Smallholder Irrigation Entrepreneurial Development Pathways and Livelihoods in Two Districts in Limpopo Province

Report to the

WATER RESEARCH COMMISSION

and

DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES

by

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Executive Summary

1 Motivation and Approach

1.1 The rural and agricultural development context

In South Africa, unemployment and poverty are closely associated and the rural areas are nodes of both unemployment and chronic poverty. The 2011 National Census data shows that 23 million people (45.5% of the population) are living below the 'Upper-Bound' Poverty Line and 10.2 million people are living below the Food Poverty Line. Rural poverty is the most severe with rural people more than twice as likely to be poor; and the severity of rural poverty is nearly 3 times that of urban dwellers. Women and youth suffer the most. The challenges in tackling poverty are compounded by high unemployment, most visibly reflected in youth unemployment which in 2015 was estimated at 45.3%. This is a crisis indeed. In rural areas, opportunities for wage labour employment are low and rain-fed agriculture is the third-most important means of livelihoods after remittances and wage labour from low-skilled jobs. Agriculture thus makes an important contribution to food security at a household level, particularly for the poorest households. Agriculture is also seen as one of the key strategic opportunities for employment and rural development but smallholder farmers face formidable challenges. It is well-established that a poorly-functioning rural economy with undeveloped infrastructure, weak market linkages and poor agricultural support services isolate rural households from the mainstream economy and from important agricultural value-chains. Weak and conflicted land institutions add uncertainty and limit transactional opportunities.

Enhancement of entrepreneurship is seen as key to growth in a free-market economic system including in the agricultural sector. Entrepreneurship in the South African informal sector is by and large, small-scale entrepreneurship, and largely synonymous with self-employment. Two categories of informal enterprise have been identified, namely survivalist enterprises and micro- or growth enterprises. Whilst survivalist enterprises are motivated by necessity (a push factor), generate limited income and rarely go beyond self-employment, micro-enterprises tend to be more motivated by opportunity (a pull factor) and offer the best potential to grow, create employment and bring about economic development.

Despite the recognised exclusionary systemic dynamics impacting on smallholders, current policies and strategies for national agricultural and water development focus on the need for a stronger and more vibrant smallholder agriculture sector. The National Development Plan of 2011 contains ambitious goals for intensive crop production activity. Smallholder agriculture, irrigation and entrepreneurship are central themes in this research project and the findings of this project could prove useful when implementation of the proposed agrarian development strategy is considered.

1.2 Research aim

The research project resulted from a directed call for proposals which included detailed Terms of Reference with defined research aims. The general aim of the study as set out in the Terms of Reference is *"to review and evaluate appropriate development paths for expansion from homestead food gardening to smallholder irrigation farming, increased water use productivity of crop production and improved livelihoods on selected smallholder irrigation schemes in South Africa"*.

The research effort pivoted on three dominant themes which were irrigated agriculture, rural livelihoods and entrepreneurship. The project identified three main populations of irrigators which were the focus of the study. The first population was home-food gardeners which comprises individuals engaged in agricultural production within their homestead. Water for irrigation is typically supplied from roofwater tanks, greywater re-use or water from municipal piped domestic systems. The second population comprises farmers active on smallholder irrigation schemes, where a scheme is defined as the hydraulic system which is shared by a group of farmers. In South Africa most of the smallholder schemes were developed in period from the 1960s to 1980s as part of the Apartheid separate development policy and are located on land under traditional tenure arrangements. The third population comprises independent irrigators who are solely responsible for their own irrigation system and typically pump from adjacent rivers or boreholes.

The key proposition in the project is that increased local, regional and national benefits from smallholder irrigated crop production will be driven by entrepreneurs who identify opportunities, develop strategies to exploit these and turn these into viable and profitable irrigated crop-production (and perhaps processing) enterprises.

1.3 Smallholder irrigation in South Africa

In South Africa the term *smallholder* mostly refers to producers who are black Africans and who farm on smallholdings; the term is used inclusively to incorporate farmers growing in home-food gardens (200 000 ha nationally), irrigation farmers (100 000 ha), and people farming in rainfed fields outside of the homestead (2 000 000 ha nationally). The term *smallholder* by name recognises the characteristic of small(er) farm size, and is typified by partially-developed links with the larger economic system. This distinguishes smallholders from large-scale commercial enterprises, which have access to fully-formed external markets. Factors that describe smallholders and allow differentiation from the commercial sector include scale, purpose of farming, contribution of agriculture to incomes, use of family labour, mechanisation, capital intensity, and financing ability.

Smallholder irrigation in South Africa is a small fraction of the total irrigation area, totaling 7.1% of the evaluated irrigated area as of 2011. There are 1 675 822 ha of registered irrigation land (in 2008) of which 1 399 221 ha is irrigated, consuming an estimated 62% of water abstracted from the national surface and ground-water resource. The number of black irrigation farmers is a small fraction of the national irrigation total, estimated at 150-250 000 individuals who farm on schemes, independently or in home and community gardens. While the first of the three groups has been established with some confidence the other two groups are based on rough estimates by calculating back from a national guestimate of 100 000 ha.

Based on the best information available, South African smallholder irrigator populations can be grouped as follows:

- Farmers on plots as part of irrigation schemes, estimated to cover 47 667 ha
- Independent irrigators, estimated to cover 30-40 000 ha
- Irrigated gardens (each of very small total size) estimated to cover 10-20 000 ha

The study focused on all three of these.

1.4 Research approach

The research was conducted using a multiple-case study approach, conducted at two research sites aiming for symmetrical analysis, covering the three populations. Thulamela Local Municipality, located in Vhembe District, was the first site and Greater Tzaneen Local Municipality, located in Mopani District, was the second. Both are located in Limpopo Province. The sites were selected purposely in response to the Terms of Reference which required that the research be conducted on two irrigation schemes in Limpopo.

Due to the need to respond to multiple themes embedded in the study assignment and gain in-depths insights into multiple factors, an exploratory, sequential mixed-methods approach was adopted for the methodology. The mixed methods approach is a research process in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches and methods in a single study or a program or inquiry. Reasons for using mixed methods often vary among researchers, but the rationale specific to this work was to enhance the breadth of understanding the study phenomena and for the corroboration of research findings. An exploratory sequential approach entailed the use of both qualitative and quantitative methods at different stages of the research process, and the Sustainable Livelihoods Framework was used for data collection and analysis.

2 Findings

2.1 Irrigated smallholder agriculture, entrepreneurship and livelihoods

Irrigated smallholder agriculture and livelihoods

Comparison of the livelihoods of three groups of households (home gardeners, scheme irrigators and independent irrigators) at two research sites provided compelling evidence that irrigated smallholder agriculture and improved livelihoods were closely associated. In terms of natural capital base, irrigator households differed primarily from the largely landless home gardeners, by having access to land and also to water to irrigate that land. At the Thulamela site scheme irrigators held about 1 ha of irrigation land on average, and independent irrigators about 2 ha. At the Greater Tzaneen site the average irrigation holding of scheme farmers was 5 ha and 6 ha for independent irrigators. *The results showed that the human, physical and financial capital base of irrigator households was also significantly greater than that of home gardener household, as were important livelihood outcomes. Incomes of irrigator households were two to three times higher than those of home gardeners, and, on average, well above the upper-bound poverty line, whilst the average*

income of home gardeners in Thulamela was below this line, and in Greater Tzaneen just about on this line. Irrigator households were also more food secure than home gardener households, because they spent more money on food, which is an indication of a better and more diverse diet and also produced larger quantities of food for own consumption. Smallholder irrigation is considered to be a successful poverty alleviation tool when it paved the way for increased consumption, asset accumulation, nutritional improvements and reduced persistent poverty among users. Over time these gains lead to institutional feedbacks that support sustained economic development and the evidence collected at the two study sites indicates that most if not all these criteria had been met.

This exciting observation requires some caution as associations between factors do not necessarily indicate causation. First, when comparing the livelihood activities of irrigator households with these of home gardeners through the various income flows, it can be seen that irrigator households had significantly higher incomes. These were in the form of regular inflows made up of employment income, grants and remittances and also higher incomes from non-farm economic activity, especially at the Thulamela site. To what extent irrigation was the enabler of the strengthening of livelihoods or the result of an already superior asset base is difficult to establish conclusively but the results obtained from scheme farmers suggest that irrigation was the enabler. Secondly, the evidence from both sites clearly shows that irrigator households are predominantly male-headed, whilst among home gardeners female-headed households are dominant. Other research in South Africa has identified female-headed households as one of the groups most prone to be stuck in chronic poverty. Studies which paid particular attention to gender and women in smallholder irrigation, recommended the 'removal of obstacles' that prevented women from full participation in irrigated agriculture but merely removing obstacles may not be adequate.

Home gardening and irrigated farming

One of the striking differences between home gardening and irrigation farming was the purpose of production. Where home gardening was done primarily for own consumption (subsistence), irrigation farming was done primarily for markets (commercial). The second important difference was that in terms of inputs home gardening was largely a LEISA (Low External Input Sustainable Agriculture) system whilst irrigated farming involved purchased inputs, mainly fertilisers, but also seed and plant protectants.

The current study showed that production in home gardens and other farming activities made a significant contribution to food consumption. In Thulamela, home gardener households consumed on average R27.88 worth of food per day and farming activities (R680) supplied this food value for 24 days. In Greater Tzaneen, where households consumed on average R25.71 worth of food, farming supplied this food value for 56 days (R1 454). Quantitatively, these contributions are surprisingly similar to the value of R750 arrived at in an earlier 2009 study, where it was estimated that the saving on food expenditure by own production from the gap in the 2005/06 household expenditure on food between urban and rural households. A similar approach was used in a separate 2015 study using 2010/11 data to estimate the value of production on land in the former homelands. Their estimate was R658 ha^{-1}. The findings in this project suggest that a significant part of this value (perhaps as much as 40%) could be generated in home gardens.

A high degree of commercialisation of farming, defined as the proportion of gross income that was derived as sales, was observed on both scheme and independently irrigated plots in Thulamela, hovering around 90%. Ten years ago at Dzindi (2002/03) this value was only 48%. This indicates that the purpose of production has almost completely shifted away from subsistence to market-oriented, and this could well be related to the rising cost of irrigated farming.

Irrigated farming and entrepreneurship

The enquiry into entrepreneurship among households at the two sites produced interesting results. Farmers in the three household groups were assessed in terms of three psychological traits that have been associated with entrepreneurship based on a self-assessment. These were: 'need for achievement'; 'locus of control'; and 'risk-taking propensity'. Generally, very limited differences were observed between the three household groups in terms of psychological traits.

The assessment of psychological traits did, however, show that farmers want to be perceived, socially/traditionally/culturally as a farming community dedicated to hard work and as a disciplined and determined group that values labour. Farmers frown upon displays of laziness, particularly in the domain of agriculture as a way of provisioning food. Their low (self-assessed) scores for uniqueness of their farm enterprise reflect the tendency to downplay any features that suggests individualism. In this way, downplaying of uniqueness (innovation) expresses the avoidance of being the object of community talk of overachievement and "making oneself better".

A cluster analysis was also carried out making use of seven performance based variables, all of which signified different aspects of entrepreneurship. This yielded seven household categories at Thulamela and three at Greater Tzaneen. At both sites, the majority of households demonstrated low to very low levels of entrepreneurship based on the indicators used. There were also a minority of households who appeared to be engaged in entrepreneurial activity with the largest number of such households were found in the cluster labelled entrepreneurial smallholders. This label reflected that these households were primarily engaged in 'the business of farming' albeit mostly motivated by necessity. In Thulamela three more household categories represented what looked like entrepreneurs motivated by opportunity. The first two were labelled petty-portfolio entrepreneurs and portfolio entrepreneurs. Both of these categories were involved in multiple enterprises, usually including market-oriented farming. The last category, labelled small-scale capitalist farmers, only had a single representative and stood out for very high entrepreneurship indicator values. Of importance also was the finding that irrigated farming was associated with raised levels of entrepreneurship, but the overlap between irrigated farming and entrepreneurship motivated by opportunity was far from complete.

The aspiration of the large majority of farmers was to grow their farm enterprise, irrespective of the group they belonged to or the study site. Home gardeners aspired to expand garden production to raise their food production, while irrigators aspired to grow their 'farming businesses' by expansion, acquisition of farm assets and gaining access to new markets. The primary goal of home gardening at both sites was to obtain food for home consumption. By contrast, the primary goal of irrigated

cropping on scheme plots and independently irrigated plots was to generate monetary income by marketing what was being produced.

It can be concluded that rural entrepreneurship, which included the production of crops and livestock for markets and also any other local business activity, made a significant contribution to the livelihoods of between 30% (Greater Tzaneen) and 40% (Thulamela) of the samples of households that participated in the study. In households where entrepreneurship was significant for livelihood outcomes, necessity appeared to be the motivating factor for most, but there was also a minority that appeared to be motivated by opportunity. This pattern resembles that described for the informal business sector found in the cities of South Africa, where also only about one out of ten informal enterprises was motivated by opportunity and the rest by necessity.

2.2 Emergent themes in entrepreneurial smallholder irrigation farming

Households and relationships of production and consumption

Households consist of people who relate to each other and from a livelihood perspective, relationships of production and consumption are central. The research suggest that the ability of parents to claim farm labour from their children in the household contributes to profitability and livelihood outcomes, with the converse being equally true. The household case studies show that young unemployed people often reject farming as a livelihood option and focus their attention on individual social and economic pursuits rather than joining their parents on the farm. It is therefore erroneous to view rural households as cohesive productive units, and the household is characterised more by relationships of consumption than relationships of production. This explains the apparent paradox in rural areas of extremely high unemployment levels coexisting with the lack of labour in farming.

Youth and agriculture

One consequence of a lack of decent work is that a person's future employment prospects are compromised as unsuitable labour behaviour patterns can last a lifetime. Yet pervasive urban poverty and the lack of urban jobs means that farming for a living will have to remain at the centre of rural development thinking for youth.

Age, gender and land

Access to land is a necessary condition for people to take up farming as a livelihood option. The case studies provide evidence that accessing (irrigation) land is not easy, especially for young people and young women in particular. When access to land is through inheritance, a young person would have to wait a long time before he can obtain access. In the past, when irrigator sons went to work in the city and then returned home when middle-aged, taking over the farm was less problematic than at present, because the migrancy phase in the life cycle of rural men has been severely interrupted due to the lack of jobs in the cities. In addition, inheritance of land is associated with farm size reduction leaving new generations of farmers with even smaller holdings than their parents. Difficulty in accessing irrigable land at a young enough age, especially for women, was one of the factors that stood out in the study and contributes to the growing disinterest of young people in farming.

Profitability of irrigation

Measured as gross income, farming contributed significantly to the total income of the households of irrigators, but the gross incomes tell only part of the story. Profitability as expressed by net operating income is sometimes small or even completely absent. Profitable irrigation is dependent on the value of production (gross income) and on the costs incurred to realise this value. The case studies showed that strategies to increase profitability include both raising the value of production by optimising agronomic factors and marketing, and strategies to minimize costs. This highlights the central importance farm-enterprise profitability initiatives in irrigation development interventions, alongside the more typical infrastructure and organisational development interventions. These profitability interventions must aim to increase on-farm productivity, reduce production costs and increase benefits from the output value chain.

Entrepreneurship and local agrarian economies

The economic development of South Africa's rural areas is dependent on the creation of rural employment. Whilst subject to debate, and perhaps dependent on locality, it would appear that farming remains the most likely locomotive of this process. At present, South Africa's macro-economic policy is aligned to the free-market economy. State-owned farm enterprises, which once existed during the homeland era, have been completely dismantled. This leaves the development of local rural economies to private enterprise. The information gained at the two study sites demonstrates that (irrigated) farming can play an important role in the economic development of South Africa's rural areas. Farming, particularly market-oriented farming, and enterprises that are linked backwardly (e.g. tractor services) or forwardly to farming (e.g. small-scale milling and the informal trade of produce) to market-oriented farm enterprises were shown to contribute significantly to the incomes of households engaged in these business activities. Whilst several rural households were able to accumulate wealth by engaging in rural business activity, others were less successful. However, even for them, engagement in (survivalist) enterprises enabled them to escape poverty.

2.3 Irrigation development pathways

It is evident that there are diverse pathways that irrigation farmers have followed to arrive at their present enterprise. It was found that rather than the route by which they get there, it is the final location of farming that is important. The project pathways framework (Figure 1) showed 12 possible development trajectories that different farmers follow to end up practising small holder irrigated farming. The cases show that all of these trajectories

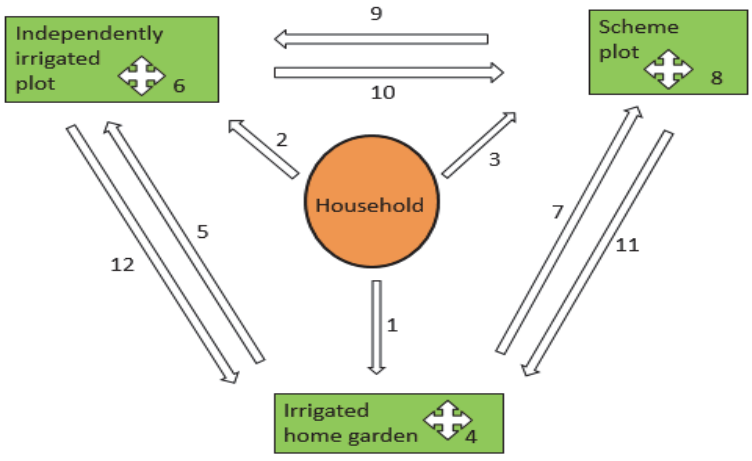

Figure 1: Development pathways of smallholder irrigators

were present in reality but it is mainly the location of the final farming activity that dictates the challenges (discussed below) that farmers face.

The motivation for getting into irrigation farming were also identified from the life histories and throws some light on why people enter irrigation farming and how they evolve:

- *'the desperates':* Irrigation farming for this group stems from unemployment, lack of options and typically, a time of desperation prior to irrigation startup. The priority need to survive and produce food for the household is the initial driver (push factor). Incremental production success and increased sale to markets leads to steady expansion and intensification, but given the origins of prevalent poverty which appear persistent, they seem to have difficulty launching to scale. This group characterises the pathway of the survivalist entrepreneur.
- *'born and bred': These* are farmers who have a family history of dryland farming. Their inculcated knowledge, passion and historical dependence on farming for food, leads to irrigation investment, intensification, surplus and profit, leading to incremental growth. They include both survivalist and opportunity-driven entrepreneurs.
- *'the forward planners':* These farmers started irrigating after a period of careful planning and saving, and building on personal skills and financial resources obtained from years of employed work, established their farming enterprises. The initial financial leverage and workplace-skills and experience seem to set this group on a higher starting platform with a characteristic faster and more successful trajectory. This group characterises the opportunity driven entrepreneurs and they are usually older farmers.

Obstacles to irrigation development pathways

Water tenure security, land tenure security and access to markets arose as critically limiting issues in relation to expansion, both within schemes and for those moving onto schemes, as well for independent irrigators. The confusing, conflicting and variable interpretations of land institutions, particularly the process to obtain and value of a PTO are a major limitation to irrigation development pathways, and a strong disincentive to irrigation development. Fear of losing land to lessees was a dominant theme limiting land-leasing transactions for scheme and independent irrigators. The weak land rental arrangements, the prevalence of water stress, combined with the widespread absence of allocations and formal mechanisms of access and control compounds the institutional risks faced by both scheme and independent irrigators face. These challenges were assessed and solutions were developed in collaboration with farmers:

- **Incentives of secure land tenure, water use rights and leadership** in organisational structures are seen as a critical condition for the expansion from homestead food gardening to smallholder irrigation farming, increased water use productivity of crop production and improved livelihoods. The outcomes support the findings of considerable fieldwork amongst home gardeners, scheme farmers and independent irrigators in both Thulamela and Greater Tzaneen, that these incentives are largely absent.

- **Expansion in scale occurs in spite of the prevailing disincentives.** Accessing land is a confusing and high risk process with multiple gatekeepers, both governmental and traditional, all seeking to

obtain some benefit from the transactions. While demands are made in the name of due-process, these are often not supported by any legislation or policy, but are given pseudo-legitimacy in the absence of legal clarity and formal institutions. Legislation has loopholes and is variously interpreted or ignored, and the resulting legislative vacuum leaves those wishing to make a living from the available land and water exposed to unacceptable uncertainties in regard to their land and water use rights, and very often exploited.

- **Use of own resources:** To obtain the equipment needed to irrigate, people largely depend on their own resources. There are, in effect, no financial institutions that provide financial support in the form of reasonable loans for this type of business development.

- **Irrigation farmers are on their own when it comes to marketing.** They learn from failures and get better as individuals, but not as a class. Farmers face barriers in understanding and benefitting from tight value chains, particularly fresh produce markets where they believe they are exploited, The government is absent when it comes to assisting small-scale irrigators with market access.

- **Government is primarily seen as a potential source of money**. This is not its primary function, but appears to be what people expect from Government. One example is the subsidised ploughing assistance which is valued by farmers at Greater Tzaneen but has had the effect of distorting the local mechanisation-contractor market and created dependency on an inadequate and unreliable service. As a knowledge service provider, the Government extension service is not viewed as a valuable source of information or provider of solutions to take peoples' farming businesses forward.

- **Youth stay away from farming.** Farmers call the youth lazy, noting the reality that most of the independent irrigators are older than 50, though there are younger entrepreneurial irrigators. However, when one considers the circumstances of high risk, the complexity of farming and the difficulty achieving profits, it is difficult to blame the youth from staying away from farming.

3 Recommended strategies

Strategies to overcome the many identified challenges were developed through multiple, in-depth consultations with different farmer groups at Thulamela and Greater Tzaneen. The writers propose that these strategies will address the dominant obstacles and provide a launchpad for new entrants and accelerate the development of existing smallholder irrigators.

3.1 Land tenure interventions

Identify and secure irrigation land for small-scale farmer settlement outside the former homeland areas (pathway 2): The most evident place to find irrigation land for small-scale farmer settlement is on existing white-owned irrigation schemes. Land acquisition, identification of suitable farmers, establishing selection criteria and supporting establishment are key issues to be addressed. The many capable scheme and independent irrigators, such as those identified in this study, would be

one obvious place to start a selection process. Stipulating the conditions for implementing smallholder settlement should include private land ownership as one of the ultimate outcomes of the settlement process.

Legislate individually-held title deeds on irrigation land under traditional-tenure (pathways 2 and 3): Land-leasing on communal schemes is limited by an absence of local institutions making entry, exit and exchange (rentals) uncertain at best, impossible at worst. A bold Government intervention that would enable a robust institutional basis for resolving issues of disincentives from insecure tenure (which undermine investment and limit exchange) would be to issue conditional title deeds to the existing land-rights holders on schemes. The conditions would incentivise irrigation activity and disincentivise leaving land unused.

Interim land leasing protocols and local administration systems (pathway 3): Failing bold transformative measures to address the inherent weaknesses of communal tenure in relation to transfer and exchange, the alternative is to accept the long-standing policy hiatus and work within the significantly inadequate prevailing land-tenure framework. This can be achieved by driving well-documented locally administered land-leasing arrangements leading to more formalised leasing arrangements on schemes.

3.2 Market and knowledge interventions (pathways 2 and 3)

Reduce risk in market access through cooperative formation (pathways 2 and 3): The most obvious way in which to address the small scale of the production of individual farmers is through the formation of cooperatives. This intervention has been proposed by many, but implementation has lacked success. We argue that cooperative formation should be an organic process during which members develop and express mutual understanding and identify a common purpose, such as collective marketing, not a 'rent-a-crowd' approach to secure Government funding. There is also the opportunity to optimise local procurement, by targeting various smallholder groupings to supply fresh produce (peri-urban groups) and semi-perishables (distant groupings).

Develop value-chain access with fresh produce markets (pathways 2 and 3): We are of the view that trusted links must be developed between small scale farmers and fresh produce markets. This will require the setting up and monitoring and evaluation of a value chain in which the interests of small scale farmers are considered and protected to the same extent as those of large commercial producers. Pilot studies of this nature are recommended and would focus specifically on: supply to local supermarkets; access to local government procurement tenders (hospitals, schools,etc.); and access to the national fresh produce markets used by many independent farmers already, but with great uncertainty and limited profitability. The initiative would have to address challenges of: DOH certification that produce pre- and post-harvest is not contaminated; costs of such certification; contracts between farmers and local supermarkets; sizing and pricing of produce (targeted packaging); payment delays from supermarkets; and local market saturation through better coordination of growers to align crop choices and target markets. Supply to bulk fresh produce markets would have to address: aggregation (to sell to markets in sufficiently large quantities); the

prevalent exploitation by market agents given lack of farmer knowledge on requirements and processes, and the establishment of monitoring delivery once crops leave for the markets; and the high cost and associated risk (of produce-loss) of packaging, transportation and storage.

3.3 Water infrastructure investment (pathways 1, 2 and 3)

Roofwater collection for home-garden supply (pathway 1): Rainwater harvesting and conservation technologies have been well-documented and tested in South Africa. It is proposed that rainwater harvesting techniques suited to serve small gardens within the homestead are identified and that their implementation is rolled out by appropriate agencies. Roof water harvesting and underground storage appears to be a suitable option for local conditions. This technique will provide water for supplementary irrigation in summer as well as for water to practise winter cropping on small parcels of land in the home garden.

Grant and/or loan funding for bulk and infield irrigation infrastructure (pathways 2 and 3): Irrigation in the homestead or on irrigation farms requires significant infrastructure investment. In homesteads, storage tanks installed will cost approximately R1000/cu.m. Irrigation systems for field crops range between R40,000 and R150,000 per ha including bulk water transfer infrastructure, but excluding storage in the form of dams, etc. In the absence of direct support from Government, expansion of this sector through private investment will be limited by the very high capital costs beyond the reach of most smallholders. The DWS Resource Poor Farmers Subsidy is one highly suitable instrument to provide funding for water-infrastructure feasibility studies, bulk water investment and operational subsidies, water-harvesting tanks and reservoirs, among other categories of support. The funding administration and the amount of funding is however far short of what is needed to transform the smallholder irrigation sector. Alignment of increased funding with proposed irrigation settlement scheme interventions such as land and water management, is essential.

3.4 Water regulations and irrigation management (pathways 2 and 3)

Dedicated support to acquire water-use licenses (pathways 2 and 3): The absence of water-use licenses and the widespread insecurity in relation to both the legal right of use, and the quantity that can be used, presents a high risk to smallholders and is a critically limiting factor. Active institutional support is needed for HDI irrigation farmers to register their use, or to secure water-use licenses. The majority of participating farmers in the project have been unable to secure water use licences or get written information on allocations. The water administration bureaucracy is complex terrain for smallholder farmers with confusing terminology, legal differentiations (licenses versus General Authorisations), and high levels of literacy demanded by farmers who often have limited formal education. Active and dedicated support to drive a process to achieve secure water use licenses for smallholder irrigators is a high priority need.

Scheme irrigation management organisational development (pathway 3): Intensive effort is needed to establish self-financed, farmer managed irrigation institutions on schemes. While

somewhat valiant attempts have been made in the past by DWS, these were isolated from other essential interventions such as: investment to ensure a functioning irrigation scheme (i.e. water infrastructure); alignment of agricultural support to ensure profitability and thereby a basis for irrigation service fee payment; and development support for the acquisition of scheme water-use rights. Irrigation services provision is practical and achievable in the smallholder scheme context by use of farmer-centred, participatory irrigation management (PIM) approaches based on institutional development of water-management organisations (WUAs or otherwise). The development approaches for these are widely published internationally and there is strong precedent in the principles of WUA functioning in the historically white-owned irrigation schemes in South Africa, but which need significant institutional re-design for the smallholder context. Unless these organisational, institutional and attitudinal-change development investments are made to achieve secure water supply on-farm, and equity of access across the schemes, underpinned by formalised conflict resolution mechanisms, water-chaos will continue to prevail, seriously undermining farmer and scheme productivity.

4 Concluding statement

The findings show that irrigation is strongly associated with improved livelihood outcomes and a strengthened human, physical and financial capital base. The incomes of irrigator households were significantly higher with all irrigator households above the upper-bound poverty line, whilst home gardeners were on or below this line. Irrigator households were also more food secure with greater food diversity than home gardener households. Entrepreneurial farmers with varied characteristics, but sharing a business outlook, were identified in similar numbers to classical peasant-farming categories, with true capitalist farmers a rarity. Obstacles to successful farming were severe and were dominated by institutional disincentives in the acquisition of secure land and in obtaining secure water supply. The wholly inadequate, even chaotic, communal land-tenure arrangements, combined with high risks related to inadequate irrigation water supply turn development pathways into somewhat treacherous endeavors. Relocation of promising farmers onto well-established (previously white-owned) schemes, fundamental reforms in communal land-tenure systems on smallholder schemes, investment in water management institutions, marketing support, and water management interventions are all strategies that would have to be pursued in parallel to achieve results. Irrigation can, it seems, provide the much sought after development outcomes but this requires a new political will to re-set the development direction, drive profitability initiatives and re-institutionalise the smallholder irrigation sector from a land and water perspective.

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The authors are presented alphabetically by surname and the order does not reflect any priority in their contribution to the work.

Acronyms

ANC	African National Congress
BEE	Black Economic Empowerment
CLaRA	Communal Land Rights Act
CMA	Catchment Management Area
CSA	Climate-Smart Agriculture
CSG	Child Support Grant
DAFF	Department of Agriculture, Forestry and Fisheries
DFID	Department for Internal Development
DRDLR	Department of Rural Development and Land Reform
DoH	Department of Health
DSD	Department of Social Development
DWA	Department of Water Affairs
DWAF	Department of Water Affairs and Forestry
DWS	Department of Water and Sanitation
GIS	Geographic Information System
GPS	Global Positioning System
ha	hectare
HDI	historically disadvantaged individuals
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
ILO	International Labour Organisation
IPILRA	Interim Protection of Informal Land Rights Act
IWRM	Integrated Water Resources Management
LEISA	Low external input sustainable agriculture
MDG	Millennium Development Goals
MUS	Multiple-Use Water Services Framework
NDP	National Development Plan
NFSD	National Framework for Sustainable Development
NGO	Non-Government Organisation
NWA	National Water Act
NWRS	National Water Resource Strategy
PIM	Participatory Irrigation Management
PTO	Permission to Occupy
RDP	Reconstruction and Development Programme
RPF	Resource-Poor Farmers
RWH	Rainwater Harvesting
SLF	Sustainable Livelihoods Framework
TA	Tribal Authority
WAR	Water Allocation Reform
WRC	Water Research Commission
WUA	Water User Association

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Appendices

Chapter 1 Introduction

1.1 Background

The research project is framed by the reality of hunger, poverty and unemployment in the densely populated rural areas of South Africa where available land and water are typically underutilized. The conundrum of hunger and economic deprivation in the midst of underutilized primary agricultural resources drives ongoing interest and enquiry into smallholder irrigation in various production contexts.

1.1.1 Rural poverty and the importance of agriculture

High levels of poverty, food insecurity and inequality remain dominant challenges in post-apartheid South Africa and poverty is most severe amongst black South Africans living in the rural areas. The 2011 National Census data shows that 23 million people (45.5% of the population) are living below the 'Upper-Bound' Poverty Line and 10.2 million people are living below the Food Poverty Line. Rural poverty is the most severe. Rural people are more than twice as likely to be poor and the severity of the poverty is nearly 3 times that of urban dwellers; in addition, women and youth suffer the most (StatsSA, 2014). Although South Africa is classified as a food-secure country in that it is a net exporter of agricultural products, this does not translate to food security at household level. In 2011, 26% of the population had inadequate access to food, and 13.4% suffered from hunger (StatsSA, 2014).

The rural economy is dominated by remittances from urban areas, government grants and pensions and opportunities for wage labour employment are very low (Machete, 2004; StatsSA, 2012). Agriculture is the third-most important livelihoods means albeit small at around 10% (Vink & Van Rooyen, 2009). It is well established that a poorly functioning rural economy with deeply entrenched systemic limitations undermines both smallholder productivity and profitability. Poor infrastructure, weak market linkages and poor agricultural support services tend to isolate smallholder farmers from the mainstream economy, including important agricultural value-chains such as fresh produce markets and supermarkets (Sender, 2015; Cousins, 2013; NPC, 2011). Despite these challenges, there is a dominant contemporary view in government and in the literature that local food production and smallholder agricultural enterprise development is a priority opportunity to address pressing social and economic development challenges (NPC, 2011; Wenhold & Faber, 2008; Cousins, 2013; Aliber & Hall, 2012). This perspective is captured well by Aliber and Hall, who note that: *"In view of South Africa's massive unemployment problem, government has determined that the underlying purpose of having a small-scale farmer emphasis is to maximise the creation of livelihoods. The drive must be to identify the sector's potential to contribute to labour absorption and poverty reduction, particularly in the economically depressed areas of the ex-Bantustans, where self-employment opportunities are desperately needed, and then help it to fulfil this potential"* (Aliber and Hall, 2012).

Development of the sector continues to be emphasised in policy. Expansion and intensification of irrigated smallholder agriculture is a central tenet of South Africa's rural development strategy which is defined in the National Development Plan (NDP) (NPC, 2011). In the NDP, irrigation is viewed as a driver of economic activity with the aim of turning more opportunities for rural communities to participate in economic, social and political life, into reality. The plan presents a wide-ranging analysis of the water-agricultural complex and of factors that must be considered in smallholder irrigation farming. It envisages the expansion of smallholder agricultural development and integration of smallholder farmers with the dominant and highly commercialised large-scale agricultural economy. The rural development vision rests heavily on 500,000 ha of new smallholder irrigation which will be the 'driving force' of growth and change in the country's rural areas to achieve job creation and poverty alleviation. *"To achieve this (job creation and poverty reduction impact), irrigated agriculture and dry-land production should be expanded, with emphasis on smallholder farmers where possible. The 1.5 million hectares under irrigation (which produce virtually all South Africa's horticultural harvest and some field crops) can be expanded by at least 500 000 hectares through the better use of existing water resources and developing new water schemes" (*NPC, 2011). The NDP aligns well with the idea that there are varied smallholder farming practices and scales in South Africa and articulates broad support strategies for sustainable agriculture. Conserving agricultural water is highlighted as a priority. The amount of water needed, however, is not in agreement with the National Water Resources Strategy 2 (DWA, 2013) which states that water is only available for an additional 82,500 ha of irrigation which equates to approximately 17% of the NDP target. The proposed smallholder irrigation expansion is over and above the 1.4 million ha irrigated nationally at present (van der Stoep & Tylcoat, 2014), farmed mostly by the highly commercial, large-scale agricultural sector. While the financial challenges, implementation capability and other resource challenges set out in the NDP make the vision of massive expansion a boldly optimistic one there are in reality few other economic development options in the poorest areas of the country. Smallholder irrigation development therefore remains an important part of rural development planning.

Limpopo Province is the poorest province in the country (STATSSA, 2012) and has more smallholder irrigation schemes than in all the other provinces combined (Denison & Manona, 2007). It has also long been established that the agricultural capabilities of smallholder crop-farmers in the northern part of the country are relatively advanced and therefore somewhat favourable (RSA, 1955). Limpopo thus draws significant attention given the historical sunk costs into schemes and the real potential for revitalisation of schemes and the advancement of irrigated agriculture.

1.1.2 Smallholders in South Africa

Smallholder farmers are viewed as those who use mainly family labour, simple technologies, and eat a proportion of their produce, but who have to earn cash either from the sale of farm products or their own labour (Cousins, 2014). In South Africa, the term *smallholder* colloquially refers to producers who are black Africans and who farm on smallholdings (van Averbeke *et al*., 2011), which include irrigation plots, home gardens and rain-fed fields. The term 'smallholder' by name recognises the characteristic of small(er) farm size, although the concept is influenced by the type and intensity of farming. In addition to size, smallholders are typified by a partially-developed link with the larger economic system with input and output markets which are localised and not fully formed (Ellis, 1998). They tend to operate with loose value chains (Christen & Anderson, 2013). The South African smallholder farmer typology developed by Cousins (2014) and adapted by Manderson (2015) is reproduced in Table 1.1 and is aligned to the above themes.

TABLE 1.1: Typology of smallholders in South Africa (Cousins, 2014 & Manderson, 2015)

Attribute	**Smallholder categories and codes**			
	Subsistence-oriented smallholders (**SH Code 1**)	Market-oriented smallholders in loose value chains (**SH Code 2**)	Market-oriented smallholders in tight value chains (**SH Code 3**)	Small-scale capitalist farmers (**SH Code 4**)
Objective of production	Household consumption	Household consumption + cash income	Cash income + some home consumption	Profit
Proportion of marketed output	None or insignificant	50% or >	75% or >	100%
Contribution to household income	Reduces expenditure	Variable – from small to significant	Significant	Very significant
Labour	Family	Family + some hired	Family + significant numbers hired	Hired
Mechanisation	Very low	Low	Medium to high	High
Capital intensity	Very low	Low	Medium to high	High
Access to finance	Absent	Some	Significant	Very significant
Households in SA	2-2.5 million	200-250 000	?	?

Note: SH = smallholder, with codes as defined by Manderson (2015)

The typology distinguishes smallholders, who produce partly for their own consumption, from small-scale capitalist farmers who are fully business-oriented. Home consumption and family labour is negligible for fully profit-oriented enterprises. While definitions vary, factors that characterise smallholders and differentiate them from the commercial sector generally include scale; purpose of farming; contribution of agriculture to incomes; use of family labour; mechanisation; capital intensity; and financing ability (Cousins, 2014).

Domains of production

The arable land occupied by smallholders is estimated by the following three groupings:

- farming on small plots as part of agricultural development projects such as irrigation schemes, estimated at 100 000 ha (Van Averbeke *et al*., 2011);
- homestead or backyard gardening, estimated at 200 000 ha (Botha & de Lange, 2005); and
- rainfed fields, totalling 2 000 000 ha (Backeberg & Sanewe, 2010**a**).

Estimates of the number of agricultural households in South Africa show wide variation, not least due to differences in definitions. Vink and Van Rooyen (2009) estimated 1.3 million smallholder households, mostly black African, with access to land for farming purposes. Aliber and Hall (2012) extrapolated from the 2009 General Household Survey, and arrived at 2.6 million agricultural households, of which 5.6% were commercially oriented, while the 2011 census survey identified 2.9 million agricultural households (StatsSA, 2013). The census data is criticised as being too inclusive of those making an insignificant contribution to food availability such as households "...with a few chickens scrabbling in their backyards" (Sender, 2015), but also as not reflecting the many invisible smallholder farmers (Aliber and Hall, 2012). While the total is open to some debate, close to half engage in cropping of some sort, either in mixed farming (animals and cropping) or cropping alone (StatsSA, 2013), with between 4% and 8% being commercially-oriented smallholders (Vink & Van Rooyen, 2009; Aliber *et al*., 2010). Women are the household heads of between 49% and 57% of agricultural households (StatsSA, 2013; Vink & Van Rooyen, 2009). Moving from households to people, it is estimated that about 4 million black people are involved in agriculture at some level, and women make up 60% of all of those involved in farming (Aliber & Hart, 2009).

There is a strong case to be made that the smallholder domain of the backyard garden, comprising 200 000 ha, is a priority area for engagement to target food insecurity. This is due to: inclusion in the household boundary with security and fencing advantages; the locus of control for multi-tasking women; the more easily mobilised and low opportunity cost of family labour; the financial manageability of this small scale of farming; and the benefits of mixed cropping and extended harvesting periods from a nutritional perspective (Backeberg & Sanewe, 2010; Minkley, 2003; Fay, 2013; Stimie *et al*., 2010; Wenhold & Faber, 2008). Others have documented the inexorable retreat from field farming to intensified and diversified production in home gardens over the last few decades in the Eastern Cape and Free State (Andrew & Fox, 2003; Hebinck & Monde, 2007; Walker, 2011; Fay, 2013) with only some 20% activity in fields in recent times (Fay, 2013; Sender, 2015). This is attributed to numerous challenges in the fields, not least a lack of fencing, no access to production financing, mechanisation shortages, and inadequate production knowledge, all of which dis-incentivise activity and undermine profitability.

While rainfed farming at field scale is under retreat, smallholder irrigation activity and development remains an area of continued activity and a priority focus, not least of the National Development Plan. While individual and scheme level successes are evident, nationally speaking, smallholder scheme performance is poor (Van Averbeke *et al*., 2011; Cousins, 2013). Interventions needed for the intensification of activity on smallholder irrigation schemes are reasonably well-understood nationally and more widely (Denison & Manona, 2007; World Bank, 2010), though expensive and complex to implement. These typically require state intervention in infrastructure rehabilitation, land administration, water institutions, and individual farmer capacity development in integrated ways that have been largely missing in South African efforts in the last two decades (Denison & Manona, 2007).

There are three domains of possible engagement to increase food production and food security in the smallholder sector, which are home gardens (usually partly irrigated), individual fields (irrigated or rainfed), and irrigation schemes. In this line of thinking, it is postulated that substantial numbers of livelihoods can be created through a mixed strategy focused primarily on small-scale farming at varied scales and for different purposes – alongside a programme supporting the growing numbers of black commercial irrigation farmers more conventionally targeted (Cousins, 2013; Aliber & Hall, 2012; NPC, 2011). The NDP is very clear on the importance of smallholder irrigation development as a central part of the strategy to address rural poverty and unemployment.

1.2 Problem statement

The risks of farming, and irrigation farming in particular, are high. While water availability reduces one element of production risk, irrigation systems bring additional technical and management complexity as well as additional costs. Irrigation is also associated with higher-intensity agriculture, typically producing two crops per year. In order to achieve farming success at any scale beyond that of a household garden, it is necessary that the benefits in food or monetary profits exceed the costs of production. This is all the more so in the case of irrigation which has an added level of sophistication and complexity compared with rainfed farming. Irrigation farming at scales beyond a half hectare or so typically extend beyond the immediate financial resources of smallholder farming homesteads and demands increased competency. Input costs become more substantial, infrastructure investment is needed (fencing, pipes, stores, etc.), wage labour must be financed and managed and logistics must be capably addressed. Negotiating access to markets with related acumen is essential to minimise input costs and maximise returns from produce sale. The dominance of the corporate agricultural sector in South Africa, against which smallholders must compete for a market share, is nearly absolute, making competition difficult (Sender, 2015). These sophisticated larger-scale capitalist irrigation farms cover more than 14 times the area of smallholder irrigators (van Averbeke *et al*., 2011). About 99% of food is produced by only 3% of farmers and is distributed by four dominant retailers who control an estimated 55% of the food retail industry (Chikazunga, 2012). Given the imbalance of forces in the South African agricultural system experienced negatively by smallholders, entrepreneurial capability is seen to be a key to growth in a free-market economic system.

Entrepreneurship in the South African informal sector is, by and large, small-scale entrepreneurship, and synonymous with self-employment (Rolfe *et al*., 2010). Two categories of informal enterprise have been identified, namely survivalist enterprises and micro- or growth enterprises. (Morris & Pitt, 1995; Rogerson, 1996, Finmark Trust, 2010). Whilst survivalist enterprises are motivated by necessity, generate limited income and rarely go beyond self-employment (Calvin & Owalade, 2011), micro-enterprises tend to be more motivated by opportunity and offer the best potential to grow, create employment and bring about economic development. Entrepreneurs can be broadly defined as individuals who identify a need in the market and develop products and services by making decisions about bringing resources together (raw materials, financial and human resources) to satisfy that need. An entrepreneur, in the pioneering thinking of Schumpeter (Co *et al*., 2006), has the characteristics of innovation, creativity and discovery applied to a business context. The entrepreneur takes risks in taking an enterprise idea into action, and is rewarded with the profits of the business. While successful smallholder irrigation farmers may not be many in number or particularly well-publicised there are those who succeed against the odds. This leads to the line of enquiry about the characteristics, histories and experiences of these farmers given the challenging South African smallholder farming context. What has enabled them to compete in an unfavourable situation and how and why did they succeed?

1.3 The project rationale

The Water Research Commission sets out the project rationale as follows (WRC, 2013).

"In the programme of action of the Presidency announced during 2010, Outcome 7 envisages vibrant, equitable and sustainable rural communities with food security for all. It is expected that Output 4 will deliver improved employment opportunities an economic livelihoods. This includes a rising percentage of small-scale farmers producing for market sales and an increased number of jobs in agro-processing. Furthermore, it has been argued (Sunter, 2011) that, for a balanced economy, both an outward and inward focus is required. The last mentioned involves support for establishment of new businesses and related additional job creation. In this regard priority attention should therefore be given to encouraging existing and new farming businesses to be undertaken on smallholder irrigation schemes. The millennium development goals also require reduction in poverty levels and empowerment of women. The available evidence indicates that natural and human resources on most if not all smallholder irrigation schemes in South Africa are utilised far below potential. Given the semi-arid circumstances and potential impact of climate change, increasing emphasis must be placed on higher productivity of water use under irrigation. It will involve higher crop production and better product quality, which allows for negotiating higher prices and improving operating margins. For this purpose ways must be found to enable more productive farming practices, and more competitive and profitable farming on irrigation schemes. This in turn requires that an assessment is made of the goals and aspirations of current and potential farmers, in particular women, to improve the economic performance of farming enterprises. In order to show the way forward, research should be done which is based on real situations on existing irrigation schemes where solutions are

practically achievable. This can be done by involving farmers and potential beneficiaries on irrigation schemes in the research effort."

1.4 The project objectives

The research project resulted from a directed call for proposals which included detailed Terms of Reference with defined research aims, listed below.

The **general aim** of the study as set out in the Terms of Reference is *"to review and evaluate appropriate development paths for expansion from homestead food gardening to smallholder irrigation farming, increased water use productivity of crop production and improved livelihoods on selected smallholder irrigation schemes in South Africa"*.

The **specific** aims are:

1 To evaluate natural, physical and financial assets with specific attention to irrigation farming potential.

2 To evaluate human and social assets with particular attention to entrepreneurial spirit and management capabilities within incentives of secure land tenure, water use rights and leadership in organisational structures.

3 To determine sources of livelihoods and opportunities to improve contribution by farming within available food value chains.

4 To determine the aspirations and goals of farmers to expand irrigation crop production from homestead gardens to irrigation plots and/or from one to more than one irrigation plot.

5 To formulate and test appropriate development paths for establishing sustainable farming businesses with crop enterprises to increase food security, profitability and employment opportunities on smallholder irrigation schemes.

The project Terms of Reference required that the focus of the research be on home gardeners and scheme irrigators' "…*development paths for expansion from homestead food gardening to smallholder irrigation farming…on selected smallholder irrigation schemes….in two Districts in Limpopo Province".* A third grouping, comprising independent irrigators, was, however, also included in the project. This was due to their observed prevalence and relative success despite many documented obstacles; their seemingly inherent entrepreneurial character intrinsic in their 'independent' status; and their increasing importance globally as drivers of irrigation expansion and development.

Three population groups were the focus of the study:

Home-food gardeners. These are individuals who engage in agricultural production within their homestead. Water for the garden is typically supplied from roofwater tanks, greywater re-use or water from municipal piped domestic systems.

Irrigation scheme farmers. These are people who farm on irrigation schemes. A scheme is a conglomeration of farms that share a bulk irrigation water supply system.

Independent irrigators. These individuals are solely responsible for their own irrigation system and typically pump from adjacent rivers or boreholes they have developed themselves. They have a substantially different set of financial, institutional, transactional and water-security issues to the other two groups.

The key proposition in the project is that increased local, regional and national benefits from smallholder irrigated crop production will be driven by entrepreneurs who identify opportunities, develop strategies to exploit these and turn these into viable and profitable irrigated crop-production (and perhaps processing) enterprises. The research project sets out to explore the development pathways of smallholder irrigators in selected districts in Limpopo Province, with a focus on three production contexts: home gardeners, scheme irrigators and independent irrigators.

1.5 Approach

The concept and processes of designing research always need to respond to the nature of the research questions that have to be addressed. In mono-thematic quantitative studies, research design provides a blueprint on how and what to be done. However, when there are multi-thematic topics, as was the case with this assignment, research design is used to provide a non-restrictive scientific strategic framework within which methods and tools to address research questions are formulated (Durrheim 2006; Murata *et al*., 2015).

The research was a multiple-case study, conducted at two research sites, each of which contained the three populations of interest. Thulamela Local Municipality, located in Vhembe District was the first site and Greater Tzaneen Local Municipality located in Mopani District was the second. Both are located in Limpopo Province. The sites were selected purposely in response to the Terms of Reference, which required that the research be conducted on two irrigation schemes in Limpopo, looking specifically at entrepreneurial pathways, in a context of individual enterprise, expansion and intensification. Three population groups were selected for intensive study, namely home gardeners, irrigation scheme farmers and independent irrigators.

The home gardener group represents the general population. In Thulamela, Itsani Block 3 and Manamani were the settlements selected to represent this population for this site. Both settlements are adjacent to Dzindi Irrigation Scheme, thus sharing many of the spatial factors that affect livelihood opportunities, agriculture, and markets. In Greater Tzaneen, Rhulani Village adjacent to

Julesburg Irrigation Scheme was selected. The group of scheme farmers is represented by the population of households that hold plots on the Dzindi Irrigation Scheme, which is the anchor site of the Thulamela case study. At the Greater Tzaneen site the irrigation scheme group is represented by farmers at Julesburg Irrigation Scheme. The group of independent irrigators comprises households that directly access a source of irrigation water and extract, convey and apply this water using privately owned equipment for the production of crops. A total of 100 independent irrigators operating in the vicinity of Dzindi were studied for the Thulamela site, while a total of 34 were studied for the Greater Tzaneen site.

Due to the need to respond to multiple themes embedded in the study assignment and gain in-depths insights into multiple factors, an exploratory, sequential mixed-methods approach was adopted for the methodology. The mixed methods approach is a research process "in which the investigator collects and analyses data, integrates the findings, and draws inferences using both qualitative and quantitative approaches and methods in a single study or a program or inquiry (Tashakkori & Creswell, 2007). Reasons for using mixed methods often vary among researchers, but the rationale specific to this work was to enhance the breadth of understanding the study phenomena and for the corroboration of research findings.

An exploratory sequential approach entailed the use of both qualitative and quantitative methods at different stages of the research process, and the Sustainable Livelihoods Framework was used for data collection and analysis.

1.6 Structure of the report

The report documents multiple themes in relation to food gardeners and farmers livelihoods, agricultural practices, entrepreneurial characteristics, irrigation development pathways and concludes with proposals to address the primary hindrances that they face. The report structure follows a logical sequence.

Chapter 2 – Literature Review: The first half of the detailed review covers the literature in relation to livelihoods theory, agricultural livelihoods in South Africa, and irrigation as a livelihoods strategy. The second part attends to entrepreneurial theory.

Chapter 3 – Methodology: This chapter presents an extensive description of and theoretical basis for the mixed methods approach and how it was applied to each of the research themes.

Chapter 4 – Livelihoods of irrigators in Thulamela and Greater Tzaneen: The chapter contains the results and analysis of data that was collected by means of survey research on the three populations of study. This provides a quantitative description of the livelihoods of rural households at the two study sites.

Chapter 5 – **Farming by Households in Thulamela and Greater Tzaneen:** In this chapter, farming by the households that were part of the Thulamela and Greater Tzaneen samples is described. This is done by means of summary tables in which the various types of farm enterprises practised by the three groups of households that made up the study sample.

Chapter 6 – **Entrepreneurship among rural households in Thulamela and Greater Tzaneen:** Entrepreneurship and the development thereof in irrigation is the essence of the study. The chapter operationalizes the agricultural elements of entrepreneurship and presents an analysis of seven 'entrepreneurial' variables from the survey database.

Chapter 7 – Life histories of irrigators: First, the characteristics of entrepreneurship were used to group different types of entrepreneurs from the survey database, and a typology was then developed. This is followed by illustrative life histories that provide a fuller and more intuitive picture of the kind of agricultural entrepreneurs that were identified in the three populations.

Chapter 8 – Smallholder development pathways: The life histories that were recorded provided a timeline of agricultural activities of the three population groups at the two sites, which are summarised in the chapter. Their pathways of development were mapped providing insight into the range of factors that impact on their agri-enterprise efforts.

Chapter 9 – Hindrances to pathways and related strategies: This chapter describes the consultative process that was undertaken with farmers to identify hindrances and opportunities, leading to a set of co-developed strategies to maximise irrigation development opportunities.

Chapter 10 – Conclusions and recommendations: The report concludes with a synthesis of the findings, and sets out recommendations for actions that are needed to remove obstacles to irrigation pathways. These actions, it is put forward, will accelerate development of smallholder irrigation farmers in Limpopo Province and in South Africa more widely.

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Chapter 2 Literature Review

The first part of the literature review covers the domain of rural livelihoods in an irrigation development context. In the second part, attention is given to entrepreneurial characteristics and related challenges in the smallholder farming sector.

2.1 Livelihoods and irrigation

2.1.1 Livelihoods: Theory and conceptual issues

The livelihood concept

Livelihood refers to the ways and means of making a living. Use of the livelihood concept came to prominence as a result of the realisation that people-centred development thinking and action required adequate levels of understanding of the reality as it was being experienced by the people who had created ways and means to cope with it in order to make a living. Livelihood thinking became main-stream during the last decade of the twentieth century, which was also the period of intense conceptual development (Scoones, 2009). The livelihood concept was attractive because it offered opportunities for people from a wide range of disciplinary backgrounds to collaborate. It brought together the critical factors that affected the vulnerability or strength of individual or family survival strategies (Allison & Ellis, 2001). These critical factors were thought to comprise the assets possessed by people, the activities in which they engaged in order to generate an adequate standard of living and to satisfy other goals, such as risk reduction, and the factors that facilitated or inhibited different people from gaining access to assets and activities (Ellis, 2000).

Clarifying how 'livelihood' should be understood is important, because the ways and means by which a living is made are the result of a complex amalgam of factors. Differences among these factors bring about considerable degrees of diversity in the livelihoods of people (Ellis, 2000; Barrett *et al.*, 2001; Niehoff, 2004; Scoones, 2009). Moreover, these factors change over time, explaining why livelihoods are dynamic. To deal with this complexity the livelihood concept had to be deconstructed in order to identify the important elements or aspects that contributed to what makes up a livelihood and also the relationships between these elements or aspects[1]. Several disciplinary perspectives influenced this analytical process, including economics, environmental sciences, sociology and political science. Emanating from this analysis was a particular way of thinking about development and more specifically poverty reduction, generally referred to as the 'Sustainable Livelihoods Approach'. Sustainability was linked to the livelihood concept to capture concerns about the impacts of livelihood activities on the asset base, particularly natural assets (environmental sustainability), and also to take into account the extent to which livelihood outcomes enabled

[1] *Scoones (2009) provided an account of the conceptual development of the livelihood concept and the various influences that made contributions to this process.*

people to escape poverty and provide for reasonable standards of living and wellbeing (Scoones, 2009).

De Satgé (2002) describes the sustainable livelihoods approach as a way of assisting people in identifying their strengths and building on the strategies they had already developed to reduce vulnerability, diversify their livelihoods and make them more secure. He adds that the approach also engages policy makers and development practitioners to ensure that policies and development initiatives target the key issues and actively contribute to livelihood security (De Satgé, 2002). Linked to the development of the Sustainable Livelihood Approach was the creation of the 'Sustainable Livelihood Framework', several of which have been produced[2]. Scoones (2009) describes these 'sustainable livelihood frameworks' as 'linked inputs (designated with the term capitals or 'assets') and outputs (livelihood strategies), connected in turn to outcomes, which combined familiar territory (of poverty lines and employment levels) with wider framings (of well-being and sustainability)'. At the centre of sustainable livelihoods frameworks are people. The perspective that people operate in a context of vulnerability reflects the poverty reduction focus of these frameworks. Within this vulnerability context people have access to certain assets or poverty reducing factors. These gain their meaning and value through the prevailing social, institutional and organisational environment, which influences the livelihood strategies that are open to people in pursuit of beneficial livelihood outcomes, which meet their personal livelihood objectives (DFID, 1999).

As is evident from the terms of reference and objectives of this project elaborated in the first chapter of this report, the adoption of a livelihoods perspective to research activities was an explicit requirement. Since the Project called for a description of the livelihoods of participants in the study, it was imperative that the team decide on the livelihood framework that would guide the collection and analysis of livelihoods information. Following careful consideration the project team decided on adopting the Sustainable Livelihoods Framework of Ellis (2000). Justification for this choice was that this Framework was one of the most recent and that it provided detailed explanatory notes on its application. As with most other sustainable livelihoods frameworks, the Framework shown in Figure 2.1 is a representation of the main factors that affect people's livelihoods, and of the relationships among these factors. It provides a checklist of important issues and indicates their linkages. It draws special attention to core influences and processes and their multiple interactions in association to livelihoods. It depicts people as operating in a broader context within which they have access to certain assets. The livelihood outcomes are influenced by a range of formal and informal organisational and institutional factors, which determine the extent to which individuals, groups or communities are capable of accessing certain assets for use in the development of livelihood strategies aimed at achieving their desired livelihood outcomes.

[2] De Satgé (2002) presented and compared a selection of different livelihood frameworks.

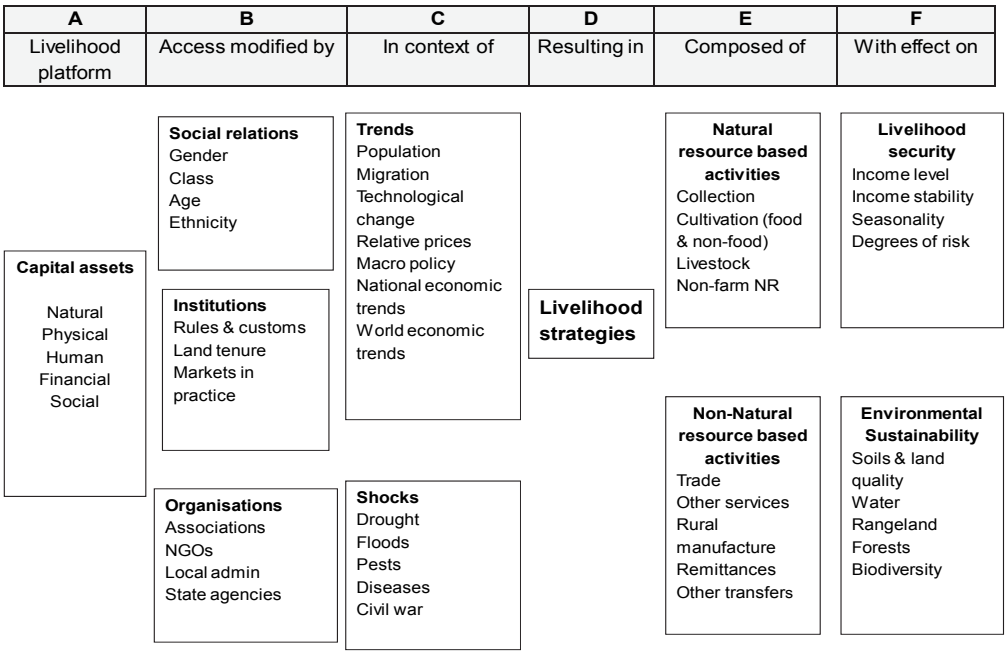

FIGURE 2.1: The Sustainable Livelihoods Framework (Ellis, 2000)

In the remainder of this section the different parts of the Framework are elaborated, and the meanings of the concepts contained in these parts are explained. This includes a discussion of different perspectives on the meaning of these concepts, which is then used to define the concept for the purpose of the current study.

Unit of analysis in livelihood studies

As with other sustainable livelihoods frameworks, the Sustainable Livelihoods Framework of Ellis (2000) emphasises the importance of people. The idea is that people's skills and resources and the different factors contributing to how they make a living must be understood (De Satgé, 2002). People can be looked at as individuals or as 'social units' but there is general agreement that livelihoods are best understood when using 'social unit' as the unit of analysis. Reasons are that it is at the level of the social unit that decisions on livelihood strategy and consumption of resources are made.

Various social units that could serve as the unit of analysis in livelihoods research have been identified and defined (see for example Baber, 1998), and there is ongoing debate on what constitutes the most appropriate unit, mainly been between advocates of the use of household and those favouring the use of homestead (see for example Hebinck, 2007). However, household is by far the most commonly used social unit in livelihood analysis. Examples of South African livelihood work in which household was the unit of analysis are Baber (1996), Mtshali (2002), Fraser, Monde and Van Averbeke (2003), Perret, Anseeuw and Mathebula (2005), Gidi (2013) and Ncube (2014). There is no single definition of 'household'. Different cultures, and social groups within cultures, think of household in different terms (Messer & Townsley, 2003; De Satgé, 2002). For this reason, it

was important to develop an operational definition of 'household' that served the purpose and suited the context of the project.

According to Ellis (1993), the household is a social unit defined by the sharing of the same abode or hearth. He points out that the household is the site where particularly intense social and economic interdependencies occurs between groups of individuals. A similar understanding of household is presented by De Satgé (2002) and Malleson *et al.* (2008), who define household as "the group of people who ate together, shared resources and lived under the same roof", and by Niehof (2004), who defined household as "a family-based co-residential unit that took care of resource management and the primary needs of its members". In many definitions of household the aspect of co-residence (sharing of a physical space) is central. Niehof (2004) argues that co-residence does not necessarily imply living under one roof, but insists that the proximity of household members have to be such that they share in major parts of the household resources and daily activities. In his definition of household, Budlender (2000) also considers proximity of great importance in defining household membership. He defines household as "a person or group of persons who ate together and shared resources, and normally resided at least four nights a week at the specific visiting point". Messer and Townsley (2003) and Carloni and Crowley (2005) define the household as "a group of people who ate from a common pot and shared a common stake in perpetuating and improving their socio-economic status from one generation to the next". Whilst the latter definition also emphasised co-residence and resource sharing, it adds 'shared purpose' to the meaning of the household concept. Mookodi (2000) and Beaman and Dillon (2010) add the aspect of authority and the notion of 'head of household', being a person who ultimately makes decisions, to the understanding of household. They define household as "a group of persons, related or not, living under the same roof, under the responsibility of a head, whose authority was acknowledged by all the members". De Wet and Holbrook (1997) identify four aspects contributing to the concept of household, namely the kinship aspect, the task related aspect, the co-residence aspect, and the aspect of identity and social markers. Among these four aspects, none on its own is sufficient to define the concept of household. The kinship or familial aspect of the household is defined by Carter (1984) as 'the origin of the links between its members'. Carter (1984) points out that the origin of these links are culturally defined relations of birth, adoption and marriage, regardless of whether those who are linked in this way live together or engage in any shared tasks. Ellis (2000) explains that the aspect of co-residence denotes the sharing of space, which conditions size and composition of the household. The task related aspect is described by Carter (1984) as 'shared tasks of production and/or consumption, regardless whether its members are linked by kinship or marriage or co-residence'. De Wet and Holbrook (1997) point out that household tasks do not necessarily need to take place in a single physical location. For this reason they highlight identity and social markers as the fourth aspect that contributes to defining the household concept. They consider identity and social markers particularly pertinent in settings characterised by migration being concerned with what migrants consider as 'their home'.

'Homestead' can be understood to refer to the physical space occupied and utilised by a household. Muhwava *et al.* (2007) and Hoosegood and Timaeus (2005) define homestead very narrowly and

refer to it as a structure used for residential purposes only. Others held a broader perspective of physical space and include outbuildings and land held by households when defining homestead, which is more appropriate when working in rural areas. One example is Dey (1993) who defines homestead as "a dwelling (whether used by the owner or let out) and the land on which it stood, together with any courtyard, compound, attached garden, orchard and outbuildings, and inclusive of any outbuildings used for purposes connected with agriculture or horticulture and any tank and place of worship appertaining to such dwelling". Another is Mtshali (2002) who worked in the rural areas of KwaZulu-Natal, and who defines homestead as "a cluster of dwellings, kitchens and animal kraals and sheds, with its associated fields", capturing the make-up of homesteads in this area. Norris (2010) describes the homestead as consisting of a house, outbuildings and adjoining land owned and occupied by a person or family as residence. De Wet and Holbrook (1997) point out that households can occupy homesteads that are separated spatially. They capture this idea by categorising households into 'single homestead households' and 'multiple homestead households'. In single homestead households migrants still see themselves as having only one home, to which they make remittances and return visits, and to which they assume they will finally retire. In multiple homestead households, migrants set up their own homestead near their places of work, usually in urban areas, but continued to maintain close contact with their natal rural homestead, through frequent visits and the sending of goods and money (De Wet & Holbrook, 1997). Social and economic linkages between urban and rural are characteristic for South Africa (Smit, 1998; Smith & Hebinck, 2007; Atkinson, 2014). As a result, decisions on linking or de-linking relationships between rural and urban affect the extent to which livelihoods are captured and understood. In the current study the focus is on the rural homestead, where farming takes place, and on the social unit that resides at this homestead. Of ultimate concern to the study are the livelihood outcomes which these rurally-based social units derived from their livelihood strategies, and it is argued that these outcomes would be reflected first and foremost in the consumption patterns of the rurally-based social units. For this reason it was decided to define the social unit of analysis in this study from a shared consumption perspective, and to use the term 'household' to refer to this social unit, in line with the social unit used in the Sustainable Livelihoods Framework of Ellis (2000). The rural space, referred to as 'homestead' is defined as the dwelling and the land and other natural and immovable physical resources that are attached to it. The rural homestead group is defined as the group of people who reside at the rural homestead. 'Household', as the main unit of analysis in this study, is defined as the group of people that share in the consumption of the resources available to the rural homestead group for their living.

Defining household in terms of shared consumption extended household membership beyond co-residence at the rural homestead to include people who live elsewhere but depend primarily on making claims against the rural homestead group for their consumption. Typically, such people are linked to the rural homestead group by ties of kinship but are away from the rural homestead to study or to look for work. On the other hand, people who are identified as belonging to the rural homestead group by those who reside there, and who maintain economic and social ties to the rural homestead group by remitting goods and/or money, but who have their own homestead elsewhere, are not considered members of the household. Their exclusion is congruent with the consumption

perspective on household membership, because these migrants take care of the consumption needs of their 'own' homestead groups.

Besides 'household' the study uses the 'farmer' in the household as the second unit of analysis. That person Is defined as the "main decision maker with reference to the farming activities of the household" and was identified by members of the household. It was that person who was interviewed for the collection of data on agriculture as well as on the 'human capital of the farmer'.

Livelihood capitals

Chambers and Conway (1991), who are widely regarded as the pioneers of the livelihoods approach, define livelihood as 'comprising of the capabilities, assets (stores, resources, claims and access) and activities required for a means of living'. From this definition it is evident that people's capabilities and assets represent the resources available to them to engage in activities to make a living. The concept of 'capabilities' has its origin in the 'capability approach to development which was pioneered by Amartya Sen (Sen, 1985). The concept 'capability' refers to what a person is able to do or be. It is a measure of his or her opportunity to achieve valuable combinations of human functioning. This 'measure of opportunity' is function of personal (health), economic, social and political factors. Sen argued that development should aim at increasing the capabilities of people, meaning that development should aim at broadening people's choices of how to live a satisfying life style (Sen, 2005). This meaning of capabilities was adopted by Chambers and Conway (1991) who define capabilities as 'the ability of individuals to realise their potential as human beings, both in the sense of being, such as being adequately nourished and free of illness, and of doing, such as exercising choices, acquiring skills, knowledge and experience and participating socially'.

Chambers and Conway (1991) consider 'assets' to consist of the tangible and intangible means that could be used to construct livelihoods, whereby tangible means refer to resources and stores, and intangible means to claims and access. In the Framework of Ellis (2000) and many others[3], the means available to people for making a living are referred to as capital assets, and these are divided into five categories, namely natural, physical, human, financial and social. Clear overlap exists between resources and the categories of natural and physical capital assets, and between stores and financial capital assets, which together make up the 'assets' referred to by Chambers and Conway (1991). However, their concept of 'capabilities' is only partially covered by 'human capital assets', and 'access', which Chambers and Conway (1991) part of assets in the form of 'intangible means', occupies its own space in the Framework. One of the main advantages of separating 'access' from 'assets' is that 'access' represents a domain that is particularly open to policy interventions.

Natural capital

In this study, **natural capital was defined** as the natural resource base such as land, water and biological resources that are utilised by people to generate a means of living (Ellis, 2000; Erenstein,

[3] Other notable sustainable livelihoods frameworks that make use of 'capitals' to denote the means available to people for making a living are the DFID Framework, the CARE framework and the OXFAM framework (De Satgé, 2001)

Hellin & Chadna, (2007; Bennett, (2010); Bhandari, (2013); Abebe, (2014). Costanza and Daly (1992) and Ellis (2000) divided natural capital into renewable resources and non-renewable resources. Renewable natural capital is active and self-maintaining by making use of solar energy. Natural ecosystems are considered renewable natural capital (Costanza & Daly, 1992). They can be harvested to yield goods and, when left in place, they also provide a range of services. Non-renewable natural capital is largely passive (Costanza & Daly, 1992). Economically important types of non-renewable natural capital are fossil fuel and mineral deposits. Costanza and Daly (1992) point out that these non-renewable natural resources yield no services until extracted.

DFID (1999) also point out that there is a wide variation in the resources that make up natural capital, including intangible public goods, such as the atmosphere and biodiversity, and divisible assets used directly for production, such as land and trees. This broad view of natural capital is captured when adopting a 'function' perspective on natural capital. For example, De Groot *et al.* (2002) define natural capital as 'any stock of natural resources or environmental assets (such as soil, water, atmosphere, ecosystems), which provide a flow of useful goods or services, now and in the future'. This array of goods and services make up the functions of natural ecosystems, which are categorised into regulation, habitat, production and information functions (De Groot *et al.*, 2002). Regulation functions are the capacity of natural and semi-natural ecosystems to regulate essential ecological processes and life support systems. These include biogeochemical cycling, climate regulation, water supply, soil retention, soil formation, maintenance of soil fertility, bio-energy fixation, nutrient cycling, waste treatment, and biological control. Habitat functions refer to the capacity of natural ecosystems to provide refuge to wild plants and animals (and native people) thus maintaining biological and genetic diversity. Production functions of natural ecosystems refer to the resources provided by natural and semi-natural ecosystems. These include food, raw materials, fuel and energy, fodder, fertiliser, medicinal resources, genetic resources, and ornamental resources. The information functions refer to the capacity of natural ecosystems to provide opportunities for reflection, spiritual enrichment and cognitive development. These include aesthetic information, recreation, cultural and artistic inspiration, spiritual and historic information, and scientific and educational information (De Groot *et al.,* 2002).

The ecosystem functions perspective of De Groot *et al.* (2002) applies to natural and semi-natural ecosystems only. Once land is cleared for cultivation, it is no longer considered part of these systems. Yet, in the Sustainable Livelihoods Framework of Ellis (2000), land that is used to produce crops is implicitly part of 'natural capital'. One way of dealing with this conceptual tension is to differentiate between' natural and semi-natural ecosystems' on the one hand and 'agro-ecosystems' on the other. In the current study the focus is on agro-ecosystems. Whilst many of the ecosystem functions of natural and semi-natural ecosystems are still performed by agro-ecosystems, human interventions bring about changes in all four functions. Clearing of the natural vegetation for cultivation adulterates the habitat functions (and also the landscape). Cultivation can also interfere significantly in the regulatory functions of the ecosystem, for example by accelerating soil erosion or by lowering the water table. However, cultivation arguably has its greatest effect on the production functions, because humans control the plants that are allowed to grow on the land, and make use of

various practices to enhance the growth of these plants. When looking at the capacity of cultivated land to provide goods that satisfy human needs, the quantity of land (area) is a critical factor. Also important is the quality of land. Various attributes of land, such as the slope and the properties of the soil, determine the extent to which land can be safely cultivated, usually referred to as the capability of the land. Besides land, water can also be a crucial natural resource in agro-ecosystems, especially in areas where water deficit limits crop production. Under such conditions the availability of a source of water to irrigate crops can greatly enhance the capacity of cultivated land to provide goods that satisfy human needs. Of importance is the adequacy of this source (quantitative dimension) and the quality of the water for irrigation purposes, which is primarily a function of its salt content (Van Rensburg *et al.*, 2011).

Conventionally, land in rural areas of South Africa is subdivided into three land use categories, namely residential, arable and rangeland, even though the use of these three categories of land can overlap (Hebinck, 2007). Residential land refers to the land that people use to build their houses on, but people also use this land to establish home gardens for the production of annual and perennial crops, to erect facilities used to rear micro-livestock, and to put up enclosures to provide shelter and protection for small and large livestock (Hebinck & Van Averbeke, 2007). Arable land is meant to be used for the production of crops but in some instances it is more important as a feed resource for livestock (Bennett & Lent, 2007), or as a place to gather plants not found elsewhere in the landscape (Shackleton & Shackleton, 2015).

The importance of natural capital for people varies depending on how reliant their livelihoods are on the natural environment (Bell, 2012). Natural capital is particularly important for those who derive most of their livelihoods from natural resource-based activities, as is often the case among the rural poor (Kollimair & Gamper, 2002). Typically, rural communities engage in a wide range of natural capital based activities, especially land based activities, such as the rearing of livestock, cultivation of crops, and the gathering of products from nature, including wild vegetables, fruit, wood for use as building material or fuel, grass and reeds for thatching and weaving (Shackleton, Shackleton & Cousins, 2001). According to Ebersohn and Eloff (2006), increasing the natural capital base of rural people should form part of a comprehensive strategy to reduce poverty and empower rural households.

Physical capital

For the purpose of this study, physical capital is defined as the communal, publicly or privately owned tools, equipment and infrastructure that area available to people and that help them to meet their basic needs, establish a foundation for generating a livelihood, and be more productive. This definition is the same as the definition proposed by De Sherbinin *et al.* (2008) but expands on the contributions physical capital can make to livelihoods.

Tools and equipment are producer goods, which people use to function more productively (Islam & Dickson, 2007; Timalsina, 2012). Infrastructure consists of changes to the physical environment that help people to meet their basic needs and/or to be more productive (DFID, 1999). Examples are

transport, shelter, facilities to store and distribute irrigation water, roads, means of communications, schools and health facilities (Ellis, 2000; Ungar, 2011). According to Ellis (2000), infrastructural assets are important because they facilitate livelihood diversification. For example construction of roads facilitates movement of people between places offering different income-earning opportunities, creates markets that would not have come into existence, and helps the transfer of information between rural centres and remote settlements in places where telecommunication is lacking (Ellis, 2000). Physical capital can be enhanced directly through provision, or indirectly by improving access, for example through better access to natural capital (as in the case of harvesting timber or natural building materials for building purposes), or improved access to financial capital, which can be converted into physical capital (Campbell, 1999).

Human capital

Ellis (2000) defined human capital as 'the educational level and health status of individuals and population', and Scoones (1998), Krantz (2001) and Haidar (2009) as 'the skills, knowledge, ability to work and good health that together enable people to pursue different livelihood strategies'. Human capital has a quantitative and a qualitative dimension. The quantitative dimension is reflected by the amount of labour that a household can mobilise, which is associated with its size and composition. Health, skills and knowledge represent the qualitative dimension of human capital (Lewis, 1984; Moser, 1998; Rakodi, 1999; Boli, 2005). Accordingly, for the purpose of this study **human capital is defined** as the skills, knowledge and health status of the people that make up a household.

Since labour often plays an important role in the livelihoods of the poor, because it is one of the few resources they possess to construct their livelihood, the quantitative dimension is important (Ellis, 2000). Badisa (2011) points out that homestead size determine the size of the labour pool within the household. In the context of farming Masuku, Raufu & Malinga (2015) argue that if all household members were willing and old enough to perform farm work the likelihood of success of a farmer household was expected to increase with homestead size.

Among the different factors that contribute to the qualitative dimension of human capital, Ellis (2000) drew attention to the health status of people, pointing out that labour as an asset is more effective when the person providing the labour is free of illness or debilitating health problems (Ellis, 2000). Chaminuka *et al.* (2006) added that households with a member suffering from chronic illnesses, like HIV/AIDS, did not only lose the labour of that member but also experienced a reduction in household labour as a result of the work required to take care of the sick person. They reported that households which had such a sick person 'lost' 6.24 hours per day, while non-affected households only 'lost' 0.34 hours per day, and that on average the cultivated area of affected households one-third smaller than that of non-affected households (Chaminuka *et al.*, 2006:53).

Age and gender also contribute to the quality of labour, particularly in activities that require physical labour, such as farming. Old people tend to be less capable of performing physical activities than young people (Howley, Donoghue & Heanue, 2012). Age tends to negatively affect the willingness of farmers to adopt new technology and practices (Badisa, 2011; Howley, Donoghue & Heanue, 2012),

and according to Bhandari (2013), age has an important effect on livelihood transition, such as farm exit. Young people are more likely to change occupation, and tend to prefer non-farm work more than older individuals. Ramaroka (2012) report that being male was a farmer characteristic that was positively associated with success in Limpopo Province (South Africa). As reasons he pointed at the superior strength of men, which makes them more capable of coping with the physical demands of farming than women, and the fact that women could only spend part of their time farming, as they were expected to perform a range of reproductive activities in the household. Whilst the image of the tough and strong male farmer has been referred to as gender-stereotyping (Little, 2002), Croppenstedt *et al.* (2013) report that female farmers in developing countries typically have lower outputs than their male counterparts and were much less likely to participate in commercial agriculture. They ascribed these gender differences to differences in access to inputs, resources, and services.

Skills and knowledge are probably the most important contributors to the qualitative dimension of labour. Both are closely linked with education, which can be obtained formally or informally (Winters, 2011). Informal education can refer to a wide range of experiences, including 'learning by doing' and migration or other activities, which provide exposure to new ideas and facilitate learning (Weir, 1999). Mango (2002) describe informal education as the main way to transfer traditional knowledge. Generally, education is seen as fundamental to the development of a country and to the development of individuals in society (Anand & Sen, 1994; Mazibuko, 2012). Education can influence household's livelihoods strategies and is a determinant of the income derived from the activities undertaken by the household (Gidi, 2013). Yunez-Naude and Taylor (2001) consider education as crucial to raising economic productivity and competitiveness and to combating poverty. Access to educational services enables people to gain skills and knowledge in formal ways and to obtain official recognition for their educational achievements in the form of qualifications, which typically improve their opportunities to make a living (Ellis, 2000). Formal education can help to secure employment and to improve people's capacity to use their existing assets (Messer & Townsley, 2003; Njagi, 2005).

Whilst education and development in general are positively related, this does not necessarily apply to agriculture. Some researchers, such as Weir (1999), regard education as one of the key determinants of structural change in agriculture. Weir (1999) report that the higher the level of education, the more successful the farmer gets, and suggest that education might have both positive cognitive and non-cognitive effects on labour productivity. Cognitive effects of education include the transmission of specific information as well as the formation of general skills and proficiencies. Increasing literacy and numeracy can help farmers to acquire and understand information and to calculate appropriate input quantities in a modernizing or rapidly changing environment (Weir, 1999; Stiglbauer & Weiss, 2000; Mena, Bilsborrow & McClain, 2006). Education also produces non-cognitive changes in attitudes, beliefs and habits, which may affect whether a farmer decides to be an (early) adopter of innovations and the extent to which the innovation will be used (Weir, 1999). The positive association between education and adoption of innovation was confirmed by Tassew (2004). Others have argued that education can also bring about a livelihood transition out of farming

for farm households, because it can enhance skills and opportunities for employment outside agriculture. According to Bhandari (2013) educated farmers were more likely to continue farming when the income from their farming was high, but since the returns from farming tend to be seasonal and often lower than off-farm employment, educated individuals were more likely to leave farming than those lacking education. In some instances education of farmers brought about total abandonment of farming as a livelihood activity (Bhandhari, 2013).

Financial capital

Ellis (2000) views financial capital as stocks of money to which the household has access. These stocks of money could be in the form of savings or as access to credit in the form of loans. Ellis (2000) points out that these stocks are only useful for households when they are converted into other assets or into consumption. Other views on the meaning of financial capital are broader than just 'stocks of money', and encompass income, remittances from family members working away from home, sources of credit, pensions, savings, cattle, and stores of seed, crops and food (Scoones, 1998; Allison & Ellis, 2001; De Satgé, 2002; Erenstein, Hellin & Chadna, 2007; De Sherbinin, 2008). Scoones (1998) and Krantz (2001) include basic infrastructure and production equipment in their definitions of financial capital, creating an overlap between financial and physical capital. This overlap indicates that at least some of the capital categories are interchangeable in the sense that they can be transformed from one into another. Inclusion of basic infrastructure and production equipment in the category of financial capital is justified when the monetary value of these assets is considered, because selling these assets would provide the seller with money (Kadozo, 2009). However, basic infrastructure and production equipment are also physical capital, because they consist of tangible assets, which can be touched and used in the conduct of livelihood activities. DFID[4] considers financial capital of households to consist not only of the available stocks of money in the form of savings, but also of regular (in)flows of money. Regular inflows of money are mostly dependent on others and need to be reliable to be considered part of financial capital. Regular inflows of income include employment income, work-related pensions, transfers from the state and reliable remittances by family members who live and work elsewhere (Kollmair & Gamper, 2002). DFID (1999) and Kollmair & Gamper (2002) point out that savings, which can be held in several forms including cash, bank deposits or liquid assets, are the preferred type of financial capital, because unlike loans savings do not have liabilities attached to them and unlike regular flows of income savings do not entail reliance on others. For the purpose of this study, financial capital is defined as available stocks of money in the form of savings, regular (in)flows of money in the form of employment income, work-related pensions, transfers from the state and reliable remittances by family members who live and work elsewhere.

Financial capital is important to rural households as it can easily be converted into other livelihood capitals to support their household in times of stress (DFID, 1999; Singh, 2007; Bell, 2012). Erenstein, Hellin and Chadna (2007) state that banking facilities, credit society facilities, livestock (small stock

[4] DFID (Department of International Development). 1999. Sustainable Livelihood Framework [Online]. Available from http://www.eldis.org/go/topics/dossiers/livelihoods-connect/what-are-livelihoods-approaches [Accessed 15 /02/2013].

and herd size), farm size are the main indicators of financial capital for rural households. Access to financial capital enables investment in physical capital, which can enhance production (Ungar, 2011).The financial capital available to rural households may come from the conversion of their production into cash in order to cover periods when production is less (Messer & Townsley, 2003). The ways in which households accumulate financial capital depends on the prevailing financial markets, and in rural areas the rearing and accumulation of livestock can be a major way in which households build a store of wealth (Ellis, 2000, Timalsina, 2013). Financial capital can be strengthened through improving access to credit, supporting the development of savings and loan groups, developing business management skills, and increasing access to natural capital that can be exchanged for financial capital (Campbell, 1999).

Social capital

Perspectives on the meaning of social capital differ considerably. Taking a broad view on social capital, Pretty and Ward (2001) identify four central aspects of social capital, and elaborate how these affect people's livelihoods. These aspects are:

- relations of trust;
- reciprocity and exchanges;
- common rules, norms and sanctions; and
- connectedness, networks and groups,

They explain that trust lubricates co-operation, reducing the transaction costs between people, and in this way so liberating resources, particularly 'time'. High degrees of trust means that one can expect others to act as expected and do not require monitoring to ensure that they do. Pretty and Ward (2001) distinguish between trust one has in individuals whom one knows, and trust one has in those one does not know, but which arises because of one's confidence in a social structure. They also point out that trust takes time to build, but is easily broken and that cooperative arrangements are unlikely to emerge in societies in which distrust is prevalent. Pretty and Ward (2001) indicate that reciprocity and exchanges increase trust. They identify two types of reciprocity, namely specific reciprocity, which refers to simultaneous exchanges of items of roughly equal value; and diffuse reciprocity which refers to continuing relationships of exchange that at any given time may be unrequited, but over time are repaid and balanced. Pretty and Ward (2001) explain that common rules, norms and sanctions are the mutually agreed or handed-down norms of behaviour that place group interests above those of individuals. They give individuals the confidence to invest in collective or group activities, knowing that others would do so as well. Mutually-agreed sanctions ensure that those who break the rules know they could be punished. Rules, norms and sanctions represent the internal morality of a social system. They reflect the degree to which individuals agree to mediate or control their own behaviour. Formal rules are those set out by authorities, such as laws and regulations, while informal rules are those individuals use to shape their own everyday behaviour. Rules are stipulations of behaviour with positive and/or negative sanctions, whilst norms are preferences and indicate how individuals should act. Societies with high levels of social capital are characterised by high levels of 'internal morality'' or self-discipline, with individuals balancing individual rights with collective responsibilities. Pretty and Ward (2001) consider connectedness, networks, and groups and the nature of relationships to be a vital aspect of social capital. They

explain that connectedness manifests itself in the different types of groups at the local level, and in the connections to other groups in society, from both micro to macro levels. They indicate that linkages increased social capital; that two-way relationships are better than one-way; and that linkages that are regularly updated are generally better than historically-embedded ones.

The social capital concept elaborated by Pretty and Ward (2001) has been used by others, such as Putman (1995), Rakodi (2002) and Grootaert and Narayan (2004), who all refer to social capital as the features of social organisation, such as norms, trust and networks, which facilitate coordination and cooperation for mutual benefit. The perspective on social capital of Ellis (2000) as referred to in his Framework is less inclusive than that of Pretty and Ward (2001). Ellis (2000) explains that social capital 'attempt to capture community and wider social claims on which households and individuals could draw by virtue of their belonging to social groups of differing degrees of inclusiveness in society at large'. Central to this perspective is the extent to which households can claim livelihood resources against the networks they form part of. Comparing this to the view of social capital presented by Pretty and Ward (2001), the 'common rules, norms and sanctions' element is not part of social capital. Instead it is considered part of 'institutions', which form part of the 'mediating processes' that influence people's access to resources. The meaning of social capital as understood by Ellis (2000) is similar to that of the DFID (1999), which define social capital as 'the social resources upon which people draw in pursuit of their livelihood objectives'. According to DFID (1999), people develop social resources through networks and connectedness, through membership of formalised groups and by developing relationships of trust, reciprocity and exchange. Others who share this understanding of social capital are Dacosta and Turner, (2007) and Adhikari and Goldey (2010). They consider social capital as the sum of resources acquired by an individual or a group by virtue of possession of a durable network of more or less institutionalised relationships of mutual acquaintance and recognition. For the purpose of this project social capital is defined as the social resources, which people have developed through networks and connectedness, through membership of formalised groups, and by developing relationships of trust, reciprocity and exchange, and from which they can claim livelihood resources in pursuit of their livelihood objectives.

Social capital can be relied upon by households to deal with different forms of stress that they may encounter (Van der Geerst, 2004; Bell, 2012). Woolcock & Narayan (2000) explain that the basic idea of social capital is that one's family, friends and associates constitute an important asset that can be called upon in a crisis, enjoyed for its own sake, and/or leveraged for material gain (Woolcock & Narayan, 2000). DFID (1999) identify enhanced ability to work together resulting in reduced transaction costs, expanded access to wider society, and reliable safety nets in times of need to be among the important benefits people can derive from building social capital. Communities endowed with a diverse stock of social networks and civic associations are in a stronger position to confront poverty and vulnerability (Moser, 1998). The households' social network system, which is typically composed of family or kinship relations, is a form of social capital that can be relied upon for reciprocity and social support, and it plays an important role reducing vulnerability (Bell, 2012). For the purpose of this project **social capital was defined** as the networks and connectedness,

membership of formalised groups, and relationships of trust, reciprocity and exchange of people from which they can claim livelihood resources in pursuit of their livelihood objectives.

Mediating factors and processes

Mediating factors and processes, also referred as 'conditioning factors' (Reardon & Vosti, 1995), or contextual factors (Ellis, 2000) affect both the assets people have access to and the ways in which these assets can or are being used in the construction of their livelihood strategies. Mediating factors and processes have been categorised in different ways and appear under various headings and in different positions within the different sustainable livelihood frameworks that have been developed. In his framework Ellis (2000) makes a first-level distinction between social relations, institutions and organisations on the one hand, and trend and shock factors on the other. The latter group of factors are largely external and there is little that households can do about them, even though they can have major effects on their livelihoods. They include economic factors, such as the state of the global and national economy; political factors, such as wars, and natural factors, such as droughts or floods. The second category of mediating factors and processes are more local or endogenous than the first category. They include power, authority, and the social and political processes through which rules and rights for individuals and groups evolve (Ellis, 2000). This second category is further subdivided into social relations, institutions and organisations.

Social relations refer to the social positioning of individuals and households within society. This positioning is influenced by factors such as gender, age, ethnicity, nationality, class, caste and religion (Ellis, 2000). The concept 'institutions' refers to the formal rules, conventions, and informal codes of behaviour (norms) that place constraints on human behaviour (Ellis, 2000). Their role is to reduce uncertainty by establishing a stable structure to human interaction (Ellis, 2000). Within the context of agriculture, institutions play an important role. For example, theft of produce or equipment indicates that the rules and norms, which prohibit stealing, are being challenged. When theft is on the rise, farmers have to spend time and or money to better protect their possessions. This raises the 'cost of doing business (transaction costs) and can result in people abandoning farming, because the risk has become too high. In irrigation, the functioning of canal schemes is highly dependent on 'trust' that the rules governing the sharing of water and the maintaining of the irrigation infrastructure (scheme-based institutions) will be adhered to by all. Letsoalo and Van Averbeke (2006) document how the actions of 'social entrepreneurs' who broke this trust, eroded infrastructural maintenance practices at the Dzindi canal scheme. This contributed to the ever decreasing availability of water on the plots of the scheme, especially towards the tail-end (De Beer & van Averbeke, 2013). Ellis (2000) refers to organisations as 'groups of individuals bound by some common purpose to achieve objectives'. Organisations play an important role in the adherence to rules and norms. Ellis (2000) asserts that social relations, institutions and organisations are critical mediating factors for livelihoods, because they constitute the agencies that inhibit or facilitate the exercise of capabilities and choices by individuals and households.

Livelihood activities and strategies

People use various resources, such as social networks, labour, land, capital, knowledge, employment, technology and markets to produce or acquire food and meet other consumption needs (Hebinck, 2007). This use of resources is referred to as 'livelihood activities'. For the purpose of this study, livelihood activity is defined as any productive or reproductive endeavour aimed at generating a means for survival or the achievement of other livelihood objectives. Individuals and households combine livelihood activities into a portfolio, which is referred to as a livelihood strategy. Livelihood strategies can include paid and unpaid work, accumulation and investments, borrowing, food production, social networking, and change in consumption patterns and sharing (Mtshali, 2002). They can be highly specialised with a concentration on one or a limited range of activities, or they can be highly diverse (Scoones, 1998). For example, homesteads rarely obtain sufficient food and income from farming alone. For this reason they construct a diverse portfolio of activities and income sources and nurture social networks of kin and community that enable such diversity to be secured and sustained (Butler & Mazur, 2007).

The key goal of a livelihood strategy is to achieve economic and social security of the household (Drimie & van Zyl, 2005). Accordingly, livelihood strategies of households typically include short term considerations, such as ways of earning a living, coping with shocks and managing risk, as well as longer-term aspirations and goals for the future of their children and their own (Carloni & Crowley, 2005).

In the analysis of livelihood strategies most sustainable livelihood frameworks place emphasis on productive activities, which are the activities that generate some form of income, be it in cash or kind. Ellis (2000) also takes this position. He divides these productive livelihood activities into two categories, namely those that are based on the use of natural resources and those that are not.

Livelihood outcomes

Livelihood outcomes are what people or households achieve through their livelihood strategy. Successful outcomes include adequate income, high levels of food security, high levels of well-being, low vulnerability to stress and shocks, and sustainable use of natural resources. Well-being mainly refers to non-material aspects of living, such as self-esteem, health, access to services and a sense of inclusion. These non-material aspects relate closely to some of the important 'functionings' of people in the capability approach (Sen, 2003).

In his framework, Ellis (2000) divided livelihood outcomes into livelihood security outcomes and environmental outcomes. He defines livelihood security as attributes related to income level, income stability, reduction in adverse seasonal effects and reduction in overall risk profile of the income portfolio, and argues that as livelihood security rose people became less vulnerable in terms of their capability to manage hostile trends or cope with shocks. Reducing vulnerability to stress and shocks is achieved by raising asset levels (Carloni & Crowley, 2005; Babulo *et al.*, 2008; Laflamme, 2010; Tuyen *et al.*, 2014).

Ellis (2000) looks at environmental outcomes in terms of sustainability, which refer to 'changes in the resilience and stability of resources, such as soils, water, rangeland, forests and biodiversity. As indicated by Chambers and Conway (1991) and Reardon and Vosti (1995), livelihood activities can maintain, enhance or deplete and degrade the local natural resource base. They can contribute to desertification, deforestation, soil erosion, declining water tables and salinisation, but they can also improve production of renewable resources like air, river water, soil, organic soil fertility, and trees (Chambers & Conway, 1991). It follows that different developmental paths can result in environments staying the same or becoming more able or less able to sustain the outputs for human consumption (Ellis, 2000).

2.1.2 Contemporary rural livelihoods in South Africa

Guided by the sustainable livelihoods framework presented by Ellis (2000), this section presents a review of literature on livelihoods in South Africa focusing on assets owned or accessed by households, factors influencing access to assets, livelihood strategies and activities households engage in to make a living and the outcomes achieved from these activities. Access to resources focuses on resources used in farming, moreso households' access to land, water for irrigation, produce markets, and access to support services (i.e. farmers' training and advice on crop production, irrigation of crops, marketing of crops, and business and financial management). The section also provides information on the vulnerability context in both Thulamela and Greater Tzaneen municipalities through use of indicators provided by Statistics South Africa (2011). These indicators include unemployment, poverty, education, household size, household income and access to resources. The chapter also outlines how agriculture fits into the livelihoods of rural households.

How do rural households make a living?

The livelihoods of South Africa's rural African poor have, for a long time, been characterized by diverse activities, which included urban opportunities. The role of farming in the livelihoods of rural African people has changed significantly in the past century. According to Thompson (1995), in pre-colonial times, agriculture was central in the livelihoods of African households in the form of subsistence production. At present, livelihoods of people in the rural areas of South Africa are diverse but in many of these livelihoods agriculture does not occupy central stage (Mohamed, 2006; Neves & Du Toit, 2013).

Neves and Du Toit (2013) state that South Africa's rural livelihoods are diverse and have been characterised by combinations of land-based and agrarian activities, informal farm and non-farm small-scale economic activities, the country's comparatively well-developed system of state cash transfers, and culturally inscribed patterns of mutuality and social reciprocity. In addition, literature suggests that the rural sector has undergone a form of compositional change, where a phenomenon of de-agrarianisation has taken place as households become more dependent on government grants while moving away from agricultural-based activities (Tapela, 2008; Department of Social Development, 2010; AfDB *et al.*, 2012; Neves & Du Toit, 2013).

According to Chitonge (2013), heavy reliance on the broad-based social assistance system in the form of social grants, particularly for pensioners and children explains the insignificant role of land reforms in improving rural livelihoods in the country. Proponents of this view argue that unlike in most African countries, where the majority of the rural poor have subsistence farming as their major means of survival, the grant system in South Africa constitutes a significant source of income for poor households, such that the recipients often survive without having to engage in subsistence agriculture. Bradstock (2006) reports that social grants are a major livelihood source and account for the largest share of household income among most land reform beneficiaries. A study commissioned by the Development Bank of Southern Africa (DBSA) reported that social grants accounted for 50% of the total income of smallholder and subsistence households, followed by wages at 22.9% and remittances at 18.6%, with income from agriculture accounting for only 3.7% (Vink & van Rooyen, 2009). A number of analysts have taken these figures as evidence that subsistence agriculture makes negligible contribution to rural livelihoods and that the prospect for viable livelihoods in subsistence farming is low. In this context, it has been suggested that increased access to social grants provides poor households with alternative income which, in turn, reduces the pressure to embark on subsistence agriculture (National Planning Commission, 2011), although evidence of the disincentive effect of social grants has not been carefully and empirically examined (Baiphethi & Jacobs, 2009). Evidence on whether social grant recipient households in rural areas are able to survive entirely on grants, especially in cases where there is only one grant recipient, is scarce. Certainly, producing own food would improve the households' well-being more than relying exclusively on social grants.

Assets owned or accessed by rural households

Livelihood assets refer to the resource base of the community and of various groups of households (FAO, 2003). Household assets influence the extent to which households can diversify their livelihoods. Ownership of assets is viewed as a cushion against adverse income shock which might affect the well-being of the households. For rural households, asset ownership translates to a secure place to live, means to earn a livelihood, and the ability to mitigate the economic and social risks associated with natural disasters, disease, and economic shocks. They are defined broadly to include human, physical, natural, financial, and social capital (Carney, 1998; Scoones, 1998).

According to Krantz (2001), one of the most important assets for rural households is their human capital. Human capital is the skills, knowledge and ability to labour and good health that enable people to achieve their livelihood objectives (DFID, 2001). Thus, quality of human factors such as household heads' skills level, health status and household size have influence on the household's ability to increase income and move out of poverty. Farmers with good education, knowledge and experience are likely to be early adopters of new technologies and more efficiently productive than their counterparts. Rural households in South Africa are often illiterate with poor technological skills, which can be serious obstacles in accessing useful formal institutions that disseminate technological knowledge. They also lack financial and marketing skills. Many rural households are also handicapped by illnesses which lead to reduction in ability to adjust to future shocks.

In the study areas, Greater Tzaneen and Thulamela, 18.7% and 17.4% have no schooling. Labour is one of the most important assets of a rural household. The population in both areas is dominated by a high proportion of young generation (economically-active), with no formal employment. Average household size in the two research sites averaged 3.5 and 3.9 household members (Statistics South Africa, 2011).

Physical capital also plays a big role in production decisions. Physical capital comprises the basic infrastructure and other productive resources that are needed by individuals or households to support livelihoods (Krantz, 2001). Buildings, irrigation canals, roads, tools and machines are examples of physical assets. A developed physical capital base enhances the effectiveness and efficiency of sustainable livelihood outcomes. Rural households in Limpopo are located mostly in the communal areas where lack of both physical and institutional infrastructure limits their expansions. Lack of access to proper roads in rural areas, for example, limit the ability of a farmer to transport inputs, produce and also access information. Ownership of agricultural and other productive equipment that could be used in microenterprise activity is also limited in rural households. According to Statistics South Africa (2011), the majority of Limpopo households have access to piped water. Access to electricity has also improved considerably in the province, which increases opportunities for agro-processing within the province.

Natural capital refers to the natural base resources such as land, water, forests and biological resources utilised by households. They all play a significant role in the livelihood of rural households. The main resource that rural households tend to have is land, though in some instances ownership tends to be a problem and if they own land, the sizes are usually small for meaningful investments (Scoones, 1998). Statistics South Africa reported that 71% of households in the communal areas have access to land for farming, although about half of these have access to less than one hectare (Statistics South Africa, 1999). In Limpopo, an average plot size is about one hectare (Shah *et al.*, 2000). Both research sites are well endowed with natural resources necessary for economic growth, with fertile land and abundant water supplies, boasting a sub-tropical climate. However, human pressure has resulted in activities like deforestation and over grazing which have contributed to land degradation.

Financial capital refers to the availability of cash or equivalent that enables households to adopt different livelihood strategies. This is likely to be in the form of savings from employment and access to credit in the form of loans (Sen, 2003). Rural poor households often lack access to credit due to the lack of collateral. According to Carter and May (1997), 20% of rural African household have no fungible assets of any kind that could be converted to cash in the case of need. These households thus have no safety net of their own, and are extremely vulnerable to any loss of income or entitlement failure.

Social capital is defined by Gilbert and McLeman (2010) as the attributes of social relations from which members of formal or informal social networks can secure benefits and is often linked to trust, reciprocity and exchange within a community. Social capital refers to group memberships,

networks, trust relationships, upon which households draw in pursuit of livelihoods. Group membership often involves obligations to assist others in times of distress. Households' participation in local institutions and having relatives in the same area contribute to the resilience of vulnerable households. In many rural communities, it is common to have shared access to property such as grazing areas, forests and irrigation systems and social relations can help increase the stability of such systems.

Factors influencing access to assets

According to Ellis (2000) the key factors that influence households' access to resources in the pursuit of a viable livelihood are social relations, institutional processes and organizational structures. They represent critical mediating factors for livelihoods because they can inhibit or facilitate the productive use of assets by households. Households' access to livelihood opportunities is mediated by social relations of age, gender, class, kinship and generation (de Haan & Zoomers, 2005). In settings where sociocultural norms restrict women's mobility, their interactions with members of the opposite sex and their ability to attend trainings or receive formal education, women's access to information, institutions and markets is compromised (Fletschner & Kenny, 2011). In the rural areas of South Africa, women's access to land is limited by their gender and social position in the community. Although women typically make up the majority of the population, their rights to land are to only a small proportion of the land.

The 'rules of the game' governing access to resources are also established through formal and informal institutions, including tenure regimes, labour sharing systems, market networks, credit arrangements, tradition and law (Scoones, 1998). For example, access to the land (a crucial natural resource) in rural areas is mediated by institutions such as policies and land tenure institutions (Scoones, 1998; Ellis, 2000). The majority of Africans hold their land under indigenous customary land tenure systems (Bruce *et al.*, 1993). An enabling policy and institutional environment makes it easier for people, to gain access to assets they need for their livelihoods. A disabling policy and institutional environment may discriminate against the poor, thus making it difficult for them to get access to land, livestock, capital and information. For example, policies to protect the environment by controlling natural resource use may make it more difficult for poor people to gain access to resources they normally use to support their livelihoods.

Organisations are groups of individuals bound by the purpose of achieving certain objectives, such as government agencies, NGOs, associations and private companies (Ellis, 2000). Organisations have an outstanding role in determining household access to productive resources, either through the resources directly embedded in the network or through collective action. Examples of such organisations can be irrigation schemes, agricultural cooperatives and savings and credit cooperatives. When rural people try to access resources, they do so through engaging in relationships with other actors.

Context

The context or prevailing external environment has a bearing on the livelihood options of rural households. Factors in the external environment can either enhance or restrict the livelihood options (De Satge, 2002). Hence, this section briefly examines the national context and also local context of the two research sites to understand the pressures and opportunities that inform household livelihood strategies. South Africa has a large rural population residing on private commercial farms and the communal lands under traditional tenure systems. In contrast to the private rural sector, there is an overwhelming perception that in the communal areas land-based livelihood strategies make insignificant contributions to overall livelihood well-being (May, 1996), and that communal areas are largely reliant on transfers from urban areas or government. Although cash from urban and government sources is the mainstay of the rural economy in many areas, the multiple and diverse livelihood base of rural households is not widely recognised (Cousins, 1999; Adams *et al.*, 2000). This diversity includes the land-based strategies of arable farming, livestock husbandry, and consumption and trade in natural resources (Shackleton *et al.*, 2001).

Du Toit and Neves (2007) claim that land dispossession and under-development contributed the most to the decline of smallholder African agriculture. Opportunities for smallholder agriculture became undercut by chronic African unemployment from the 1970s, amidst South Africa's increasingly capital-intensive growth path. Rural livelihoods are also influenced by developments such as supermarket retail dominance in the past decade. These factors have contributed to increased urbanisation, persistent rural poverty and high unemployment rates (24.5% unemployment rate in 2015).

Limpopo Province has the second largest proportion of agricultural households (33%) after Eastern Cape Province (35.4%) (Statistics South Africa, 2013). In Thulamela District Municipality, most people derive their livelihood through agricultural pursuits. More than 85% of the 618 462 people in the municipality live in tribal areas. The main occupation sector is agriculture, both commercial and subsistence farming. According to the 2011 census, there were 71 812 agricultural households in Thulamela municipality in 2011. More than 50% of the households in the municipality (54.4%) were female headed. Majority of agricultural households (48.7%) fall into an income category of R4801-R38400 in Thulamela compared to 50.5% in Greater Tzaneen (Statistics South Africa, 2011). Unemployment rate among the economically active population in Thulamela is 43.8% while youth unemployment rate is 58.3% (Statistics South Africa, 2011).

Greater Tzaneen municipality, on the other hand, has a population size of 390 095 people. About 80% of the households in the municipality reside in the 125 rural villages of the municipality. The 2011 Census recorded 36 793 agricultural households. About 48% of the households in the municipality were female headed. Unemployment rate among the economically active population in Greater Tzaneen municipality is 36.7% while youth unemployment is 48.5 (Statistics South Africa, 2011).

Livelihood strategies and activities

Generally, rural livelihood strategies may include subsistence production or production for the market, participation in labour markets or working from home and migration. Households diversify their sources of livelihoods to buffer themselves from uncertainty and enhance their resilience to shocks (e.g. drought, floods, pests and diseases, loss of major household income source, or sharp food price increases) and stresses (e.g. low income from a livelihood activity, shortages of land and other natural resources, or poor market access), which are prevalent in rural areas (Slater, 2002, Mutenje *et al.*, 2010). Vetter (2013) reiterates the importance of livelihood diversification as a strategy to manage risk arising from variable or declining returns on livelihood activities. Rural households diversify their livelihood sources dependent on the perceived risks attached to alternative income sources. The greater the uncertainty of returns, the greater the vulnerability of the household's livelihood. Seasonality plays an important role in rural livelihoods, for both farm and off-farm activities. Seasonal factors apply just as much both to landless rural families as they do to farm families.

Rural livelihoods are influenced by a diversity of factors. Generally, rural households across the globe engage in both migration and natural resource use as components of livelihood strategies designed to meet household needs. In many regions, households remain heavily dependent on natural resources (Shackleton & Shackleton; 2004, 2011) while also regularly engaging in labour migration as a livelihood strategy (Collinson *et al.*, 2006). In South Africa, although in many cases agriculture does not occupy central stage of the livelihoods, rural livelihoods have been characterised by a combination of land-based and agrarian activities, and non-farm small-scale economic activities.

Noteworthy is that the diversity of livelihood strategies found in South Africa comprises a heavy reliance on relatives and neighbours for moral and material support, significant dependence on loans from community members, micro lenders and burial societies. Other households rely on membership of burial societies and church organisations as a livelihood coping strategy (Tapela, 2008). Social grants and social networks have become particularly critical to many poor households in South Africa, with over 15 million people receiving social welfare grants from the government and this includes many land reform beneficiaries (Mencarini 2000; Anseeuw & Mathebula 2008; Tapela, 2008; Department of Social Development, 2010; AfDB *et al.*, 2012).

As documented in Twine (2013), livelihood diversification within a particular livelihood source, such as livestock farming, in addition to diversification between livelihood sources, has been identified as a strategy associated with more resilient livelihood trajectories. Shackleton *et al.* (2001), Sallu *et al.* (2010) and Vetter (2013) all place emphasis in that poorer households tend to rely on a greater range of benefits from their livestock than wealthier owners. The benefits range from cash from livestock sales and the direct-use values of products such as milk and meat. Also mentioned by Vetter (2013), livestock contributes to multiple livelihoods of households, who do not own livestock, through access to draught power from oxen or products such as milk, meat and manure, benefits which usually extend beyond livestock owners. However, such a contribution by livestock has received limited policy attention (Shackleton *et al.,* 2005). Furthermore, the role of livestock as a

form of savings and insurance, and hence as a safety net, is often overlooked, and yet is more important than as a source of regular income to most livestock owners in communal areas (Ainslie, 2005; Shackleton *et al.,* 2005).

Livelihood outcomes

The two main livelihood outcomes in the sustainable livelihoods framework are livelihood security and environmental sustainability (Ellis, 2000). Commonly used indicators of livelihood security are income, food security and well-being. This study focussed on all three indicators.

Regarding income, South Africa's total household income was R1.57 trillion in 2011, with an average income of R119 542 per annum. This average, however, varies across race and gender. The average household income is remarkably lower for black African households at R69 632, while white households had the highest average income of R387 011. The average household income for male-headed households was R151 186, whereas for female-headed households, it was far lower at R70 830 (Statistics South Africa, 2012). According to Leibbrandt and Levinsohn (2011), South Africa's household income per capita was R24 409 in 2008. The largest proportion (72.7%) of the annual household income was derived from employment. Most (55.4%) of agricultural households in South Africa have an annual income of less than R38 400.

Limpopo has the highest proportion of agricultural households with no income (Statistics SA, 2013). The most important sources of income in the province are grants, formal salary and farming income. With respect to the research sites, 23.9% of the households in Thulamela had an income between R9 601 to R19 600 and 11.9 % of the households had no income. In Greater Tzaneen, a quarter of the households had an income between R9 601 to R19 600, while 13.4% had no income at all. The annual income for agricultural households was rather low, with only 0.7% and 0.8% of the households earning above R307 201 in Thulamela and Greater Tzaneen, respectively. A majority of agricultural households (48.7% and 50.5%) had an income between R4 801-R38 400 and a significant proportion (29.9% in Thulamela and 34.5% in Greater Tzaneen) had no income (Statistics South Africa, 2011).

The Income and Expenditure Survey 2010/2011 shows that the total annual South African household consumption expenditure was R1.25 trillion with the average household spending approximately R95 183. Expenditure on housing, water, electricity, gas and other fuels remains the largest contributor (32%) to total annual household consumption expenditure. The annual consumption expenditure on food is R159 973 with an average of R12 200 per household (Statistics South Africa, 2012). The average annual consumption expenditure for black African households was at the lowest at R55 920, while that of white households was the highest at R314 524 per annum. Female-headed households spent R63 307 on average per annum while male-headed households spent R115 890 on average per annum (Statistics South Africa, 2012). Thulamela has one of the highest household consumption expenditure in the Limpopo Province. According to Masemola *et al.* (2010), Thulamela and Polokwane municipalities jointly explain 30% of household spending in the province. Overall,

Mopani district has the highest poverty rate in the province, while Vhembe has the lowest poverty rate.

How does agriculture fit in?

In the developing world, most people depend on agriculture for their livelihoods. According to the 2011 Census, 2.9 million households engaged in agriculture in South Africa with 16.3% of these located in Limpopo Province (Statistics South Africa, 2013). Furthermore, irrigation farming is considered to be an effective strategy for improved rural livelihoods. Smallholder irrigation farming has been found to have a wealth-generating function in agriculture, moreso in rural settings (Hussain *et al.*, 2003; Hussain & Hanjra, 2004; Ghosh *et al.,* 2012). Hence, irrigation development in South Africa has been extensive since the 1920s. The importance of smallholder irrigation farming in South Africa is indicated by the number and type of participants involved. Most smallholder farmers are in communal areas of South Africa, where the incidence of poverty peaks.

Hence, a strategic vision for the rural economy of South Africa to 2030 was outlined in the National Development Plan (National Planning Commission, 2011). This vision outlines a multiplicity of interventions that increase the capabilities of rural communities, giving strong attention to agricultural activities. The New Growth Path identified the agricultural sector as one of the sectors with significant potential to create jobs (DED, 2011). Smallholder irrigation has been found to provide the expected income and food benefits for households with secure irrigation access, and has the potential to reduce inequalities. In addition, casual, seasonal and permanent employment in irrigation schemes provides many households with a source of livelihood that derives from the agricultural production on-farm (Hope *et al.,* 2008; Tapela, 2008). According to Smith (2004), the benefits of irrigation farming spread wider linking to improvements in human capital through better nutrition and increased ability to pay for health and education. They also include increased ability to save, to borrow and to invest in capital, which reduces vulnerability and contribute to overall productivity.

Chitonge (2013) reports on an analysis of whether land redistribution in South Africa has contributed meaningfully to the livelihoods of beneficiaries. An analysis of crop and livestock production data suggested that although land may not be used to full capacity in many of the households, the majority of them use the land they have to produce different crops and livestock products for home consumption and sale. Such a finding is contrary to the view that land reform is not going to contribute significantly towards improving the well-being of the beneficiaries. The view, however, is partially supported by the idea that most rural households have diversified their livelihood strategies such that land-based strategies contribute only a small share to rural livelihoods. The central argument of this view is that as more and more rural households diversify their livelihoods, land-based activities (mainly agriculture) contribute an increasingly declining proportion of household income and livelihood, a phenomenon which has been referred to as 'de-agrarianisation' (Bryceson, 1999) or 'depeasantisation' (Bryceson, 2009). Hence, the observation has been that not only are non-farm activities becoming central to rural livelihoods but an increasing number of rural

households lack commitment to farming and this has led to a more profound transition from one way of making a living to another.

Furthermore, there have been allegations that 'far fewer black South Africans want to farm than is commonly supposed; most blacks regard jobs and housing in urban areas as more important priorities' (Centre for Development and Enterprise, 2005). However, the urban formal job solution seems to be problematic under the current situation, given the country's stubborn lump of unemployment resulting from the failure of the economy to create enough jobs and there are no clear indications of an economic turn-around that would result in rapid job creation anytime soon (Chitonge, 2013).

Given the above reasons and others, it has been observed by Kepe *et al.* (2008) that, few people in South Africa believe that land reform has the potential to contribute to economic growth and development, or rural household welfare. There is, therefore, widespread scepticism about the potential of agriculture to improve livelihoods for large numbers of people.

2.1.3 Irrigated agriculture as a rural livelihood option

Irrigation farming and schemes defined

Irrigation is the practice of transporting water from a source, either continuously or opportunistically, and applying this water to agricultural land to enhance plant growth (Molden *et al.,* 2007; Van Averbeke *et al.*, 2011). Crops can then be grown in areas otherwise too dry, and yields can be increased by reducing the water stress experienced by the plant. Typically irrigation increases both yields and quality, generating more income, and allows for multiple cropping cycles during a single year where the temperature regime is favourable (van Averbeke *et al.,* 2011). Multiple cropping cycles increase the labour requirement per unit area and spread it more evenly over the year than in the case of dryland farming. By removing the risk of yield reductions due to water deficit, irrigation enables intensification, but costs and complexity of irrigation necessitate higher investment of time, equipment, fertilizers, attention to variety selection, with additional labour and market transactions (van Averbeke & Denison, 2013). So irrigation is always associated with intensive farming.

Farmers can either irrigate independently or share an irrigation system with others, and so the *scheme* is defined as an agricultural project involving multiple farm units that depend on a shared water supply and irrigation system (Reinders *et al.*, 2010). The scheme is determined by the hydraulic command area and the boundary excludes surrounding villages, farms and grazing areas, though with inter-linkages. Reinders identifies three elements of water-management: the water source (dam or river), bulk conveyance system (diversion and supply canal), and the irrigation scheme containing the farms (Reinders *et al.*, 2010).

Smallholders in South Africa

Smallholder irrigation in South Africa is a small fraction of the total irrigation area, totaling 7.1% of the evaluated irrigated area as of 2011. There are 1 675 822 ha of registered irrigation land (in 2008) of which 1 399 221 ha is irrigated (Van der Stoep, 2011), consuming an estimated 62% of water abstracted from the national surface and ground-water resource (Annandale *et al.*, 2011). It is estimated that 1.26 million black households (96% of 1.307 million) have access to arable smallholdings, mainly located in the communal areas. Most of these are rainfed. Plot sizes are generally small with an estimated 65% of these households holding less than 0.5 ha, and 93% holding less than 5 ha (Vink & Van Rooyen, 2009).

The number of black irrigation farmers is a small fraction of the national irrigation total, estimated at 150-250 000 individuals (de Lange, 1994; Backeberg, 2006). These smallholders farm on irrigation schemes, independently on their own (or leased) farms, or in home and community gardens. While the first of the three groups has been established with some confidence (Denison & Manona, 2007b; van Averbeke *et al.*, 2011), the other two groups are based on rough estimates by calculating back from a national guestimate of 100 000 ha (van Averbeke *et al.,* 2011; Perret, 2002). Based on the best information available, South African smallholder irrigators can be grouped as follows:

- Farmers on plots as part of irrigation schemes, estimated to cover 47 667 ha
- Independent irrigators, estimated to cover 30-40 000 ha
- Irrigated gardens, estimated to cover 10-20 000 ha

One trend that highlights an important grouping globally, and increasingly in South Africa, is the recognition of independent – also called informal or atomistic – irrigators. These are smallholder irrigators who operate on their own outside of schemes. Turral *et al.* (2010) point out that the global expansion of irrigation during the past three decades has mainly been the result of private small-scale irrigation through low-lift pump technology, in shallow wells and alongside rivers. In Ghana similar experiences illustrate the importance of independent irrigators as a driver of expansion. Assessments of irrigation areas around the country in 2011 showed formal irrigation schemes covered only 28 100 ha, while informal, small-scale irrigators using low-head pumps were estimated to cover 186 000 ha (Namara *et al.*, 2011). Small-scale independent irrigators had up to this time not been considered a major contributor to irrigated production and were not included in country strategies. As a result of the new awareness of their prevalence they have since been prioritized in the national irrigation reform agenda. Little is known about this sub-sector in South Africa and it has not received a similar focus to the study of schemes; the sector may be much larger than currently estimated, as in Ghana and India, which are well-known countries reflecting the dominant global trend (van Hofwegen, 2010; Turral *et al.,* 2010). This study acknowledges the limited information on independent irrigators in South Africa and that these are an important sub-sector of farmers, particularly in relation to entrepreneurial development in agriculture.

Irrigation systems and multiple factors

Many studies on small farmer and irrigation development over the last 60 years have highlighted the multiple factors that must be considered at farm and scheme level to achieve agricultural success.

Factors and relationships cover a wide domain including physical, social, financial and biological aspects with a longitudinal dimension of dynamic change-over-time. These include adequacy of resources, issues of access, knowledge and institutions and comprise discrete factors as well as relationships between factors (RSA, 1955; Withers and Vipond, 1974; Van Rooyen and Nene, 1996; Van Averbeke *et al.*, 1998; Bembridge, 2000; Perret, 2002; Van Averbeke, *et al.*, 2011; NPC, 2011; Van Averbeke and Denison, 2013; Cousins, 2013; Sender, 2015). These factors and relationships can be re-organised to align with the livelihoods framework of Ellis (2000), comprising assets, access, trends and outcomes. An understanding of the factors involved in irrigation farming and related livelihoods is important in the study of irrigation farming as multiple factors must be elevated above minimum threshold levels to allow the system to function, and yield benefits. The literature review outlines these factors and expands on their relevance and importance to the study.

Irrigation Assets

Physical factors that must be considered are routine in irrigated agriculture and mainly relate to climate, soil, and water.

Climate is the long-term characteristic regime of weather and includes solar radiation, temperature, rainfall and air movement. *Soils* include considerations of slope, general morphology in relation to flooding and drainage, and their structure, chemical and organic composition. Physical properties of soils are central parameters in the technical design of irrigation schemes (Withers and Vipond, 1974) and impact on crop selection and crop-production planning (Van Averbeke, *et al.,* 1998). Bembridge (2000) argues that for irrigation planning purposes, climatic and soils factors can be categorised quite simply as good, fair or poor.

Water for crop production under irrigation is both from rainfall and from the irrigation water source. Rainfall is a primary parameter in irrigation design, with the intention that the irrigation system supplies the deficit needed for crop growth. Irrigation water is not always available whenever it is needed and aspects of water quality, water quantity and reliability of supply are of high importance (van Averbeke *et al.*, 1998; Bembridge, 2000). In relation to water for cropping then, key factors include rainfall and the irrigation water quantity, quality and reliability of supply.

Technology and infrastructure: Backeberg (2002) sets out four areas for attention in relation to irrigation infrastructure. *Irrigation water distribution system:* Sources, such as rivers and dams, or from groundwater dictate certain technical requirements which impact on the type of farming system that can thrive. Supply from groundwater sources is more typical for private irrigation systems than for large public irrigation schemes given the volumes of water that are needed. Pumped schemes have much high failure rates than gravity fed schemes (Van Averbeke *et al.*, 2011) and the introduction of pumping can also result in changes to the nature of the farming system. Denison and Manona (2007), documented findings from a set of engineering feasibility studies in the Eastern Cape where the choice of sprinklers, centre-pivots or drip irrigation, which replaced gravity canal schemes had the effect of 'forcing' a shift to higher-yield and higher-risk farming approaches. High production farming was essential to justify the additional income to cover pumping costs with

expansion needed to achieve economies of scale. Bembridge (2000) notes that gravity fed schemes have much lower running costs than pumping schemes and also highlights the importance of site-appropriate technology selection. He motivates that decision-makers consider short-furrow irrigation, a highly efficient but labour-intensive in-field irrigation practice that has efficiencies similar to micro-jet irrigation (>80% application efficiency) (Reinders, 2010)

Transport facilities include roads, railways, airports, seaports and related cars, trucks, trains and ships, as well as animal and human transport. Arnon (1981, in Van Averbeke, 1998) notes that an efficient marketing system for commercial farming is not possible without a good transport system. This is because the lack of good transportation such as bad roads, inadequate access to suitable vehicles for long haul distances, lack of railway access among other, can result in very high costs (both input and market transport) and also significant losses in produce delivered, particularly for perishable products.

Communication technology relates to all forms of communication, but most importantly here are phone and internet access, which provide direct links to both production and market information. While cell phone access is the norm across South Africa, though there are exceptions in remote locations, internet access is similarly possible, though computer ownership and internet-surfing skills are in generally very limited among smallholders.

Storage and processing facilities are important for a number of reasons. Most smallholders produce relatively small quantities individually that require some aggregation and processing (typically packaging into boxes and pallets) to efficiently access bulk markets such as large urban fresh produce markets, or supermarkets. Where roads are inaccessible for any period of time, this also requires storage facilities to minimise crop losses from vermin, moisture or insects. Processing facilities, such as machinery, buildings and equipment can significantly reduce storage losses, and aid transport efficiencies due to the reduced bulk and higher value product, but as noted by Van Averbeke (1998), this is not always economically viable.

Access in relation to Land tenure systems

Land tenure institutions are a major factor in irrigation farming. Tenure arrangements impact on tenure security in relation to access, use and control and where tenure is not deemed to be secure for a sufficient timeline, this act as a disincentive for farming investment (Arokoyo & Chikwendu, 1993; de Soto, 2000; Boudreaux & Sacks, 2009; IFAD, 2008). Land tenure is understood as a land holding arrangement in which the land holder enjoys a set of rights. These rights are user rights, enforcement rights, exclusion rights and transfer rights (Adams, Sibanda & Turner, 1999; van Averbeke, 2013; FAO, 2002). Land tenure can be understood within the context of the functioning of three elements; breadth, duration and assurance (Moor & Nieuwoudt, 1995). Breadth refers to the quantity and quality of rights enjoyable by the land holder. Duration concerns itself with the length of period in which the land holder enjoys such rights. And lastly, assurance is about presence of certainty that the prevailing land administration order will enforce the rights.

There are different forms of tenure in South Africa which have evolved under influences of both traditional tenure systems and imported colonial arrangements, leaving a complicated mix of individual, family and collective rights of access, use and control. In the rural areas of South Africa which are located in the former Bantustans, including self-governing territories[5] and independent states[6], arable lands are predominantly classified as *communal* although the propriety character of this term has attracted criticism from revisionist scholars of agrarian studies, particularly in the last two decades (Okoth-Ogedo, 2008, Cousins, 2008, Peters, 2009, Pottier, 2005). It is not only the conceptual propriety of the term that is problematic, but more importantly, the problems of communal tenure arrangements emanate from and reside largely in the reality that its administrative model is highly fragmented and varies greatly in how it is interpreted and applied across the country.

In the South African situation, both historical and contemporary, the term communal land tenure has and does not denote a single and unified regime of land administration in the same way that the individual freehold tenure system works. The legislative and administrative history of South Africa is characterised by repeated state efforts to engineer and modify property relations, and this history of actions has resulted in the concept of a *communal* land tenure system as an umbrella category which includes diverse tenure forms such as customary, Trust, Permission To Occupy (PTO) and Quitrent tenure systems. In many villages customary and PTO tenure systems overlap and hence cause confusion over land rights among landholders.

Lahiff (undated) gives a brief historical account of how the state used legislative instruments to create this confusion. Trust tenure was created by the 1936 Land and Trust Act which provided that land be held in trust for blacks by the South African Bantu Trust which later became the South African Development Trust (SADT). The state went on to use the Black Administration Act 38 of 1927 to create other forms of land control on SADT land including Permission To Occupy, deed of grant and lease hold. After some three decades of continuous amendments to property relations and administrative modalities, the State promulgated the Bantu Areas Land Regulations, Proclamation No.R.188 of 1969 that subsequently became the dominant legislative mechanism of communal land administration at least until 1994. The state found it necessary to pass this proclamation because even though the 1913 and 1936 Land Acts had already created designated spaces for black farmers, they did not specify the tenure systems under which land in the affected areas had to be used (du Plessis & Pienaar, 2010). The R188 proclamation is widely credited for attempting to bring order and uniformity in the domain of communal land administration across the homelands. It provided that quitrent tenure would be issued on surveyed land and Permission to Occupy on land not surveyed.

The fragmentation in communal land administration was not helped by the state's passing of the Constitution of Self-Governing Territories Act 21 of 1971 which provided self-governing territories, including Gazankulu and Lebowa which got incorporated into Limpopo province in 1994, with legislative powers to oversee and institute their own land administration orders. This act in

[5] Lebowa, Kangwane, Gazankulu, QwaQwa, KwaZulu and KwaNdebele
[6] Vhenda, Bophuthatswana, Transkei and Ciskei

combination with the Black Administration Act 38 of 1927 which had been promulgated previously, empowered self-governing territories to determine nature of land rights, and further gave them the power to pass proclamations. ‘

The Permission To Occupy system became the dominant mechanism of land allocation and rights in rural areas where land is held under customary system. The issuing process included the local chief, district magistrate and the Department of Agriculture. “It was a system of lesser rights to land, where land is rented for life and rent is paid to the government via homeland authorities (e.g. magistrates)” (Lahiff, undated: 296). Quitrent certificate would be issued by the Director General of the Department of Agriculture or Development Aid for arable, residential and trading rights. “The quitrent system provided holders with the right to possess land in perpetuity, but did not grant the right to alienate that land. The holder could not mortgage or sell the land, and could let land only with permission from the Chief Commissioner in the area” (Lahiff, undated: 297). But these tenure systems often coincided and overlapped with customary tenure land rights of which land was issued by exclusive direct involvement of local traditional leadership according to tribal customs observed by the community.

In an effort to project a non-racial face in matters of land administration, the state passed the Abolition of Racially Based Land Measures Act in 1991 which among other repealed the 1913 and 1936 Land Acts, but it left proclamations passed according to these Acts intact including the R188 which sanctioned the permit system (du Plessis & Pienaar, 2010). This created both an administrative vacuum and costly confusion in matters of land administration and tenure security because among others, issuing of PTO certificates has continued to the present especially in the Vhembe and Greater Tzaneen parts of Limpopo. Land held under this system lacks in legitimacy of tenure and there is no assurance of enforceability of rights by rights holders. In other areas PTO certificates are no longer issued and procedures of issuing land are considerably varying from area to area (Cousins, 2007).

The PTO system under which land in most irrigation schemes, as regulated by proclamation R.5 of 1963 called the Regulations for the Control of Irrigation Schemes in Bantu Areas (van Averbeke, 2013) in Limpopo is used should be looked at against this backdrop of rights analysis and brief history of state legislation. The PTO tenure system offers user rights, but emphatically prohibits transfer or land rights. Following the state’s banning of the system in 1991, PTO has since lost legal powers to enforce and assure rights. Its status with regards rights to exclude other users is equally problematic because there is no legal order to resort to in situations of contestations over rights.

Access in relation to Water institutions

Water law and institutions in South Africa are intended to empower irrigation management organisations at scheme level and at the higher level of the DWS Regional office, or CMAs where these are established. Water User Association legislation in the National Water Act (1998) provides specific powers and defines how WUAs must be established and run. While effective in the larger-scale commercial schemes, WUA success in a smallholder scheme environment is largely absent, not

least due to marginal profitability. The reasons for underperformance of the smallholder irrigation sector are the result of a raft of challenges, including water-insecurity, weak market linkages, a lack of agricultural financing, inadequate production knowledge, and severe institutional deficiencies in land and water organisational domains (NPC, 2011; Sender, 2015; Cousins, 2013, Hollingworth & Matsetela, 2012). The latter authors also point to the misalignment of land and water reform initiatives which are equally important primary resources in irrigation.

In a context of generally weak institutional arrangements, access to water institutions presents twin issues. The first challenge is the administrative process of securing water allocations. This involves securing a volumetric allocation in typically water stressed context and embedding that allocation in a water-use licence. The second challenge is related to the rules of water distribution, operations, maintenance and management on schemes.

The National Water Policy Review Positions Paper (DWA, 2013b) and the National Water Resources Strategy (NWRS-2((DWA, 2013a) are clear on the imperative to obtain economic returns on water, given increasing national water stress. All users, including smallholder farmers, should in future, be paying for water in line with the principle of 'the user pays'. This measure, important a target as it is, adds further financial stress to an already struggling smallholder sector but remains central to present water resource management strategies. The second edition of the National Water Resources Strategy (NWRS-2) identifies that with the sustainability of fresh water resources having reached a critical point and that South Africa is facing serious water challenges. Primary concerns include security of supply, environmental degradation, and resource pollution (DWA, 2013a). Related to this, the associated management of water is facing a crisis – a situation defined as having a negative impact on economic, political, societal or environmental goals – and this in a context where agricultural water use is the largest category of use, accounting for 60%[7] of the national available surface and groundwater resource (DWA, 2013a). The NWRS-2 further notes that agriculture has great potential for socio-economic impact in rural communities, which is a perspective shared and articulated in greater detail in the National Development Plan, where smallholder irrigated farming on schemes and on independent farms, with varied business orientations, is the central tenet of the country's rural development strategy up to the year 2030 (NPC, 2011). This vision of agrarian reform underpinned by smallholder irrigation is optimistic, given the well-documented reality that smallholder schemes in South Africa perform well below their potential (van Averbeke *et al.*, 2011) and are a small fraction of the commercial sector (100 000 ha of 1.4 million ha) (van der Stoep, 2011), with limited expansion taking place.

The drive for economic returns from water through cost recovery, alongside the development agenda to establish and strengthen a thriving smallholder irrigation sector presents a development conundrum given present marginal enterprises, where the addition of water costs adds financial stress. Water redress mechanisms such as Water Allocation Reform, aim to balance social and economic tensions in relation to access to and benefit from water; a priority established in the White Paper of 1997 (RSA, 1994) and in the National Water Act (RSA, 1998). The Department of Water and

[7] Van der Stoep (2011) assesses agricultural water use similarly but slightly higher at 62%.

Sanitation (DWS) has mitigated the financial impact on HDI smallholder irrigators historically through the Resource Poor Farmers Subsidy (DWAF, 2004; DWA, 2013a), targeting HDIs who are prioritised in the Water Allocation Reform (WAR) strategy (DWAF, 2008), but financial support and reach is limited.

There is strong intent, and even frustration on the part of political leadership as shown in the 2013 Water Policy Review Positions Paper water allocation is still heavily skewed to White South Africans and has not yet been transformed. While policy is patently clear, smallholders still face major challenges obtaining formalised allocations in a generally stressed water environment in Limpopo, where administrative mechanisms to provide secure water-use entitlements to smallholder schemes are lacking or absent (Van Koppen & Schreiner, 2014). Without sufficient water-use security (administratively in the form of licenses), smallholder farmers proceed with cropping with high levels of uncertainty and high exposure to unacceptable levels of risk

In relation to the second domain of interest, functioning scheme-level water institutions are essential for effective irrigation system operations, maintenance and management (OMM). Functional and efficient water institutions (rules) and organisations (groups of individuals in organisational entities) are needed to ensure that water is provided in sufficient quantity at the right time and that the irrigation water distribution system is maintained over time to ensure water provision into the long term. This requires competencies in technical administration (operations and water distribution), financial administration (fee collection and reporting) and water infrastructure maintenance and replacement. The absence of a *secure* irrigation water supply is an obvious disincentive to investment in irrigation and a contributing factor in the lack of irrigation success. The National Water Act (1998) made provision for Water User Associations to be established to take responsibility for the OMM of all schemes in South Africa, including large commercial schemes under Irrigation Boards, Government Water Schemes along with smallholder schemes. The development of smallholder WUAs has however not been successful and along with the critical failure to give effect to Water Allocation Reform over the last 15 years (since the NWA), has led to a radical reform initiative outlined in the DWS Water Review Position Paper (2013b). This calls for the disestablishment of all WUAs and a move to centralisation of water management but the impractical scenario of centrally managed schemes has left the policy recommendations without any effect since the 2013 positions paper. On smallholder schemes, weak or absent WUAs remains the prevalent reality (Pegasys, 2013). The presence and functionality of local water management institutions on smallholder schemes are an important factor to consider in the analysis.

Access to Farmer organisations

Farmer organisations are typically established in the form of cooperatives, because the collective of many farmers in a structured group can achieve outcomes that are not possible for a single smallholder farmer. Bulk purchasing, crop sale coordination, aggregation, lobbying and engaging with markets can be facilitated by cooperatives. In South Africa, where local communities insist on active participation in service delivery, farmer organisations play a pivotal role in facilitating collaboration, determining a common agenda and engaging with Government and private sector on

an ongoing basis. The presence and vitality, or absence, of farmer organisations on schemes is thus another factor impacting on scheme ability to support vibrant farming enterprises.

Trends: Underperformance of the smallholder sector

Despite the positive average outcomes of irrigation on production, economic growth and poverty reduction, irrigation developments have seldom performed to their design potential with generally worse performance in Africa than elsewhere (Shah *et al. 2002,* Turral *et al.*, 2010; Bembridge, 2000). Reasons for the general underperformance and high incidence of failure in the African smallholder sector are numerous and include inappropriate design at a technical level, lack of participation by farmers, institutional challenges, competing water needs, weak market linkages, inadequate skills, difficulty in accessing finance (Faures *et al.,* 2007). More locally, Bembridge (2000) attributes poor performance of South African smallholder irrigation schemes to multiple factors, including poor maintenance of infrastructure and equipment, high energy costs for pumping, lack of institutional support for credit, weak access to markets, limited tractors and draught power, lack of extension and farmer training, on-scheme conflict and weak local organisations. The dominance of infrastructure development in modern irrigation development with insufficient emphasis on the farm enterprise and the multiple linkages of individual, household, farm, scheme and an external world is another contributing factor (van Averbeke & Denison, 2013). The general trend is one of decline of infrastructure and management systems on irrigation schemes and a smallholder sector that is subject to increasing relative costs and reduced market prices. While the trend of infrastructure decline and underutilisation of resources in smallholder irrigation is widely reported in South Africa, it seems that independent irrigators are likely to increase in importance given the global trends in this regard. A parallel trend is that of water scarcity and the subsequent need to increase returns from available water, which translates to an agenda of modernisation in irrigation, aiming for increased water-use efficiency, alongside increased greater sophistication in agronomy.

Outcomes: irrigation as a step up in life

There are both obvious and hidden benefits from irrigation investments funded by Government. Initial benefits arise from the construction works in the form of employment and short term local economic activity, but the investment is mainly justified by the projected increase in farm production made possible by providing farmers with access to water for cropping.

In Southern Africa, irrigation has played an important part in livelihoods for more than a millennium. Tempelhoff (2008) provides accounts of early indigenous Southern African agricultural water management practices, including for supply to village settlements and for irrigation during the iron-age period from 800-1500 AD. These hydraulic capabilities, he highlights, were an essential part of survival for isolated Bantu people in the Southern African region. He laments that awareness of their existence and their importance in supporting the powerful centres such as Mapungubwe and Great Zimbabwe between 1200 and 1500 AD is widely overlooked. When the evidence is carefully studied these early systems were as important then to society, as high-tech intensive irrigated farming is for food security in our society today. Indigenous practices were later eclipsed by the introduction of the plough and more extensive rainfed practices, as well as the invasion of modern Western

traditions in the nineteenth century, the latter both obliterating ancient furrow systems, and dominating historical narratives (Tempelhoff, 2008).

A major study from a later era, the comprehensive Tomlinson Commission (RSA, 1955), analysed data on yields, profitability and household income assessments for both 'European' and 'Bantu' farming contexts in the 1950's. The Commission found that irrigation provided a substantial advantage in production and profitability. Comparing rainfed and irrigation production, average yields on European rainfed farms (i.e. with greater advantages due to the political regime at the time) were found to be 4.4 times lower than average yields on Bantu irrigation schemes (noting these were supervised by degree qualified agricultural managers). Comparing Bantu irrigation and rainfed mixed farming households the average annual income of the most advantageous agro-climatic group of rainfed mixed farmers (52.55 pounds) was only 46% of the income of the average irrigation household (115.5 pounds).

At a global scale, the positive effect of irrigation on poverty was documented in different developing countries (Castello *et al.*, 2007). Irrigation significantly increased farmer incomes. Comparing the incomes of irrigation farmers with those of neighbouring dryland farmers, the authors found that the incomes of irrigation farmers were 1.1 to 2.9 times higher than those of their dryland neighbours. In China, Huang *et al.* (2006) found that the revenue from irrigated land was on average 1.79 times higher than that from neighbouring dryland farms. In Ethiopia, Gebregzhiaber *et al.* (2009) compared crop income, farm income and total income of households of irrigation farmers with those of dryland farmers in a rural population where agriculture contributed on average 72% to total household income. Crop income of irrigation farmers was 1.9 times higher than that of dryland farmers, total farm income was 2.7 times higher and total household income 1.8 times higher. Whereas these results clearly illustrate the direct benefit of irrigation on household income, they also show that the livelihoods of the two groups was structured differently, with the livelihood of irrigation farmers being centred more around farming than that of dryland farmers.

The economic performance of irrigation schemes has also been positive. World Bank projects between 1961 and 1987 show a respectable average internal rate of return of 15% (Faures *et al.*, 2007). A comparative global study of 314 schemes conducted by an IMWI team analysed the costs and benefits of Sub-Saharan African irrigation development versus global experience (Inocencio *et al.,* 2007). It was concluded that under the right conditions, irrigation investment can provide good returns and have significant impacts on agricultural growth. Success was linked to implementation at programmatic scale (i.e. large development programmes) with many smaller-scale irrigation schemes rather than few larger ones, a multi-sector approach and maximising farmer participation. The report also highlights the importance of investment in software and hardware components and simplicity of design and operation.

Conclusions

Although irrigation schemes and farmers generally underperform in the smallholder sector relative to larger-scale corporatized agriculture, irrigation has historically led to a rise in farm income that

was sufficient to lift poor households out of poverty, substantially improve rural livelihoods and drive economic development more broadly. The positive effect of irrigation on revenue per unit land and related livelihoods of farmers were that irrigation increased yields of particular crops; irrigation increased cropping intensity by enabling the production of more than one crop per year; and irrigation broadened choice of crop, making it possible for farmers to select crops with superior value, with related food, financial and economic benefits.

2.2 Entrepreneurship in smallholder farming in South Africa

2.2.1 Introduction

This section sets out to build an operationalised understanding of the terms 'entrepreneur' and 'entrepreneurship'. It builds from a number of definitions that are already provided in various published bodies of work. The underlying aim is to provide an interpretive framework/argumentation that can provide theoretical guidance to analysis of smallholder farming that follows in subsequent chapters. Such framework should be capable of appreciating the entrepreneurial realities unique to the world of small holder farming in contexts of developing economies and plural socio-economic orders that in South Africa particularly and the rest of the African continent widely are a resilient remnant of the histories of colonial and apartheid governance systems that sought to disenfranchise black farmers. We give a brief review of preceding contributions to this debate, and finally propose our position.

It is widely acknowledged that the definition of an entrepreneur is elusive and some scholars admit that there is little hope of finding one definition that the whole research community can agree upon. Hebert and Link (1989) argue that in order for the scholary community to achieve analytic progress uniform and universally acceptable principles should be formulated. Accordingly, the authors propose what they call a synthetic definition of an entrepreneur: "the entrepreneur is someone who specialises in taking responsibility for and making judgemental decisions that affect the location, form and use of goods, resources and institutions" (Hebert & Link, 1989: 47). The strength of such a definition is that it incorporates various aspects, including risk, uncertainty, innovation, perception and change, and it accommodates several entrepreneurial activities that take place in a market system such as coordination, arbitrage, ownership, speculation, innovation and resource allocation. However, because it is so wide, this definition renders almost every social activity entrepreneurial.

We argue in this work that the emerging elusiveness of the definition is far less about the presence of conceptual difficulties inherent in the universe of entrepreneurship per se', than it is a function of methodological misappropriation by researchers. In their enquiries about what it means to be an entrepreneur and what entrepreneurship is, researchers have been concerned with efforts to find a universally applicable and agreeable understanding. Doing so is problematic because entrepreneurship is characteristically a multi-domain affair. There is entrepreneurship in arbitrage, manufacturing, farming, organisational building, social and sustainability spheres. Each of these operates within different sets of reality universes which are made of unique regimes of

opportunities, challenges and are driven by correspondingly different kinds of intentions (aspirations and goals). Instead of directing the methods of enquiries to find one single concept of entrepreneurship, research efforts need to embrace the concept of plural realities, one that accommodates differences and appreciate uniqueness as legitimate components of a real and legitimate world. Scholary efforts that seek to find and propose universally applicable theoretical definitions can help lend predictive power to the debates, but their weakness is that they mask, suppress and ignore very important real-world complexities unique to certain domains of entrepreneurship. This is essentialist, and has potential to provide very poor analytic tools, which in turn can be detrimental to the knowledge growth of the subject area.

2.2.2 Defining and entrepreneur and entrepreneurship

Explaining entrepreneurship and who the entrepreneur is, became a scholarly topic in the 1800's. Jean Baptist Say, a French economist in the 1800's, gave an explanation of the entrepreneurial function and was best known for his law of markets and the belief that agriculture is one of the industries that can create value within the economy of a country (Van Praag, 1999). He defined the entrepreneur not only as the coordinator of the means of production, but as the risk taker, who carries out the activities by him/herself. From the earliest understanding of the definition, entrepreneurs were regarded as risk takers, mostly because they invest their own money and time. The interest in the entrepreneur as market actor was taken up in earnest in the 1900's. Schumpeter (1934) underlines key factors to the concept of entrepreneurship as innovation, creativity, or discovery. This is supported by the work of Peterson (1985) who describes entrepreneurship as the opportunity-seeking style of management that sparks innovation.

The term entrepreneurship did not develop into a concept understood similarly by all, even though it is clear from the above that certain aspects such as opportunity recognition and risk are a recurring theme. Entrepreneurship as concept implies many different things, as such there exists little hope that scholars will ever agree on a single definition (Chell, 2008). However, the earlier definitions of entrepreneur and entrepreneurship reflect the state of understanding at the time of its composition (Zahra *et al.,* 2009).

Modern definitions of entrepreneurship still seem to embrace different elements. Shane and Venkataraman (2000) define the field of entrepreneurship as the scholarly examination of how, by whom, and with what effects opportunities to create future goods and services are discovered, evaluated and exploited. Timmons and Spinelli (2007) define entrepreneurship as a way of thinking, reasoning, and acting that is opportunity based, holistic in approach, and leadership balanced for the purpose of value creation and capture. The authors argue that entrepreneurship results in the creation, enhancement, realisation, and renewal of value, not just for owners, but for all participants and stakeholders. According to Zimmerer and Scaborough (2005:5) an entrepreneur is "a person who creates a new business in the face of risk and uncertainty for the purpose of achieving growth and profit by identifying significant opportunities and assembling the necessary resources to capitalise on them". Although not all scholars agree that an entrepreneur will always be involved in

starting up of a business (Shane and Ventakaraman, 2000), it can be accepted that consensus determines the entrepreneur not only come up with ideas, but also acts on it.

Another component to the understanding of entrepreneurship is introduced by Chell (2008), who states that entrepreneurship is a process of recognising and pursuing opportunities with regard to the alienable and inalienable resources currently controlled with a view to value creation. Hebert and Link (1989: 47-8) posit that an entrepreneur is a person who "….has a comparative advantage in decision making, and makes decisions that run counter to the conventional wisdom either because he has better information or a different perception of events or opportunities….Entrepreneurial actions are performed in all societies by individuals whose judgement differs from the norm".

Various South African scholars entered the debate on entrepreneurship and the understanding of the entrepreneur. Rwigema and Venter (2004) define entrepreneurship as the process of conceptualising, organizing, launching and — through innovation — nurturing a business opportunity into a potentially high growth venture in a complex, unstable environment.

Nieman and Pretorius (2004:4) state that an entrepreneur can be defined as "a person who sees an opportunity in the market, gathers resources, establishes and grows a business towards the satisfaction of the needs of the market". Nieman and Niewenhuizen (2009) add the element of risk and profit. These elements are also reflected in the understanding as provided by Chell (2008). Growth of a business is shown from the above as a defining feature of entrepreneurial ventures (Nieman & Pretorius, 2004; Rwigema & Venter, 2004). An entrepreneur is also regarded as an economic agent who is able to perceive market opportunities and assembles the needed factors of production in order to exploit specific opportunities (Van Aardt *et al.,* 2008).

In the definition provided by Co *et al.* (2006), the combination of the other authors is summarised into one definition. The author defines an entrepreneur a person who identifies a need in the market and develops products and services by making decisions about bringing resources together such as raw materials, financial and human resources, to satisfy that need. In doing this, the entrepreneur takes risks but he is in return rewarded with the profits of the business.

While the authors seem to place more credit on personality qualities of the individual entrepreneur (agentic performance), we place the emphasis to the constraining and enabling power of structural arrangements such as rules, legal regulations and policy direction within which choices and decisions of an entrepreneur to exploit opportunities have to be made. The critical resources that smallholder farmers use such as land, water and markets are not owned, nor are they controlled by individual agents (entrepreneurs). They are owned and controlled by different arms of the state. As a result, the power of agentic performance and alertness to influence entrepreneurial decision making and undertaking of associated activities is substantially limited. Paying attention to structuration is even more critical given the reality that South Africa's agrarian economy is dualised into two components of commercial farmers (mainly previously advantaged whites) and smallholder farming (exclusively previously disadvantaged blacks). Any meaningful efforts to analyse entrepreneurship in the domain

of smallholder farming in South Africa cannot afford to ignore this structural reality; doing so may render it absurdly out of touch with reality and unhelpful in advancing the intellectual growth of the subject matter.

Chell (2008) builds her argument on entrepreneurship by attempting to answer the question; who is an entrepreneur? In which turn she argues that "…. It is people who explore opportunities for the development of innovations, found businesses and do so from the recognition of a socio-economic problem, which they endeavour to solve through identification of creative solutions" (Chell, 2008: 1). Chell (2008) focuses on the individual (entrepreneur) and the process (entrepreneurship, becoming an entrepreneur). In light of the multiple definitions of entrepreneurship that are out there, Chell (2008) acknowledges that there is little hope of achieving a consensus on what an entrepreneur or entrepreneurship is. She gives five different definitions, of which two are relevant for this study:

(i) Entrepreneurship is the ability to recognise opportunity while simultaneously figuring out whether there exist possibilities to tap the necessary resources to exploit it. Moreover, it is pre-existing credit (financial, social or intellectual capital) that entrepreneurs are given access to resources to exploit the opportunities that they have recognised.

(ii) Entrepreneurship is the process of recognising and pursuing opportunities with regards to the alienable and inalienable resources currently controlled with a view to value creation.

Naturally, entrepreneurs have no complete control over resources, including economic resources and pre-existing capitals such as human and social. And for Chell (2008) entrepreneurial behaviour is about "engaging in processes that create value". Entrepreneurship is a wide concept that includes business founding, social and non-for-profit enterprise and corporate entrepreneurship.

Although entrepreneurship is about relentless is about relentless pursuit of opportunities, this does not imply that entrepreneurs do that mindlessly. Rather, entrepreneurs are very minded; they pick up opportunities, test and drop them if the opportunity proves to be what the entrepreneur had thought they were. And they use networks to draw social capital to enable them to exploit opportunities.

2.2.3 Understanding entrepreneurship through analytical tools

In this work, we adopt the structuration theory for an analytic understanding of entrepreneurs and processes of entrepreneurship. The structuration theory argues that people's lives are lived within social environments in social arrangements of interconnectedness. Their behaviours and actions are practised within a socially constructed framework of norms, rules and responsibilities which are themselves constrained by economic, political and legal systems of regulation. In essence, the structuration theory sees human lives and all their associated activities and processes of living as happening within and significantly influenced by structural arrangements that obtain in the spaces in which the lives are lived. The structuration theory offers necessary intellectual tools with which to critically analyse and understand the performance of South Africa's smallholder sector in light of entrepreneurial opportunities, constraints, final outcomes, as well as collective and individual

aspirations. Van Averbeke *et al.* (2011) understand the concept and reality of smallholder farming in South Africa as fundamentally a structurally constructed class of black farmers largely located in the areas under communal tenure in which among a horde of challenges, there are poor market linkages, poor transport network, poor extension services and robust information asymmetry. Thus taking cue from the authors' structural definition, the economics analysis of the equilibrium theory that assumes that entrepreneurship is explained by decisions to allocate resources to meet demand is not a sufficient analytical tool to explain the entrepreneurial realities of small holder farmers. Neither can the theory of trait psychology with its emphasis on personality traits help us appreciate the full scope of smallholder entrepreneurship which we argue in this work that it is fundamentally shaped by both structural and agentic factors. Person constructs (traits) manifest in a social space which itself is made of the interplay between structural instruments of control and the behaviours of the controlled (agentic performance).

TABLE 2.1: Analytic tools of entrepreneurship compared

ECONOMIC	SOCIOLOGY	PYSCHOLOGY
Equilibrium theory assumes a model of economic behaviour in which decisions are made to allocate resources in a way as to ensure that the supply of a product or service meets demand. Where *perfect information* is assumed there is no function for the entrepreneur to perform. *Imperfect information* distribution allows the alert individual (entrepreneur) to use that information in order to realise an opportunity that others are not aware of. *Radical innovation theory*, however, assumes the creation of a new product or service that creates disequilibrium	*Structuration theory* assumes that behaviour is influence (or determined) through social rules, norms and responsibilities, which give meaning, legitimacy and power to agent. However, such behaviour is constrained at each level in the socio economic system through economic political and legal rules and regulations. The entrepreneur must work within this system; as such behaviour emerges from an interplay of agentic – structure interaction/interpretation. *Social constructionism* assumes that each agentic decision-maker is unique and that a holistic view should be taken of behaviour and context. Social constructionists critique	*Trait psychology* assumes that there is an internal structure to personality. This structure can be boiled down to five broad traits. The mix and strength of these determine the overall persona. *Specific traits* are also identified that measure particular attributes of the person. At this level, attempts have been made to identify traits that typify and entrepreneur. Trait psychology assumes that a trait is a relatively stable and enduring characteristic that will strongly influence behaviour. It should therefore be possible, if the correct trait is identified, to predict the

	positivism and trait theory as being essentialist.	behaviour of a sample of entrepreneurs. Trait psychology cannot predict behaviour in particular circumstances, but can predict the likelihood of a behaviour given the trait. Alternatives to traits are person constructs, skills, strategies and plans.

Adapted from Chell (2008)

In seeking to understand the reality of smallholder entrepreneurship in South Africa, it is very critical that we attend to the following two questions:

(i) What is the role or influence of structural arrangements in entrepreneurial processes of resource accumulation, access to markets and information?

(ii) Can entrepreneurship be explained in a non-essentialist conception that is capable of appreciating the uniqueness of agentic decision-makers in their varied processes of opportunity identification, venture creation, and growth?

The structuration analytic framework views entrepreneurship from a processual rather than a snap-shop standpoint. It recognises the importance of the nature of a socio-economic structure, made of a regime of rules that regulate, control and influence of the kind of decisions an agent/entrepreneurs makes and how they make them. Chell (2008) fragments the socio-economic environment into spatial blocks in order to facilitate analytical engagement. The environment of socio-economic structures range from the macro, meso to micro spatial scales in a descending order, shown in Figure 2.2. The agent/entrepreneur has a historical identity, human capital and generic person constructs (traits).

The model suggests that the socio-economic arrangements are construed differently by agents/entrepreneurs as constraints or opportunities. The act of giving meaning to these situations is a process that involves recognition, development and exploitation. All this is undertaken with the aim to create value. This involves taking of various actions and making strategic and operational decisions to achieve the desired goal/end.

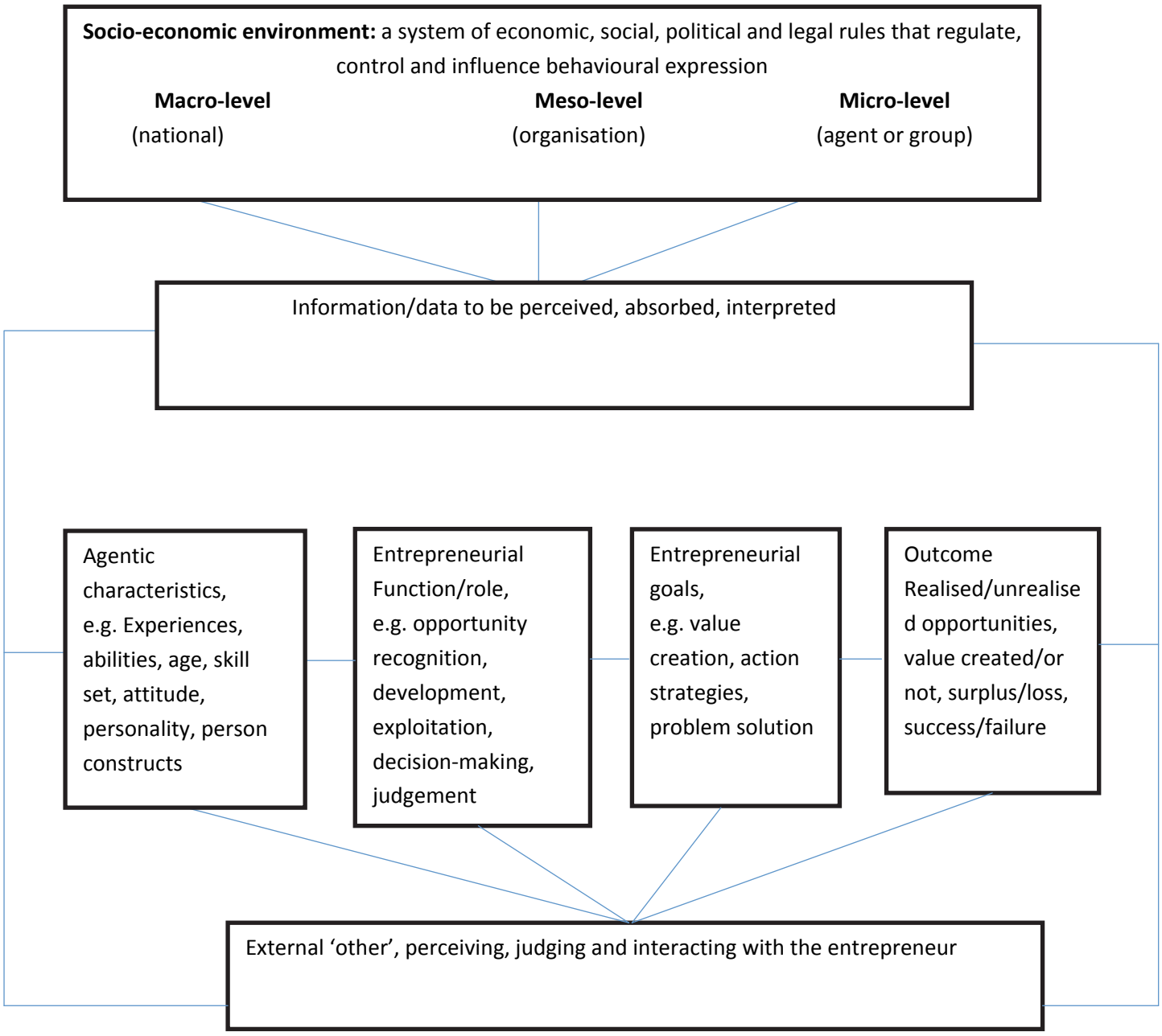

FIGURE 2.2: The entrepreneur and the entrepreneurial process (Chell, 2008)

But making such decisions and the processes of choosing what decision to make have a spatial and temporal aspect. The outcomes include realised and unrealised opportunities, value creation or not, success or failure, growth or downsizing, continuation or quitting, profits or loss, and wealth or impoverishment. The feedback loops in the model represent potential for heuristic learning that may lead to better decision making in future. Chapter 6 in this volume presents detailed case studies that explain these entrepreneurial processes.

2.2.4 A typological analysis of entrepreneurs

It is facile to posit that entrepreneurs are heterogeneous, and a lot of intellectual exercises to reflect this nature of differentiality have been undertaken and published. But what is difficult, and is yet to be agreed upon by the research community is the nature of differential criteria that must be used in exercise of typologising different entrepreneurial players. As a result some have classified entrepreneurs according to their business motives. Such typologising is represented in Table 2.2.

Table 2.2: Types of entrepreneurship

Type of entrepreneurship	Explanation of concept	Scholars
Social entrepreneurship	Entrepreneurship that focus on the creation of social value, while profit is regarded as a means to achieve social outcomes.	Zahra *et al.* (2009); Martin & Osberg (2007); Drayton (2002)
Sustainable entrepreneurship	Entrepreneurship that focus on both a social and environmental outcomes, together with the need to create economic value (profit)	Cohen and Winn (2007)
Ecopreneurship	Synonymous to sustainable entrepreneurship	Isaacs *et al.* (2007)
Environmental entrepreneurship	Entrepreneurship that focus on both commercial and ecological processes in order to solve environmentally relevant challenges.	York *et a.* (2016)
Technopreneurship	Entrepreneur that focus on using new scientific developments in achieving profit.	Wickham (1998)
Intrapreneurship	Individuals who function as entrepreneurs in existing businesses by being innovative and creating new opportunities.	Baron and Shane (2005); Van Aardt *et al.* (2007)
Survivalist entrepreneurship	Individuals acting as entrepreneurs as a means for economic survival.	Research on this form of entrepreneurship is prominent from a South African perspective. Co *et al.* (2006)
Agripreneurship	**Entrepreneur who's main business is farming**	**No academic journals could be identified with scholarly definitions on this type of entrepreneur.**
Diaspora entrepreneurs/ Transnational	Diaspora entrepreneurship is the study of ethnic ties in new venture creation or venture growth; while transnational	Diaspora Although the term "diaspora entrepreneur"

entrepreneurs	entrepreneurs is defined as entrepreneurs that migrate from one country to another, keeping business links with both countries.	has not been widely used, it would seem that scholars are moving towards using this term to identify entrepreneurs migrating from one country to another to start and grow businesses. Transnational Chen and Tan (2009); Rogerson and Mushawenhuka (2015)

Lans *et al.* (2014) askes the question if agricultural entrepreneurship is different from entrepreneurship in non-agricultural firms? They continue to assert that there are many similarities but also some differences. The agricultural entrepreneur is restricted by his geographical location and many opportunities such as market access, water, infrastructure and support frameworks provide challenges because of the distance of markets, water sources and infrastructure and support mechanisms. This is especially true in a rural agricultural context.

The above table can be linked to characteristics that might be found in entrepreneurs. Many authors have addressed typical characteristics of entrepreneurs (Cunnigham & Licheron, 1991). In general there is a distinction between *psychological traits* (as less transferable attitudes), or *talents or virtues* (like high self-esteem, risk-taking attitudes), versus more transferable skills in the management of business activities and running an enterprise. Various authors, including Bull and Willard (1993), Jennings (1994), Timmons and Spinelli (2004) and Etemad (2004) have mapped out this theory development and elaborated on many crucial elements of entrepreneurship.

Table 3 depicts the characteristics that can be found in an entrepreneur and the majority of these characteristics are to be traits that can be learned.

TABLE 2.3: Characteristics of entrepreneurs

Psychological traits	- High need for achievement [1, 10, 11, 16, 18] - Autonomy and dominance; desire for independency [2, 10, 11] - Internal locus of control [10, 12, 18] - Tolerance for ambiguity and uncertainty (risk taking) [3, 10] - High propensity for risk taking [4, 18] - Adaptability and flexibility [5, 11] - High self-esteem, self-confidence, self-assurance [6, 7, 10, 11] - Creative, innovative [8, 10, 11, 13, 15, 16, 17] - Opportunity recognition, responsiveness, alertness [9, 10, 11, 13, 15,16, 17]	
Skills	- Management skills such as planning ahead, organising, control, experience and leadership [8, 10, 11, 13, 17, 19] - Operational skills such as administration, finance, marketing, logistics, human resources [8, 10,11, 13, 17, 19] - Technical skills [17, 18]	- Good human relations skills, such as communication [13, 10] - Adjust to sector's value systems [15]
Process	- Create a vision and direction [13] - Finance the enterprise [13] - Good organisers; gather resources such as finance, labour [8, 11,13, 18]	- Planning for expansion and growth, addressing market risks [8, 13] - Planning for competing in the market [8, 13] - Creating networks, such as business, social and international networks [13]
Outcome	- Wealth creation [10,13, 14] - Business growth [10, 11,14]	- Employment, community welfare [10, 13, 14]

References: [1] McClelland, 1961 [2] Brush, 1992 [3] Schwartz, 1979 [4] Hisrich and Brush, 1987 [5] Buttner and Moore, 1997 [6] Cuba et al., 1983 [7] Rosa et al., 1994 [8] Drucker, 1985 [9] Kirzner, 1999 [10] Timmons and Spinelli, 2004 [11] Van Aardt and Van Aardt, 2007 [12] Jennings, 1994 [13] Etemad, 2004 [14] Nieman et al., 2007 [15] Cunnigham and Licheron, 1991 [16] Schumpeter, 1936 [17] Peterson, 1985 [18] Bull and Willard, 1993 [19] Robbins and De Cenzo, 2006

Adapted from: Ras et al., 2009

2.2.5 Entrepreneurship in South Africa

In South Africa, entrepreneurs are categorised into several groups according to scale of income.

TABLE 2.4: SMME's in the South Africa agricultural environment

Category of SMME	Description	Total full time paid employees less than-	Annual turnover less than-	Total gross asset value less than-
Survivalist	Operates in the informal sector of the economy. Mainly undertaken by unemployed persons. Income providing minimum means to keep the unemployed and their families alive.	No employees	Below poverty line	Little capital invested; No assets
Micro	Usually owner and family operated. Informal – no license, formal business premises, labour legislation Turnover below the VAT registration level of R300 000 per year. Potential to make the transition to a viable formal small business.	1-5 employees	R150 000	R100 000 (Fixed property excluded)
Very Small	Part of the formal economy, use technology.	Up to 10 employees	R400 000	R400 000 (Fixed property excluded)
Small	More established than very small enterprises, formal and registered. Mostly still owner managed.	Up to 50 employees	R2 million	R2million (Fixed property excluded)
Medium	Still mainly owner managed, but decentralised management structure with division of labour. Comply with all formal requirements.	Up to 120 employees	R4 million	R4million (Fixed property excluded)

Adapted from the National Small Business Act (1996)

But an understanding of what entrepreneurship, and who an entrepreneur is may not be fully appreciated by reading the figures of their turnovers obtainable only after the close of a business year. This is because turnover is an end product of varied efforts and complex processes of entrepreneurial engagement. Turnover is like a statement of financial position, it does not tell the important stories behind the final figure. A far more informed understanding of entrepreneurship can be obtained by a methodological process that asks what entrepreneurs do, rather than what they get.

Another way of classifying entrepreneurs is to consider entrepreneurial experience. Such typology is useful in that it demonstrates the influence of experience in entrepreneurial processes. Experience is part the human capital package but its importance is rarely given weight in academic publications. Smallholder entrepreneurial ventures are often an extension of a family or individual's practices of farming which they use as a livelihood activity. Hence an analytic approach that pays attention to narratives about how farmers accumulated their entrepreneurial experiences has significant potential to unravel more insights about smallholder entrepreneurship. Unlike other entrepreneurs such as arbitrageurs, small holder farmers largely accumulate their skills through informal learning and access resources using social networks. Table 2.5 classifies entrepreneurs according to their varied levels of experience.

TABLE 2.5: A typology of entrepreneurs according to experience

Entrepreneur type	**Character of experience**
Nascent	Those seriously planning to start a business
Novice	Those with no prior experience of founding a business
Habitual	Those that had established at least one or more businesses prior to starting up the current venture
Serial	Who found, disengage and establish further businesses
Portfolio	Who retain the business that they inherited, found or purchase

Adapted from Chell (2008)

But what these typologies fail to do is to show the role of motivation, aspirations and goals in entrepreneurship processes including opportunity identification, venture establishment, exploitation and growth. Jenking and Johnson (1997) attempt to address this gap. They look at entrepreneurship from a standpoint of intentions, thereby making the concept of intentional behaviour a central part of their analysis. They emphasise the relationship between intentions and outcomes in entrepreneurship. Using this approach, the authors put entrepreneurs into four groups according to their intentions (Table 2.6).

(i) Entrepreneurial intentions are inferred where the entrepreneur has explicit desire to grow their enterprise
(ii) Entrepreneurial outcomes are inferred where the entrepreneurial venture has realised increased growth in sales and profit over a period of five years
(iii) Non-entrepreneurial intentions are inferred where the entrepreneur has an explicit desire to stabilise performance of the business

(iv) Non-entrepreneurial outcomes are inferred where the business venture remains stabilised over a five year period

TABLE 2.6: Typologising entrepreneurs by intentions and outcomes

Entrepreneur	Intentions and Outcomes
Unrealised Entrepreneurs	Those with entrepreneurial intentions but non-entrepreneurial outcomes
Realised Entrepreneurs	Those exhibiting entrepreneurial intentions and entrepreneurial outcomes
Realised Non-Entrepreneurs	Those showing non-entrepreneurial intentions and non-entrepreneurial outcomes
Emergent Entrepreneurs	Those with non-entrepreneurial intentions but demonstrate entrepreneurial outcomes

While unrealised entrepreneurs demonstrate a coherent strategy (talk the talk), emergent entrepreneurs focus on internal operations such as efficiency, and while they had no real entrepreneurial aspirations, their efficiency made them successful. Realised entrepreneurs on the other hand focus on both coherent strategy and internal aspects of business operations. Realised non-entrepreneurs focus on personal outcomes but focus on both internal and external issues, and realised entrepreneurs emphasise organisational outcomes.

This analysis underscores the importance of considering aspirations or goals in entrepreneurship and how these impact on enterprise performance over time. Aspirations and goals often get to be ignored or omitted in exercises that seek to typologies entrepreneurs. Often times scholars tend to focus on predictive indicators such as psychological traits and economic factors such as resource distribution and exploitation of capitals alone. This analytic frame facilitates a linkage between intentions (aspirations), context (socio-economic structural organisation) and outcomes. Such an approach bears valuable relevance in analysis of smallholder farming which is often not only an entrepreneurial venture but necessarily a culture of livelihoods that some farmers grow into a business venture in response to different triggers that include necessity (survivalist) and opportunistic (desire to exploit and opportunity).

2.2.6 Small, micro and medium enterprises in South Africa

The informal sector includes some SMME's, such as survivalists, micro and even very small enterprises. The SMMEs sector largely encompasses businesses that do not adhere to legal requirements, standards and procedures. The effect is that their contribution is not easily determined and may lead to a lack of necessary support intervention. However, this sector contributes significantly to especially local economies. Micro and very small businesses offer job opportunities on small holdings, as well as extended opportunities because of the distribution channel it creates. This ensures critical economic opportunities for the poor and the opportunity to learn skills that can later be applied in the formal sector. Over the period 2008 to 2014, employment

levels in the informal sector stayed in the vicinity of 2,4 million people (up 13 000 jobs), with the youth and women evident as the biggest unemployed groups (StatSA, 2015). Although workers in the informal sector typically earn less income, that is not long term guaranteed, the sector provides employment and revenue income opportunities specifically for women. The importance of the informal sector and small business entrepreneurs can therefore not be over emphasized.

However, as is evident from the Global Entrepreneurship Monitor (GEM) report, South Africa is not succeeding in creating and maintaining high levels of entrepreneurship. The GEM report analyses the level of entrepreneurship of different countries. This is done through surveys and interviews, of which the result is widely accepted as relevant for comparison purposes. The main indicator is Total Early Stage Entrepreneurship Activity (TEA), which determines the percentage of working age populations that is about to start up entrepreneurial activity or have started one in the last three years (early stage entrepreneurs).

South Africa's rate of entrepreneurial activity is very low for a developing country. The GEM report for 2014, indicated that the percentage of adult South Africans involved in entrepreneurial activity dropped by 34% from 2013 to 2014. Reasons for closing down include lack of finance and poor profitability. This is in addition to a fall of 6.97% of adults involved in a business that are less than three years old. The report indicated that conditions to enhance new business creation have deteriorated. As reasons, the report lists the country's poor ratings on government programs, primary educations, restricting regulatory environment and strict labour legislation. South Africa performed below other BRICS countries and showed the highest failure rate (GEM 2014).

Statistics South Africa (Stats SA) conducted an audit of agricultural statistics in 2009 that found smallholder and subsistence agriculture are significantly constrained by lack of information. This led to the inclusion of agriculture related questions in the Population Census of 2011 and a subsequent publication in 2013 on agricultural households (StatsSA, 2011). The report covers all types of agriculture including subsistence, smallholder and commercial activities. According to the report, 2, 9 million households (20%) were involved in agriculture, with the agriculture industry contributing 2,2% to the country gross domestic product (GDP) and a contribution to employment of 5,2%. The contribution to employment shows the importance of this sector and the need to give attention to the growth of the agricultural industry in South Africa.

2.2.7 Entrepreneurship in smallholding irrigated agriculture

Small farmers are an essential part of the South African community and have an important function to provide food to the less than privileged. Taking into account that South Africa has 20,2% of its population in extreme poverty and 45,5% in moderate poverty which is extremely high when combined (South Africa, 2012), their market function cannot be ignored. According to the Department of Agriculture, Forestry and Fisheries (South Africa 2012), declining agricultural performance is a major driving force behind growing poverty among African smallholder farming

populations, and its recovery offers the greatest prospects for rural populations to escape out of poverty.

A reality for South African smallholder farmers is that challenges faced are not easily overcome by most participants in a subsistence economy. Challenges for smallholder farming stem from past political inequalities and include access to water (South Africa is a water scarce country), lack of sizable land (limiting growth opportunities), poor quality soil (due to geographic location and lack of agricultural training and mentorship), no financial resources to expand (insufficient cold storage, capital assets such as tractors and ploughs), expensive labour costs, access and transport to markets, inadequate support from government, poor infrastructure, lack of training and farming knowledge. All these constrain entrepreneurship performance and growth of smallholder and subsistence farmers.

Although many smallholders function on a subsistence basis, only providing for themselves and their families, easier access and transport to markets may present an opportunity for growth and a focus on expansion on entrepreneurial activities. In South Africa, about 99% of food is produced by 3% of farmers and distributed by four retailers that control 55% of the food retail industry (Chikazunga, 2012). Access to markets is thus clearly a problem for smaller agricultural participants such as smallholders. Food growers in South Africa have three different formal markets that include exporting produce, retail contracts and fresh produce markets (FPM). Informal markets relate to food stalls used to distribute produce from farms. Large and medium business focus primarily on formal markets for the distribution of their produce. Small business owners do not have the same luxury of ensuring certification and compliance required for exporting or providing to local retailers bent on compliance with existing standards.

Exporting agricultural produce requires compliance with not only the GlobalGap, but also private business standards. South African standards such as HACCP always need to be complied with. This also requires certification, which has a cost implication. Local retailers have in recent years also become more and more conscious of consumer concern and compliance requirements has increased with regards to food safety and sustainability practices.

Commercial farmers (farms set up with the primary goal of creating a profit) have as first priority exporting their produce especially to European markets. Such farmers have the knowledge and resources to bargain good prices with retailers and enter into contracts with international market agents. However, reality demands that an alternative market is available for all produce not contracted for. These produce competes then with the produce of smaller business on FPM.

The FPM is a system uniquely South African. It functions purely on supply and demand. Fresh produce markets exist as municipality or private markets in a fair amount of cities and even rural areas throughout South Africa. A farmer takes his/her produce to an agent working at the market, trusting the agent to ensure the best possible price. Produce ownership does not transfer to the agent and the farmer is free to use any agent of his choice. The agent often accepts all produce no

matter its quality or packaging. Various agencies with their own appointed agents functions at each market, ensuring competition between agencies. Agencies are allocated an amount of space on the sales floor directly related to sales of the previous year. It is thus essential for the agent to build a trust relationship between himself and the farmer to ensure that the right produce of the right quality will be allotted to him in order to satisfy the various buyers. Such relationship is built over years and coveted by agents and farmers alike. This system thus ensures that both big and small farmers can sell their goods as the buyer ultimately decides on what they want.

Other markets that smaller producers can interact with are *House wives* markets or Spaza shops. *House wives* markets typically buy bigger farmer goods as they are in many instances clearly marked, comply with packaging requirements and looks to be good quality, while Spaza shops (small informal traders) and street traders typically buy produce from small farmers as their products are affordable. A perfect example of supply and demand forces in a perfect market condition.

Lack of sufficient land and water, does inhibit potential for small holders but does not mean they cannot improve their entrepreneurial skills. One agent made a comment that the small farmers in many instances produce good quality, just not in good quantities. The agent went on to state that that although quality is always important, funds are the determining factor at the market. The reality is that agents mostly accept produce, no questions asked. This goes a long way to ensure no barriers to entry.

Large commercial farmers provide mostly to formal markets, including FPM's. This implies that they compete with small farmers in terms of produce in a market that is not defined in terms of certification but by demand and supply. The quality of the small holder can end up to be of a better quality than that of the commercial farmer, as the commercial farmer often selects the best produce for the export market, the next best goes to local wholesalers and the rest to the fresh produce market. A fresh produce market functions solely on the forces of demand and supply and in that case a large commercial farmer has to take the price that has been set on the market. However there are times when a decrease in price does not translate into more products been sold. This happens when the market is flooded or on market timing.

The demand for natural foods has taken centre stage in the food economy. The global food and energy crisis have put a bigger spotlight on the need for sustainable food production and consumption systems (Chikazunga, 2012). This market share has not been measured, but does present various opportunities for smallholding farmers. A South African food producer thus needs to grow fruit and vegetables, using environmental resources efficiently by reducing waste and use of chemicals and also ensuring good working conditions and even uplifting of employees and surrounding communities. Linking sustainability with the production of food is clearly attainable if a model can be developed to bring the small growers in line with the example of bigger farmers. Smallholder farmer development needs to play a key role in growing the farming sector and creating jobs in South Africa (NDP, 2011).

2.2.8 Smallholder exclusion and systemic challenges

The case for investment in smallholder farming activity holds that a diverse set of smallholders are capable of high productivity and rejects simple stereotypes of large-scale and small-scale farming systems. Initially argued by Kirsten and van Zyl (1998) this is supported by more recent international work which highlights the potential of particular economies-of-(small)scale that can be uniquely exploited by smallholders (Christen & Anderson, 2013). Diversity in social-class, resources, capabilities and ways of farming are seen to be important in understanding these opportunities. Responses to promote smallholder agriculture must therefore acknowledge diversity and respond accordingly (van Averbeke *et al.*, 2011; Cousins, 2013; Van Averbeke & Denison, 2013; Perret, 2002).

The optimistic view of smallholder farmer development is contested in fields of land reform, water reform and agrarian reform. Smallholder development is criticised as being unviable or extremely difficult at best, given multiple constraining factors that include scale, sophistication, market exclusion, macro-economic agricultural decline and institutional weaknesses (Sender, 2015; Vink & Van Rooyen, 2009, Cousins, 2013; Movik, 2012). Available data on the minimal contribution of smallholder farming in the national context supports this view: "…none of these statistics point to any signs of dynamic capitalist development from below or of the emergence of a new class of productive capitalist farmers from the ranks of smallholders" (Sender, 2015:15). Sender argues that what is needed is to respond where there are local underutilized agricultural resources in a re-directed capitalist drive, where government: concentrates on crops which are wage-labour intensive; follows corporate agricultural production trends; progressively increases the minimum wage; and makes strategic institutional interventions in the food-value chain to make food cheaper for poor households. While Sender (2015) makes no attempt to explain how one might move to consolidate many small portions of arable land held with family rights (under communal tenure) for such corporate-driven massification without prompting major social and political upheaval, it is argued that in this way, women will increasingly be able to escape poverty through the empowering reality of wage-labour, rather than attempting to earn an income from a small plot (Sender, 2015).

The NDP (2011), while agreeing on the realities of multiple systemic constraints, is more optimistic. The Commission argues for massive investment in small-scale commercial farming with a comprehensive and multi-faceted strategy to address the multiple limiting factors and thereby achieve inclusion of smallholders into the mainstream agricultural economy. In this, the primary emphasis of the NDP (2011) is on smallholder *irrigation development* which is a central foundation of the rural development agenda (NPC, 2011). Cousins (2013), while concurring with the views of Sender and the NDP on macro-economic constraints and systemic exclusion of smallholders from markets, still maintains a positive view of smallholder potential. While Sender (2015) argues that smallholder success is simply impossible, and the NDP (2011) argues to the contrary with a multi-faceted strategy to deal with diversity, Cousins' (2013) optimism has an important caveat. He argues that success for smallholders (at a national scale) seems unlikely without fundamental re-structuring of the exclusionary capitalist framework within which smallholders operate in South Africa. It can thus be seen that while there is agreement that smallholder irrigators face a raft of systemic

exclusionary factors in the wider agricultural and economic system in South Africa, the solutions to deal with these are unclear and contested. In an entrepreneurial framework, these major uncertainties and exclusionary realities bring high levels of risk and consequently cost to the small-scale farming business.

2.2.9 Conclusions

This section does not attempt to provide a predictive model of entrepreneurial behaviour, nor characteristics of entrepreneurs. It aims to provide a theoretical explanation of how entrepreneurs and entrepreneurial processes project themselves to the outside world, and hence provide an analytical argument within which to explain the multiple cases of what smallholder irrigation farmers do at the two research sites and in other contexts of similar characteristics in South Africa and widely. However, space limitations confine our engagement with existing literature to a very basic level; hence the resultant analytic argumentation may be fairly elemental. However, the overview is wide enough to demonstrate how diverse the research community is with regards their understanding of the concept of entrepreneurship.

In this work, the concept of entrepreneurship is understood as synonymous with growth (expansion/intensification) of the business (sell to market for profit). Entrepreneurial processes that manifest in intentions (aspirations and goals), identification of opportunity, mobilising resources (access to capitals) and outcomes define entrepreneurship. But all these processes take place within a regime of rules, legal regulations and policies (structural arrangements). Co (2006) provides an insightful synthetic definition which he arrives at combining various definitions. The author states that an entrepreneur can be defined as someone who identifies a need in the market and develops products and services by making decisions about bringing resources together (raw materials, financial and human resources) to satisfy that need. The entrepreneur takes risks in doing this and is rewarded with the profits of the business. However, this definition does not cater for those who do not consciously (aimingly) identify a market opportunity, but rather are forced (without a sense of conscious aiming) by extreme survival needs to supply a good or service, only to discover later that there is a market opportunity. And some of these forced entrepreneurs create their own opportunities instead of discovering existing ones. This is a typical narrative among smallholder farmers whom sometimes get forced into entrepreneurship by extreme poverty conditions. Typically, survivalist entrepreneurs start enterprising when all other means of generating an income, including finding a job, have failed.

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Chapter 3 METHODS AND MATERIALS

3.1 Selection of research sites

The Terms of Reference (TOR) of this project required that research be conducted on two irrigation schemes in two districts in Limpopo, along with a focus on adjacent home-gardeners. The project is aimed at identifying development paths for *increased* water use productivity and the *expansion* of irrigated crop production and a third group comprising independent irrigators was added. As explained in Chapter 1, this group of the smallholder irrigation sector was considered to merit at least equal attention in the research effort. Thus the site selection was guided by the need to include home gardeners, farmers on 'schemes' and independent irrigators in settings where other factors are reasonably homogeneous, in two Limpopo districts.

In order to locate relevant sites with rich information, a screening exercise of irrigation schemes was conducted. Irrigation schemes were the anchor point of the study with home-gardeners and independent irrigators selected from the surrounds. Typologies of South African smallholder irrigation schemes that would assist in a scoping exercise were reviewed but were found to be outdated. The most recent of these by Perret (2002) and Bembridge (2000) are similar to each other but have been superseded by major program interventions of the last 15 years. One reason is that the Agricultural and Rural Development Agency (ARDA) which played a key role in irrigation management in Limpopo has since disappeared. Programs such as Water-Care, RESIS and RESIS Recharge in Limpopo, and the national land-reform programme also changed key defining factors. These more recent programmes had impact on land-holding patterns, farmer level institutions, the nature of the infrastructure and in some cases led to imposed contract farming relationships (van Averbeke & Denison, 2013). To facilitate selection, the available scheme typologies were updated based on an unpublished census survey of all smallholder schemes in Limpopo in 2010 by the authors. This was used to assist scheme selection. It includes a reference to the type of farming that can be accommodated on a particular scheme, historical origins, technology type and management structure. Type of farming was seen to be important in categorising schemes and was included in the amended scheme typology, informed by van der Ploeg's three dominant modes of farming (van der Ploeg, 2008) summarised below:

- **peasant farming** is characterised by the primary intention of strengthening the (family) agricultural resource base in a context of deprivation, where income is only one of motivations for farming – others being own consumption and investment in social linkages, family reproduction in the long-term and livelihoods resilience more broadly. Peasant farmers have limited appetite for risk, which informs farming decisions, and they aim for reduced *dependence* on external markets.

- **entrepreneurial** farming is characterised by full market engagement with the primary purpose of generating profits, and therefore with high market (i.e. external) dependency

and related high risk. Entrepreneurial farming can be called 'business' farming in the context of this project as the emphasis is on the individual (i.e. individuals in business farming) and excludes corporate farming (corporates in business farming).

- **corporate** farming, which is farming at a large scale, often financed by venture capital within a web of interlinked agri-enterprises. Corporate farming is not of primary interest in this study other than in a contextual sense.

There is substantial diversity in the role that farming plays within peoples' livelihoods linked to their resource availability, their interests and aspirations, their capacity to absorb shocks, and their alternatives for survival. The project was mostly interested in the schemes where *entrepreneurial* farming takes place. Schemes dominated by corporate farming were not of interest given the absence of entrepreneurial focus. Peasant farming however remains of interest, as this does not exclude the potential for exploitation of opportunities in external markets so long as these initiatives do not threaten the autonomy of the farming system by being perceived as too high a risk. The updated scheme typology shown below. This is annotated with a descriptor in parenthesis showing which of van der Ploeg's farming categorisations prevail on the schemes.

1) **Gravity-fed canal schemes**: typically constructed between 1950 and 1975 and comprising simple, robust diversion weirs, canals, with furrow irrigation infield. (both *Peasant* and *Entrepreneurial* farming)
2) **Modernisation schemes: Pumped smallholder schemes**: these comprise technically intensive irrigation systems, dams developed in the mid-70's and 80's. (mainly *Corporate* farming)
3) **RESIS-recharge schemes:** the RESIS Recharge programme intervention was based on an industrial agriculture model, or 'corporate' farming, where the scheme is leased out. There is little involvement of plot holders and profit-share is typically small and contested. (mainly *Corporate* farming)
4) **Ex-homeland estate cooperatives:** former parastatal estate irrigation schemes primarily growing orchard crops (mainly citrus, bananas, litchis, mangos, avocados) transferred to Communal Property Associations (CPAs), or Tribal Authorities. (mainly *Corporate* farming)
5) **Individual business farmers:** individual irrigators operate on a variety of landholding arrangements. These are individuals, who or are self-motivated independent farmers on 5-20 ha farms. (mainly *Entrepreneurial* farming).

The Terms of Reference required that the research be conducted on two schemes in Limpopo, looking specifically at entrepreneurial pathways, in a context of individual enterprise, expansion and intensification. The two types of schemes that are then a priority for the study are Type 1 (gravity-fed canal schemes) and Type 5 (individual business farms). These are where entrepreneurially motivated farming is found though represented in different ways, sometimes in lower-risk, less externally dependant modes of farming (peasant), and other times higher-risk business farming approaches by individuals (entrepreneurial).

Limpopo Province has the highest number of irrigation schemes in the country (between 129 and 183 depending on how a scheme is defined in size and type, (Denison and Manona, 2007) and which are found mostly in Vhembe, Sekhukhune, Capricorn and Waterberg districts. Two study sites in two districts were to be selected where each of the three farmer populations are located sufficiently close to each other. This aimed to ensure that they shared as many possible contextual factors as possible, including, agro-ecological factors, language and other cultural attributes, economic opportunities other than agriculture, farming practices and traditions, and distance to markets. The site selection process considered the kinds of schemes in Limpopo and their relationship with the type of farming and the livelihoods mix of farmers. In view of the project emphasis on understanding entrepreneurial development pathways which are facilitated by strategies of intensification and expansion, five schemes were selected as being of particular interest. Each study area is 'anchored' by an irrigation scheme.

3.1.1 Irrigation sites of interest

Five irrigation schemes were selected and assessed based on the criteria on Table 3.1 over the page. The selected schemes were Dzindi, Julesburg, Mashushu, Tsatane and Steelpoort irrigation schemes shown on Map 3.1 below. Summary characteristics are shown in Table 3.2.

MAP 3.1: Five irrigation schemes considered for research purposes

3.1.2 Selection criteria

The most suitable irrigation schemes for study sites were selected on the basis of the following criteria.

Table 3.1: Criteria for research site selection

1.	***Prior working relationships*** *– trust with key organisations and individuals.* While not a pre-requisite for constructive engagement, good prior working relationships between team members, extension officers, local NGOs and communities facilitates project progress. Where good relationships are in place: these significantly reduce the start-up time with the community; engagement is built on a platform of trust; the risks of unexpected community situations arising is reduced because both 'parties' are known to each other; and the team is able to assess local dynamics more accurately and thereby better manage expectations.
2.	***Availability of information*** *– baseline, demographics and studies* Research effort is substantially enhanced where existing information is substantive and available. This may be contextual, in the form of other projects or work in the area, or it may be targeted research with relevant baseline data that can both inform and enrich the present study. The availability of substantial, locally relevant information and data, prior to this initiative, would add value to the outcomes.
3.	***Logistical considerations*** *– travel costs, safety, local accommodation* Travel distances and travel time significantly impact on budget. Sites close to key team members are quicker and easier to respond to than distant sites, and can be visited more often with a set travel budget. The intention is also to establish local accommodation at each research site to facilitate as much field time as possible, but in a way that local accommodation costs are minimised. Willingness of the community to facilitate local accommodation and practicalities thereof have bearing. Safety of team members, particularly women who will at times need to work alone in the field, is essential. While safety cannot be guaranteed to anyone anywhere, risks need to be realistically considered and mitigated.
4.	***Technical feasibility*** *Existing agricultural activity and production:* The project aims to get insight into the intensification and expansion of entrepreneurial farming – both in irrigated fields and in home gardens. There is little point engaging in this assignment with a weakly functioning scheme or with people who have little interest in agricultural production. *Organised community structures:* Local dynamics can undermine external initiatives – be they research or developmental in nature. Stable communities are easier to engage with and present lower risks of problems. *Willingness:* It is essential that local people are willing to participate in the research process, particularly as this initiative engages within power dynamics within the household, and the broader community.
5.	***Relevance and contribution to development*** There is specific interest in the evolution of livelihoods through entrepreneurial agricultural activity. The context of the research site must reflect a wider development situation for which solutions are being sought through this assignment.

TABLE 3.2: Summary characteristics of study sites of interest

	Dzindi	Mashushu	Steelpoort	Tsatane	Julesberg
Scheme typology	Gravity-canal scheme	Gravity-canal scheme	Gravity-canal scheme	Business (pumped)	Business (gravity)
Scheme:					
GPS coordinates:	S: 23° 01.324" E: 30° 26.134"	S: 24° 07.020" E: 30° 07.088"	S:24 ° 53.616" E: 30° 00.678"	S: 24° 38.426" E: 29° 56.184"	S: 24° 05.200" E: 30° 18.489"
District	Vhembe	Capricorn	Sekhuhkune	Sekhukhune	Mopani
Distance to town	Thohoyandou (13 km)	Polokwane (120km)	Burgersfort (65km)	Burgersfort (80 km)	Tzaneen (35 km)
Size	106 x 1,28 ha = 136 ha	40 ha	69 ha	6 x 10 ha each	48 x 5 ha each
Irrigation method	Gravity- short-furrow	Short-furrow	Gravity & pumped	Pumped sprinklers	Gravity & pumped
Main crops	Vegetables / maize	Vegetables / seed-maize/ coriander	Vegetables / maize	Vegetables	Vegetables
Farming typology					
Irrigators on scheme	Peasant / business	Peasant / business	Peasant / business	Business (individuals)	Business (individuals)
Vicinity of scheme	Business close by (yes) Food-gardeners	Business close by (unknown) Food-gardeners	Business close by (yes) Food gardeners	Peasant close by (yes) Food gardeners	Thabina canal scheme Food gardeners
Selection criteria					
Suitability for study	High	High	High	High	High
Prior relationships	High (fieldwork ongoing)	Med (fieldwork ongoing)	Med (fieldwork ongoing)	Low	Med
Willingness to participate	High	High	Med	Med	High
Availability of information	High	High	High	Low	Low
Logistical considerations	Low	Med	Med	Med	High

Assessment of site suitability was made qualitatively based on site visits to schemes and other available information.

3.1.3 Discussion of site suitability

Dzindi Irrigation Scheme is located in the Thulamela Local Municipality of the Vhembe District and is close to the major urban centre of Thohoyandou. People farm with different purposes in mind, covering the full range between food farming (subsistence) to entrepreneurial business-oriented farming with a predominance of cash-crops. The TUT team has long-standing relationships in the area and substantial baseline information is available. Independent irrigators are known to operate in the vicinity, and along with home-gardeners would provide an appropriate set of the three populations of interest. Dzindi has the substantial advantage of strong prior working relationships with the TUT team and a bank of available information which would provide depth to the research findings.

Tsatane is a collective of individual farmers with their own pumped irrigation systems from a shared watercourse, close to Steelpoort Irrigation Scheme in Sekhukhune District. Tsatane farmers are independent farmers selling high-value horticultural crops to external markets. They work at substantial personal risk and make significant investments from their own resources for all farming operations.

Steelpoort Irrigation Scheme has farmers with mixed-purpose farming, both business and producing for own food. Together Tsatane and Steelpoort would cover both the scheme and independent irrigator categories. At the time of the site selection, Steelpoort scheme farmers were the subject of another research study which may have had implications on participation, or potentially confuse the research effort and community relationships.

Julesburg comprises similar farmers to Tsatane in terms of scale and marketing approach. But Julesburg is a scheme, where farmers share the water supply infrastructure, and Tsatane is a group of adjacent individual irrigators sharing one watercourse. Julesburg farmers engage with local and distant cash-markets and are farming at a relatively larger scale than typical smallholder schemes (5-10 ha vs 1.5 ha). In the area there are also a number of flood-irrigation schemes and independent irrigators. The irrigation scheme, surrounding independent irrigators and the homesteads in adjacent villages would then adequately cover the 3 populations. Julesburg is easily accessible from Tzaneen and the farmer association showed willingness to host the research effort.

Mashushu scheme is one of a small set of canal schemes located in the upper catchments that is remarkable because they have maintained full productivity and integrated a peasant mode of farming, with production of maize, vegetables, mangos for local trade, while engaging with safer distant markets periodically. At Mashushu this is in the form of seed-maize and coriander, depending on their own risk-assessment of prices each year. Based in the upper catchment of the forested northern Drakensberg, water security is high but location is relatively remote. The presence of individual, independent irrigation farmers is likely but not confirmed.

There is no compelling reason, from a research perspective, to reject any of the above five sites and all are found to be suitable, though some better than others. Dzindi was particularly favourable

given the prior relationships and extensive background information. Julesburg was also particularly favourable given the unusually large typical plot size (5-10 ha) versus more usual 1.5 ha on flood schemes. This is of interest given the entrepreneurial and business emphasis of the study. Given that Dzindi was an older gravity-furrow scheme (with smaller plot sizes), it was decided that Julesburg, with its larger plot sizes (5-10 ha) and more distant marketing emphasis would be the most suitable second research site. The proximity to Tzaneen and ease of access for fieldwork logistics was an additional positive factor.

The **Dzindi** and **Julesburg** Irrigation Schemes were thus selected as the anchor-sites for the study, with adjacent homesteads and surrounding independent irrigators identified following this decision. The main characteristics of Dzindi and Julesburg, the anchor schemes for the study are shown in Table 3.3.

3.1.4 Research site descriptions

Dzindi in Thulamela Local Municipality (Vhembe District) and Julesburg in Greater Tzaneen Local Municipality (Mopani District). The home food gardeners are located in the immediately adjacent villages which have a direct relationship with the scheme in some way. The independent farmers were located within the local municipality. The nomenclature adopted for the study in relation to the two sites is:

- ***Thulamela Site*** – comprising Dzindi scheme irrigators, home-gardeners from the adjacent settlements of Manamani and Itsani, and independent irrigators within the local municipality.
- ***Greater Tzaneen Site*** – comprising Julesburg scheme irrigators, home-gardeners from the adjacent Rhulani Village, and independent irrigators within the local municipality

The irrigation schemes at the two research sites are diverse in numerous aspects, historical, infrastructural, land-holding, etc. For example: plot sizes at Julesburg are sizeable irrigation farms (5-20 ha) vs Dzindi 1 ha; both enjoy gravity supply but Dzindi is furrow and Julesburg piped-sprinkler; the dominant marketing approach at Julesburg is impacted by surrounding commercial farms and they package and sell afar to Pretoria while at Dzindi sale in adjacent Thohoyandou dominates. While detail of people's livelihoods, agricultural practices and scheme dynamics is presented in the chapters that follow a summary of key scheme characteristics is set out in Table 3.3 to provide initial context.

Maps of the schemes and their localities are included in Appendix 4.

TABLE 3.3: Summary status of Dzindi and Julesburg schemes

	Dzindi	Julesberg
Scheme type	Gravity-canal scheme	Gravity-piped sprinklers
Coordinates	S: 23° 01.324" E: 30° 26.134"	S: 24° 05.200" E: 30° 18.489"
District	Vhembe	Mopani
Local Municipality	Thulamela	Greater Tzaneen
Distance to town	Thohoyandou (12 km)	Tzaneen (35km)
Neighbouring village	Manamani (489 HH) and Itsani (Block 3) (405 HH)136 ha	Rhulani Village (900HH)
Scheme Size	Gravity/Short-furrow	240 ha
Irrigation method		Gravity sprinklers and furrow irrigation (mixed)
Farming overview		
Main crops	• Maize (*Zea mays* L var. *indentata*) • Chinese cabbage (*Brassica rapa* L. subsp. *chinensis*) • Nightshade(*Solanum retroflexum* Dun.) • White cabbage (Brassica *oleracea* L. var. *capitata*)	Okra Green beans Green maize Other mixed veg (occasional)
Irrigators on scheme	subsistence/ peasant/business (typically 1 ha)	Business (individuals) (typically 5 ha)
Vicinity of scheme	Food-gardeners in Itsani village	Food gardeners in Rhulani village
Marketing	Own-use and local sale to Thohoyandou hawkers	Primarily on-site packaging to Pretoria Fresh Produce market

Irrigation Assets	Dzindi	Julesburg
Soils	High-value deep red soils (75%)	High-value deep black and red soils
Fencing	Poor to absent	Poor or absent
Water infrastructure	Canals – 62 years old and degraded with high losses. Major issue for future sustainability	Gravity pipeline, approx 40 years old, degraded and leaking badly. Key issue for future sustainability.
Water source reliability	Diversion weir in river: unreliable and seasonally fluctuating. Competition with peri-urban users abstracting from canal is increasing along with washing-soap and plastic pollution issues.	Supply from Tours Dam which also supplies 2 other irrigation schemes (Solani and Tours) and regional domestic schemes. Supply to scheme is reliable from a source perspective.
Land access institutions	Farmers have user rights via irrigation tenure system formalised in Permission to Occupy certificates. Invasion of agricultural land by peri-urban informal settlement (Shayandima) is a threat to farmers on the scheme periphery.	Farmers previously had annual rights only, but mobilised in 2012 and obtained Permission to Occupy certificates. The legal validity of these is questionable in the new dispensation.
Water management institutions	Farmers work collectively within the Dzindi Irrigation Scheme Committee with explicit rules on water management and apportionment, based on revisions of the original rules that prevailed prior to cessation of homeland rule.	Farmers obtain water readily, albeit via the dilapidated pipeline. There is little need for collaboration around water supply, although ad-hoc responses for repairs and connections are coordinated as needed by the Julesburg Farmers Association.
Farm infrastructure	Farmers have a broiler production unit and a large shed off-scheme. The shed is rented out to a waste-processing enterprise	The original scheme office is completely dilapidated and is dysfunctional. Association meetings are held under trees outside of the office. No storage or other farm infrastructure

3.2 Study Design

The study was conducted using a case study design. This is "an empirical inquiry that investigates a contemporary phenomenon within its real-life context when the boundaries between phenomenon and context are not clearly evident, and in which multiple sources of evidence are used" (Oosthuizen *et al*., 2005: 71). It allows for the combining of quantitative and qualitative methods in an investigation of a single assignment. However, and perhaps because of this, the academic community continues to define case study design in multiple ways. Eisenhardt (1989) describes case study as a research strategy intended at developing an understanding of the dynamics within a single setting. Darke, Shanks and Broadbent (1998) refer to case study as an empirical enquiry that investigates a contemporary phenomenon within its real-life context, especially useful when the boundaries between phenomenon and context were not clearly evident. In a case study there is normally a focus of attention to a boundary that could be social, temporal or physical. The area of focus may be defined by social unit size, such as individuals, an organisation, family, community or nation. It can as well be defined by spatial units including villages, districts and countries, and it can be defined in temporal terms in which case events, episodes and units of time demarcate the scope of inquiry (Huberman & Miles, 1994; Murata *et al*., 2015), and cases may embed sub-cases within them in which case it becomes a case within a case.

One important feature of the case study design is the combining of different research methods, which is done to illuminate the case from different angles (Eisenhardt, 1989; Schell, 1992; Johansson, 2003). Case study research uses a variety of evidence from different sources, such as documents, interviews and observations (Rowley, 2002), and makes use of both quantitative methods, which are concerned with numbers and measurements, and qualitative data collection methods, which are concerned with words and meanings (Darke, Shanks & Broadbent, 1998; Eisenhardt, 1989; Gerring, 2004; Zucker, 2009). "By allowing for use of multiple research methods that include surveys, interviews, field observations and even experiments, case study designs not only spread wide the net of evidence, but also offer a valuable flexibility for researchers to use, without restriction, the study tools that are deemed most appropriate for a particular research problem" (Murata *et al*., 2015: 28). The use of both quantitative and qualitative data contributes to developing explanations for both the process and outcome of a phenomenon through complete observation, reconstruction and analysis of the case under investigation (Zainal, 2007).

Figures 3. 1 and 3.2 summarise the study design used at the Thulamela site and the Greater Tzaneen site, respectively. These figures show that the field survey research component was common to both sites, and where there were differences in design, these occurred after completion of the field survey.

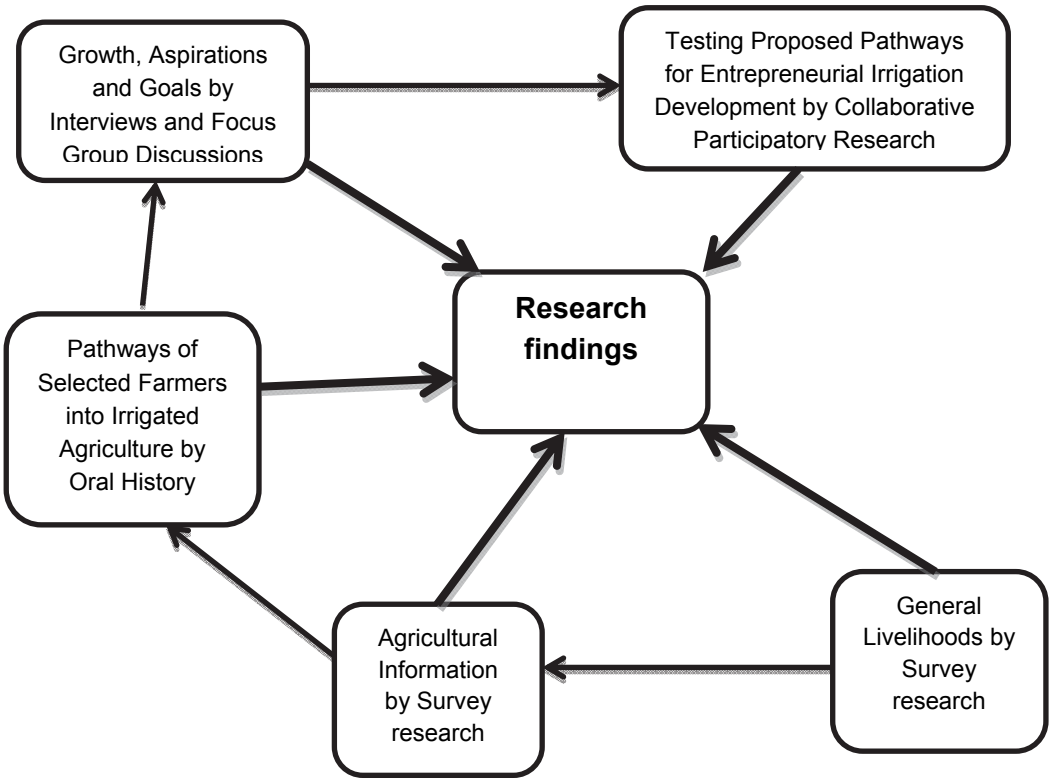

FIGURE 3.1: Study design used at Thulamela

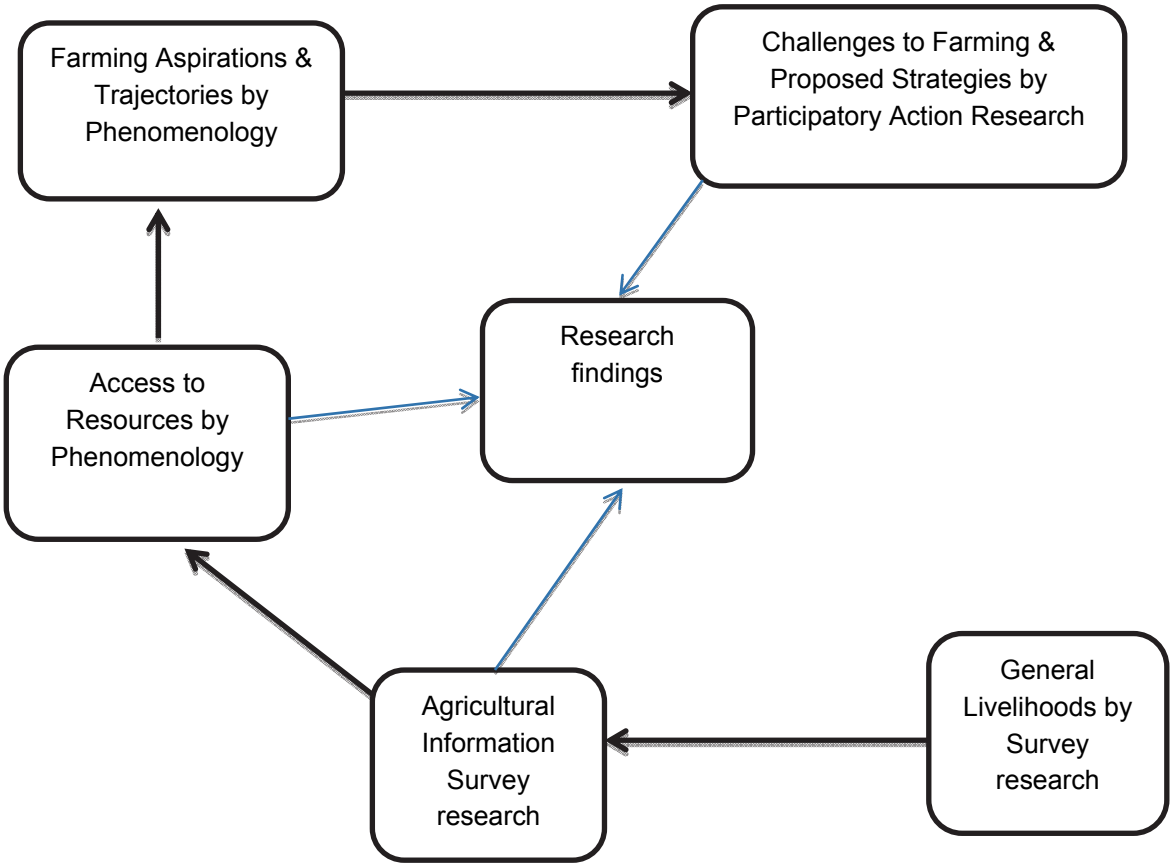

FIGURE 3.2: Study design used at Greater Tzaneen

3.3 Survey research

3.3.1 Survey research design

Survey research was used to collect data on livelihoods and agriculture of households at the selected study sites. The term 'survey' is used in a variety of ways but generally refers to the selection of a relatively large sample of people from a pre-determined population, referred to as 'the population of interest'; followed by the collection of data from those people (Kelley *et al.,* 2003). Pinsonneault and Kraemer (1993) defines survey research as a means of gathering information about the characteristics, actions or opinions of a large group of people, referred to as a population. Survey research is used to investigate the 'phenomena of the moment'. It is specifically suited to provide a snap shot of an on-going activity (Leedy & Omrod, 2001; Kelley *et al.,* 2003). Survey research is used to answer questions that have been raised, to solve problems that have been posed or observed, to assess needs and set goals, to determine whether or not specific objectives have been met, to establish baselines against which future comparisons can be made, to analyse trends across time and generally to describe what exists, in what amount and in what context (Isaac & Michael, 1997). According to Levy and Lemeshow (1999), the survey research design involves two steps. First, a sampling plan must be developed to obtain the sample from the population. The sampling plan describes the approach that will be used to select the sample, how sample size will be determined and the choice of media through which the survey will be administered (Glasow, 2005). The second step involves the establishment of procedures for describing population estimates from the sample data and for estimating the reliability of those population estimates (Levy & Lemeshow, 1999).

In the remainder of this section on survey research we describe how the survey research design was applied at the two study sites under the headings 'materials', 'sampling', 'procedures' and 'analysis'. At both study sites the same materials (questionnaires) were used and analysis of the data was done on the combined data set. However, there were differences in sampling and in some of the procedures used in the conduct of the survey between the two sites, and for this reason these aspects of the survey design are presented under site-specific sub-headings.

3.3.2 Materials

Materials used in the survey included two different interview schedules, a 30 m tape measure to measure distances, and a Garmin eTrex® H personal GPS device manufactured by Garmin Ltd Olathe, Kansas USA, which was used to record the coordinates of the residential plots and fields, both rainfed and irrigated. The two interview schedules were developed jointly by all members of the research team. One of the interview schedules focused on general livelihoods (Appendix 3.1) and the other on agriculture and entrepreneurship (Appendix 3.2). During the development of the two interview schedules, questions were borrowed from the interview schedules developed by Van Averbeke *et al*. (1998), Monde (2003), Mohamed (2006), and Hebinck and Lent (2007), which were all used to investigate livelihoods and agriculture in rural settlements. New questions were added to suit the objectives of the current study. The two interview schedules were translated from English to

Tshivenda with the help of the three field assistants, namely Mr T. Raedani, Mr R. Rasilingwane and Mrs G. Masala.

The 'General Livelihoods' questionnaire'

In line with the sustainable livelihoods approach and guided by the Framework presented by Ellis (2000), the general livelihood questionnaire was aimed at collecting information on the asset status of households, the factors that mediated access to assets, the activities households engaged in to make a living and the outcomes they achieved from these activities. As pointed out by Ellis (2000), the collection of a comprehensive data set on all aspects of livelihood requires an enormous effort, and for this reason he recommends that data collection should be done purposefully. In the case of this research project the focus was on farming, particularly irrigated farming, and the contribution by this activity to the livelihoods of people. Accordingly, whilst the overall objective of the livelihoods survey was to develop rich pictures of the livelihoods of households at the two study areas, collection of data was more detailed in matters pertaining to farming.

Natural capital: Data collection on natural capital was restricted to cultivated land and water used for irrigation purposes. Variables included the area of the residential site and the cultivated area (home garden) at this site, the area of the rainfed and irrigated arable land holdings and of the parts of these land holdings that were irrigated, the different sources of irrigation water that were used, and their adequacy for the purpose of irrigation. These operational measures are in line with recently published livelihoods studies by Shivakoti and Shrestha, 2005; Erenstein *et al.,* 2010 and Su and Shang, 2012, in which the focus was also on the role of farming in the livelihoods of people.

Physical capital: Data collection on physical capital of households was restricted to production goods and privately owned infrastructure that was used in agriculture. These included basic hand tools, draught animals (cattle, donkeys, horses) and implements, tractor and implements, transportation assets used in farming (bakkie, truck, animal-drawn cart, tractor-drawn trailer) irrigation equipment (pipes, pumps, water storage facilities) and immovable/fixed farm assets (farm shed, grain storage facility, grain mill, poultry production facility). Public infrastructure and production goods owned by households for use in other sectors of the local economy, such as construction, were not considered. For this reason, physical capital in the current study was defined operationally as the tools, equipment and privately owned infrastructure that assisted households in carrying out of farm-related activities.

Human capital: Data on human capital were collected at the household level and also for the person identified as the "farmer" in the household. At the household level data collection included household size; age, gender, formal education level attained and employment status of all household members. Information on the health status of the household members was not collected because it is regarded a highly personal matter. For the farmer in the household additional data collected included experience in farming and irrigation, a selection of personal attributes thought to be associated with entrepreneurship, and their perception of the degree of innovation in their farm enterprises relative to those of their neighbours.

Financial capital: Financial capital was defined operationally as consisting of the regular inflows of money (salaries and wages, remittances, state grants), other flows of money excluding income from agriculture (making and selling goods, trading, service provision), savings, insurance payments and loan repayments received or made by households during the period 1 July 2012 to 30 June 2013. Regular flows of money consisted of the combined labour income in the form of salaries and wages as well as associated overtime and bonus payments received by members of the household, private pensions, remittances, bursaries awarded to household members attending tertiary education and transfers from the state (social grants). The "other flows of money" referred to monetary income derived from different forms of self-employment excluding agriculture. These forms of self-employment included trading (buy and sell or make and sell) and service provision. Data on stocks of money (how much money people had stashed away) are difficult to collect, as this is a highly personal and sensitive matter. To get an indication of whether households were building such stocks, data was collected on the money households saved during the period 1 July 2012 to 30 June 2013. Households were also asked to provide information on insurance payments and loan repayments during this period. Insurance is important because it shields the livelihoods of households against particular shocks. Loan repayments are an indicator that households have access to credit, which can provide them with the financial means to acquire relatively expensive capital goods. Loans can also be an indication that livelihoods are under stress, especially when these loans are taken out to finance consumption.

Social capital: Collection of data on social capital included household membership of the various groups and organisations that operated at the local level as indicators of connectedness, networks, groups, and data on the perceived likelihood of households making successful claims of money, food and labour against family, friends, neighbours and the groups or organisations they belonged to as indicators of relationships of trust, reciprocity and exchanges

Access to resources: The enquiry about access focussed on resources used in farming. Data on access included households' access to land (residential land and rainfed arable land), water for irrigation, types of produce markets used by those who sold part of their produce, and access to support services which included farmers' training and advise on crop production, irrigation of crops, marketing of crops, and business and financial management. Farmers' access to agricultural loans, grants and donations were also investigated.

Context: Information on the vulnerability context in Thulamela was obtained by using indicators provided by Statistics South Africa (2012)[1]. These indicators included unemployment, poverty, education, income and land.

Livelihood strategies: Data on the livelihood strategies of households was obtained by considering the various sources of income households relied on to make a living during the period of study. These included employment (salaries and wages), self-employment (making and selling goods, trading and service provision), remittances and social grants, and agriculture.

[1] SOUTH AFRICA. Statistics South Africa. 2012. *Census 2011.* [Online]. Available from: http://www.statssa.gov.za. [Accessed: 10/06/2015].

Livelihood outcomes: Livelihood security and environmental sustainability are the two main livelihood outcomes in the Ellis (2000) Framework. In the current study information on livelihood outcomes was limited to livelihood security outcomes since no data on environmental sustainability were collected. Commonly used indicators of livelihood security are income, food security and well-being (Turner, 2001; De Satgé, 2002; Stevens, Devereux & Kennan, 2003; Vink & Van Rooyen, 2009; Fanadzo, Chiduza & Mnkeni, 2010). Data on livelihood security outcomes of households included total household income, per capita income, total household expenditure, expenditure on food relative to total, monetary value of selected assets (consumer durables, personal transportation assets, farm assets), and selected indicators of wellbeing. Consumer durables, defined by Lehohla (2014) as 'household items that last for a long time such as computers, kitchen appliances, radios, televisions, cars and furniture usually acquired once in several years', included household furniture (kitchen unit, bed, stove, lounge suite, etc.) and electronic items (cell phones, computers/laptops, etc.) whilst transportation assets included cars, bicycles, motor bike and taxi. Farm assets included all production goods used in agriculture (see also physical capital). Wellbeing indicators included sources of energy used for cooking, sources of domestic water, types of toilets, and households' perceptions of their personal safety and security. These indicators were also used by Turner (2001), Qizilbash (2002), Bhorat, Poswell and Naidoo (2004), Lehohla (2009) and Manyelo (2011).

The 'Agriculture and Entrepreneurship' questionnaire

The interview schedule labelled 'Agriculture and Entrepreneurship' was designed to collect information on the different farm enterprises of the sampled households and also enquired about entrepreneurship.

Agriculture: Collection of data on agriculture was aimed at developing income statements for each of the commodities that were produced in home gardens, on rainfed and irrigated arable land and using the commonage during the period 1 July 2012 to 30 June 2013.

For crop enterprises this was done by asking the respondents to first state all the crops they had planted in the home garden and rainfed plots and all the types of livestock they had kept during that period. For each crop enterprise the interview schedule enquired about the area planted to the crop and all the operating expenses incurred during production of the crop. These included costs of land preparation, fertilisers, seeds, agro-chemicals, water and hired labour. The interview schedule also enquired about crop income in the form of sales, gifts and home consumption.

For livestock enterprises, the interview schedule enquired about the different types of livestock the farmer kept during 1 July 2012 to 30 June 2013, and for each of these the interview schedule enquired about the total number of animals the farmer had on 1 July 2012 and their value, the number of animals added through reproduction and their value, the number of animals bought during period 1 July 2012 to 30 June 2013 and the cost of their purchases; the number of animals that died and their value, the number of animals slaughtered for home consumption and those that were slaughtered and partially consumed and their estimated value, those that were sold and the income received, income received from the sales of products other than the animals themselves (milk, eggs, skins, manure), and the expenses incurred to produce the animals (health care, labour, feed).

Entrepreneurship: Questions concerning different aspects of entrepreneurship were directed at the farmer in the household. They measured a range of personal attributes associated with entrepreneurship, enquired about the goals and aspirations they had for their farm enterprises, and about the various risks they had experienced when setting up and operating their farm enterprises.

3.3.3 Sampling

From the Terms of Reference of this project, it can be deducted that the Water Research Commission sought answers to four main questions, namely,

1. To what extent does smallholder irrigation as an entrepreneurial activity improve the livelihoods of rural people;
2. What are the pathways available to rural people to engage in smallholder irrigation as an entrepreneurial activity;
3. Which are the important constraints people face along these different pathways towards engaging in smallholder irrigation as an entrepreneurial activity and growing their irrigated enterprises;
4. What interventions are needed to remove or reduce the identified constraints?

The research team was of the view that an appropriate way of answering the first question was to do a comparison between the livelihoods of households that had irrigation enterprises and those that did not, and to do so at both research sites. Accordingly at both sites the rural population was divided into three groups, namely 'home gardeners', 'scheme farmers', and 'independent irrigators'. At each study site, the population of 'home gardeners' represented the group of rural households that did not have irrigation enterprises[2]. The livelihoods of households in this group served as the baseline with which the livelihoods of the households of scheme farmers and independent irrigators could be compared to assess the impacts of small-scale irrigation. The population of 'scheme farmers' comprised households that held a plot on an irrigation scheme. The population of 'independent irrigators' consisted of households that accessed water directly from source to irrigate land situated outside the boundaries of their residential sites.

Sampling of populations involves answering two important questions, namely,

- How will the sample be drawn from the population? and
- How large should the sample be?

The first question is concerned with the sampling method. There are two main ways of selecting a sample from a population, i.e. probability and non-probability sampling. The main advantage of probability sampling is that it allows for inferences to be made from the information derived from the sample to the population as a whole. Probability sampling requires each element of the population to have a known and non-zero chance of being included in the sample. Non-probability sampling does not provide a basis for estimating how closely the sample characteristics approximate the parameters of the population from which the sample was obtained. In other words, the

[2] In this study 'irrigation enterprise' venture involving the production of crops using artificial application of water on land outside the boundaries of the residential plot.

information obtained from a non-probability sample applies to the sample only (Van Averbeke, 2014).

The second question is concerned with the size of the sample, which is dependent on a range of factors, including the purpose of the study, the population size, the risk of selecting a 'bad' sample and the allowable sampling error (Israel, 1992). Surveys, even those involving probability sampling, are prone to errors. Errors of coverage, sampling and non-response are sources of error common to all survey research (Reireson-Draugalis & Plaza, 2009). Coverage errors occur when the sampling frame (list of all elements in the population) does not include all the elements that make up the study population. Sampling errors arise from the discrepancy between the population parameters (true value of attributes for the study population as a whole) and sample statistics (value of the attributes as determined for the sample) which arise from surveying a sample instead of the entire population (Reireson-Draugalis & Plaza, 2009). Three criteria are used to limit sampling errors, which refers to the risk of taking a 'bad' sample, namely level of precision, confidence level, and degree of variability (Israel, 1992). Level of precision refers to the range in which the true value of the population is estimated to be, and this range is often expressed in percentage points. Conventionally a precision of 5% is considered adequate. In practice this would mean that if a survey of a sample shows that 10% of farmers have cattle, and the level of precision is 5%, then it can be concluded that between 5% and 15% of farmers in the population rear cattle (Israel, 1992). The second criterion, confidence level, is concerned with the likelihood of selecting a representative sample, meaning that the sample that is selected has a known probability that its statistics will fall within the specified range of precision. Typically a 95% confidence interval is used, meaning that 95 out of 100 samples selected will provide statistics that meet the precision criterion. The last criterion is the degree of variability in the attributes being measured. Basically, the more heterogeneous the population in terms of a particular attribute, the larger the sample size required to obtain the selected level of precision (Israel, 1992). Considering these factors, Israel (1992) recommends the use of a census (all elements of the population are included in the survey) when dealing with small populations. Alternatively one can make use of published tables or formulas to determine the required sample size for given levels of precision, confidence (and variability if known). Using the table published by Israel (1992), which is identical to the table provided by Reireson-Draugalis and Plaza (2009) and selecting a precision level of 5% and a confidence level of 95%, the recommended sample size for the population of 866 home gardener households found in the settlements of Manamani and Itsani (Block 3) would be 265. Considering the massive amount of information that needed to be collected from each sampled participant, this size of sample was beyond the logistical means that were available to the research team.

Assael and Keon (1982) point out that the reliability of a survey is function of total survey error, which is composed of sampling error (dealt with earlier) and non-sampling error. Non-sampling error refers to error that has nothing to do with the actual sampling process but is caused by error in the responses provided by participants, including non-responses. They also reported that non-sampling errors were usually the major contributor to error in survey research. Therefore, whilst concerns about sample size are important, of paramount importance is the reliability of the information

provided by participants. This important warning was heeded in the collection of data in Thulamela, which is elaborated in the section that deals with survey procedures.

Returning to the question of sample size, Hill (1997) argues that sample size is often as much a budgetary consideration as a statistical one, and advocates application of the 'rules of thumb' proposed by Roscoe (1975).

The rules relevant to the current study were as follows:

1. Use of statistical analyses on samples smaller than 10 is discouraged;
2. Large samples are preferred over smaller ones;
3. There is seldom justification for sample sizes smaller than 30 and larger than 500.
4. The lower limit of 30 (some authors go as low as 20) is the minimum needed for a reasonable probability of detecting treatment or group differences;
5. When a sample is broken up into groups (sub-samples) rule 4 applies to the sub-samples.
6. For descriptive research (as applies to the current study), the sample should be not less than 10% of the population;
7. For correlation research, at least 30 elements are required;
8. For experimental research (e.g. testing of group effects as in the current study), 30 elements per group are required.

Sampling in Thulamela

Home gardeners: The population of home gardeners at this study site consisted of the households residing in the settlements of Manamani and Itsani (Block 3). The small settlement of Tshivhuyuni, which borders Itsani (Block 3) was incorporated in Itsani. Home gardeners were sampled using 'modified' random sampling. Random sampling is probability sampling method, which means that results obtained from the sample can be used for generalisation towards the population as a whole. Random sampling provides each unit in the population with an equal chance of being selected for inclusion in the sample. The random sampling method that was applied is called 'modified', because the population of households was subdivided into smaller groups of more or less equal size before sampling occurred. This modification is explained in more detail lower down.

In Manamani, the sampling frame consisted of a printout of a satellite image (Google Earth)[3] of the residential part of the village on a scale of 1:7086. The image showed that there were a total of 534 residential sites in Manamani. An audit of all the residential sites in Manamani was done on the 25th of October 2013 by walking through the village with a printout of the satellite image in hand. It was discovered that 45 of the 534 residential sites that appeared on the satellite image were vacant or used for purposes other than residential (schools, shops, churches). Since household was the unit of data collection and analysis, and household was defined as the domestic group occupying a homestead (residential site), these 45 stands were removed from the sampling frame leaving a total of 489 residential sites that were occupied and used for residential purposes. These 489 sites constituted the sampling frame. As a rule of thumb, and when dealing with a population smaller

[3] Google Inc. (2013). Google Earth (version 7.1.2.2041). [Software]. Available from: http://www.filehorse.com/download-google-earth/

than 500 units, surveys should sample not less than 10% of the population to be representative, and not less than 50 units to apply statistics. The arbitrary decision was made to aim for a sampling fraction of 15%, which implied a sample size of 73 households. To draw the sample the satellite image of the residential part of Manamani was subdivided into 10 sections containing approximately 40 to 45 residential sites each. This was done to ensure that all sections of the village would be represented in the sample, as some parts of the village were older than others. After demarcating these sections on the Google image, all residential sites in each section were numbered consecutively, starting the numbering in the top left corner and assigning numbers in the same way as a book is read. The total number of households in each part was then multiplied by the sampling fraction (15%) and the product was rounded upwards to the next whole number to obtain the sample size for each of the sections. The random number table created by Morey (2014) was then used to select the sample of households in each cluster.

The same sampling plan was used to select participants Itsani, using a printout of a satellite image (Google Earth)[4] of the residential part of this village as the sampling frame, and 'modified' random sampling as the sampling plan. The same procedures as described for Manamani were applied but in addition to removing vacant sites and sites used for purposes other than residential from the sampling frame, all residential sites belonging to households that held a plot on the Dzindi Irrigation Scheme were also excluded. The sampling fraction used for Itsani (Block 3) was slightly lower (13.5%) than in Manamani and a total of 51 households out of a population of 377 households were sampled. This brought the sample size of all home gardener households at the Thulamela site to 125.

Of real significance for the study is that both Manamani and Itsani are 'almost landless' communities. In both settlements the number of households that hold land other than their residential site is very low. In a separate investigation specifically aimed at identifying land holdings among residents in the two settlements It was established that 43 (8.8%) of the 489 households in Manamani held arable land, with 29 (5.9%) holding dryland plots and 14 (2.9%) independently irrigated plots. The sample of households that was drawn at Manamani contained two households with land (2.7%). One of these held an independently irrigation plot and this household was removed from the sample and transferred to the population of independent irrigators. The other held a dryland plot. In Itsani (Block 3)[5], 37 households (8.5%) held arable land, of which 28 (6.5%) were households that had a plot on the Dzindi Irrigation Scheme and nine (2.0%) held rainfed arable land. As indicated earlier, scheme farmer households were excluded from the population. Whilst the number of households with rainfed arable land was limited in both settlements, the proportion of households holding such land in the Manamani sample (1.4%) was lower than in the population as a whole (5.9%) but identical to that in the population (2.0%) in the Itsani sample (2.0%).

[4] Google Inc. (2013). Google Earth (version 7.1.2.2041). [Software]. Available from: http://www.filehorse.com/download-google-earth/

[5] This refers to the total population of 433 households in Itsani (Block 3) and includes households holding a plot on the Dzindi Irrigation Scheme.

Scheme farmers: Since the size of the population of households that held a plot on the Dzindi Irrigation Scheme was relatively small (102), the decision was made to survey the entire population (census). All but two of these households participated in the survey. The two households not covered by the survey had permanently left Thulamela but did not give up on their plots.

Independent irrigators: From the start, it was decided to aim for a sample size of 100. This decision represented a compromise between the need to have a sample that was large enough to warrant the use of statistics and the limited time and financial resources that were available for the conduct of the study.

The first step in the sampling process was to arrange a meeting with agricultural extension officers working in Thulamela. This meeting occurred on the 18th of June 2013 at the Vhembe District offices in Makwarela and 15 extension staff members were in attendance. At this meeting, the purpose of the study was elaborated and the meaning of independent irrigator' was explained. Staff in attendance was given the opportunity to ask questions about the study objectives and about the meaning of independent irrigator. When all questions had been answered, their participation in an exercise aimed at identifying and locating independent irrigators operating in the Thulamela Local Municipality was requested. First, they were asked whether they knew of any independent irrigators operating in their extension ward. Those responding positively were then requested to indicate the location of their ward on printout of a Google map of Thulamela Local Municipality and to estimate the number of independent irrigators operating in their wards of which they were certain, and finally to provide their cell number for future contact. During this exercise, a total of 73 independent irrigators (Appendix 4.7) were identified in the Tshidzini, Tshiombo, Tshisaulu, Malavuwe, Lwamondo, Tshikombane, Dzwerani, Nangodi and Tswinga extension wards. Indications were that additional independent irrigators were operating in Thulamela but these could not be located due to the absence of some extension staff. During the meeting two important things were learnt, namely, that independent irrigation was relatively common in Thulamela, and that there was no data base of this type of small-scale irrigators that could serve as a sampling frame.

The absence of a sampling frame precluded the use of a probability sampling plan that would be representative for the Municipality. This left non-probability sampling as the only option available. Considering that Dzindi was the anchor site of the study in Thulamela, the decision was made to identify and sample all independent irrigators operating in the vicinity of this Scheme, because these independent irrigators would be operating under climatic and market conditions that were largely similar to those of plot holders at Dzindi, thus providing a reasonable basis for comparisons between the two types of smallholder irrigators. To obtain the sample of independent irrigators around Dzindi, snowball sampling was practised (Strydom, 2005). This sampling method involves contact with one element that has information on the issue of interest leads to another element with information, resulting in a trail of respondents. Sampling started by interviewing known independent irrigators in the area. These farmers were then requested to refer the researcher to other independent irrigators they knew about. This sampling process was continued until no additional elements could be identified. For this reason it was assumed that all existing elements of the population of independent irrigators farming in the vicinity of Dzindi had been included in the sample, and that the survey of these elements constituted a census of that population. A total of 58 independent irrigators were included in this sample (Table 3.4). To raise the sample size to 100,

additional elements of the population of independent irrigators operating in Thulamela had to be identified. Other three study sites were arbitrarily selected; this was based on the anticipated presence of substantial numbers of independent irrigators at these sites.

TABLE 3.4: Sites in Thulamela Municipality at which independent irrigators were sampled (2013)

Site	Number of independent irrigators sampled
Area around Dzindi (peri-urban)	
Manamane	14
Shayandima	17
Itsani	13
Muledane	8
Thohoyandou	3
Maungani	1
Subtotal	**57**
Other study sites (rural)	
Tshiombo	27
Tshidzini	8
Khubvi	6
Subtotal	**41**
Total	**98**

These sites were Tshiombo, a rural area where independent irrigators farmed on land adjacent to the Tshiombo Irrigation Scheme; Tshidzini a rural area located north of Malamulele across the Levhuvu River, and Khubvi also a rural area located north east of Thohoyandou. In this way 42 independent irrigators, distributed among the three sites as shown in Table 4.1, were added to the sample bringing the sample size to 98.

Sampling in Greater Tzaneen

Sampling was done separately for the three groups of farmers. Selection of scheme irrigators involved a census of all registered plot holders. A list of all farmers that hold plots on the Julesburg irrigation scheme was obtained from the scheme chairperson and based on the small number of farmers it was decided to include all the scheme irrigators in the study. Julesburg irrigation scheme had a total of 48 registered smallholder farmers. However, only active farmers were interviewed, resulting in 27 scheme irrigators being included in the study.

Independent (non-scheme) irrigators were selected from villages around Julesburg irrigation scheme using snowballing and with assistance from the local extension officer located at the Department of Agriculture offices at Berlin Farm. Independent irrigators were difficult to locate, as there was no existing database in the extension office. The group of independent irrigators comprised households that directly accessed a source of irrigation water and extracted, conveyed and applied this water using privately owned equipment in the production of crops. There were many independent irrigators operating on plots of variable sizes. A census approach was therefore adopted, where all

independent irrigators that were identified were interviewed. A total of 35 independent irrigators became part of the study.

Home gardeners were randomly selected in Rhulani village. The home gardeners represented the general population of the study area as almost every household cultivated part of the homestead during the rainy season. Generally, home gardeners did not necessarily water their crops, but relied on rainfall.

The map of Rhulani village was used as a sampling frame for randomly selecting home gardener households. A map was printed from Google Earth, showing all 900 homesteads within the boundaries of the village. In consultation with the field assistants, it was found that some stands that appeared on the map were either vacant or used for purposes other than residential. Such stands were marked on the map and excluded from the sampling frame. This process yielded a village population of 800 homesteads, of which 15% were sampled. A 15% sampling fraction was decided upon based on available resources and time for the study. The selection procedure involved assigning numbers to the 800 homesteads on the Google Earth map of Rhulani to allow for selection using random numbers. In total, 120 random numbers were generated, using random number generation statistical methodologies, and the randomly selected households were identified on the map. This random selection ensured that both home gardeners and households that did not practise farming were selected.

The overall sample consisted of scheme irrigators, independent irrigators, home gardeners, dryland farmers and non-farming households and was representative of the community in the research area. The actual sample size was 180 households, determined by the sampling procedure used

3.3.4 Survey process and data collection

Thulamela

Data were collected by means of face-to-face interviews with participants, and by doing measurements on their farms and residential sites. The face-to-face interviews were structured and followed the order of the questions listed in the two interview schedules. Surveying was done during the months of September to November 2013, and March to July 2014.

When seeking to interview participants, an appointment was arranged beforehand, during which the participant indicated his or her availability and the venue where the interview could take place. Before each interview, the field assistant read the relevant informed consent statement[6]. This statement explained what the project was all about and what would be expected from participants. It also clarified that participation was voluntary, that the information being provided would be kept confidential and that the anonymity of participants would be maintained at all times. Potential

[6] Ethical approval for the work in Thulamela was provided separately for the population of home gardeners (Ref No 2013/08/009), independent irrigators (Ref No 2013/08/007), and Dzindi scheme farmers (Ref No 2011/05/012), and formed part of the proposal approval process of the three Master's students registered at the Tshwane University of Technology and participated in the project.

participants were also told that they had the right to end the interview at any time without providing reasons for doing so. They were informed that information they provided would be used in the writing of several Master's dissertations and would also be incorporated in the final report of this study, and that these documents would be available to the public. When participants consented to participation, they were asked to sign the informed consent form, of which one copy was left with them and one copy was kept by the researcher. A number of participants refused to sign the informed consent form but gave verbal consent in the presence of the field assistant, who acted as witness.

Both researcher and field assistant were always present during interviews. At the start of the interview the information required on the front page of the interview schedules (field interview number, name of interviewer, date of interview, district, municipality, village name, GPS coordinates of the household or of the plot/field, language spoken during interview and the time of the interview) was recorded. Most of the respondents chose to be interviewed in their own language (Tshivenda). During the interview the researcher held the English version of the questionnaire, while the field assistant held the version compiled in Tshivenda and used this to ask the questions. The field assistant translated the responses in English, because none of the researchers was sufficiently competent in Tshivenda to understand the responses. Translation of the answers to English was done to enable the researchers to correctly enter all the required information on the interview schedule document and to ask for additional information where necessary.

Each participant was visited at least twice, i.e. once for the conduct of the livelihood interview and a second time for the agriculture and entrepreneurship interview, which included the field measurements. The livelihood interview took between 30 and 60 minutes to complete, and the agriculture and entrepreneurship interview between 90 and 120 minutes.

To limit non-sampling error, two-thirds of the participants in the sample were visited a third time. In some instances this was necessary to obtain missing data or resolve ambiguities but in the majority of cases the third visit was needed to reconcile homestead income and expenditure data. All participants for whom the difference between gross total household income and total household expenditure was greater than 15% of total household income were revisited for this purpose. This was a stringent criterion, because other organisations, such as Statistics SA only reject elements where total expenditure and total income differ by more than 300% (Budlender *et al*., 2015).

Measurement of distance in the field, needed to determine the area of land holdings (residential site, dry land fields and irrigated plots), as well as the area on each of these holdings that was planted to crops during the period 1 July 2012 to June 2013, was done after completion of the agriculture and entrepreneurship interview. Area measurements involved sketching the shape of the plot in a field book or at the back of the questionnaire, followed by measuring the dimensions required to estimate plot area. These measurements involved the use of calibrated steps, which were converted into metre during data capture. Steps of researchers and field assistants were calibrated by repeatedly walking a distance of 30 m, which had been laid out using a measuring tape, whilst counting the number of steps it took to cover this distance. This calibration process was

continued until the number of steps to cover the 30 m distance became constant, indicating that the manner in which the distance was being walked had been 'standardised'. This standardised way walking was then applied when doing field measurements.

Greater Tzaneen

Similar to Thulamela, data collection was by means of individual face-to-face interviews. Data collection was done in two phases using structured questionnaires. Given the relatively high illiteracy levels among smallholder farmers and lack of records at farm level, interviewing was seen as the best data collection method, since these farmers' ability to respond to any other type of questionnaire is limited. A general livelihoods questionnaire was administered in the first phase while the second phase used an agricultural and entrepreneurship instrument. Surveying was done during the months of August to December 2013.

A few days before the interviews, appointments were arranged with sampled households to determine their availability for the interview and the venue where the interview would take place. Such appointments were arranged through scheme leadership for the scheme irrigators, local leadership for the home gardeners and through telephone calling for the rest of the sample and whenever it was necessary.

In Greater Tzaneen, 180 households were interviewed in the first phase and 97 were followed up in the second phase. Both questionnaires took about an hour to administer. The first phase collected detailed information on household composition and characteristics, income-generating activities, household expenditure, household wellbeing, household asset endowment, household savings and loans, and membership of associations/groups.

The second phase targeted households who had indicated involvement in farming activities during the first phase. During this phase, additional livelihood data focusing on agriculture and entrepreneurship was gathered to augment the general livelihood survey. Data collected included the availability of and access to farm labour, farmers' goals and aspirations for each of the different types of farming practised during the period July 2012 to June 2013, access to land and water, ownership of agricultural assets, farm enterprise income statements, marketing of both livestock and crops, farmer support services, entrepreneurial attitude and attitude to risk.

The data collection team consisted of field officers, masters' and PhD students from the University of Pretoria. Field activities included recruiting three field assistants who spoke the local languages, Sepedi and Xitsonga. This was necessitated by the fact that most of the data collection team members were not competent in the languages spoken in the sampled villages. They, however, had extensive experience of conducting surveys. The data collection team was thoroughly trained in data collection, the importance of the study and data quality management prior to commencement of the exercise. The field assistants were trained in a day's workshop. This training involved going through all the questions in the questionnaire, establishing common understanding of the type of data required by each question. In addition, all questions were translated into the two local

languages and consensus was sought on whether the translations represented the English meaning of the original questions.

Both the researcher and field assistant were always present during interviews. The majority of respondents preferred to be interviewed in their own language. Hence, interviewing with the field assistant involved the researcher first asking the question in English; the assistant would then ask the same question in the local language with which the respondent was comfortable. The respondent would then respond in his/her language, after which the assistant translated the response to English for the researcher to record on the questionnaire in English. Clarity on responses was sought immediately, where necessary, to prevent data-capturing errors in the process of translation. Each respondent was visited at least twice during the survey period. Each day was concluded by checking the questionnaires to minimise measurement errors and using Google earth to capture the GPS coordinates of the homesteads visited. In instances where data was missing or the responses were unclear, some households had a third visit arranged. Third visits were arranged for most of the households, during phase two, for presentation of the enterprise budgets. However, this exercise could not be completed for all households due to time limitations.

3.3.5 Data processing, transformation and analysis

Data processing and transformation

Data entry templates and coding sheets were developed before commencement of the fieldwork, with some modification afterwards to assist the coding process, which enabled transformation of qualitative data into numeric values. This was necessary for statistical analysis of the data. Data capture was done using MS Office Excel. In what follows specifics are provided on the ways in which certain data sets were processed and coded and/or transformed, following the sequence of the Sustainable Livelihoods Framework that was used.

Natural capital

Transformation of data on natural capital was only done on the descriptors used to assess the adequacy of particular sources of water used for irrigation. These were transformed into percentage score as shown below.

Descriptor	Never enough	Rarely enough	Mostly enough	Always enough
Percentage score	25%	50%	75%	100%

The reason for assigning 25% to the lowest level of adequacy was that some water for irrigation was available.

Physical capital

No transformations were done on data pertaining to physical capital.

Human capital

Several transformations were done on human capital data. Household members were divided into two groups namely, economically active and economically inactive. Economically active persons were defined as 'persons aged between 15 and 64 years and economically inactive persons as persons younger than 15 years or older than 64 years old' (Tait *et al.,* 1996). Separation of household members into these groups enabled calculation of the ***number of adult equivalents*** (Carter & May, 1999) using equation 1 and the labour force ratio as proposed by Hayami (1978).

Number of AE in a household= $(A+ ½ C)^{0.9}$

whereby:

AE = adult equivalents

A = number of adults in the homestead) people aged 15 years and older)

C = number of children in the homestead (people younger than 15 years old); and

0.9 = a scaling factor which reflects that as homestead size increases less money per individual member is required to achieve a particular living standard.

The ***labour force ratio*** of a household, which is an indicator of labour availability, was calculated by dividing the number of economically active members of the household by the household size. The labour participation rate was calculated by dividing the number of working (employed) economically active adults by the total number of economically active adults. The ***labour participation rate*** was defined by Hayami (1978) as "the ratio of number of economically active members to the total number of members of the household". Unemployment rate was calculated by dividing the number of unemployed economically active adults by the total number of economically active adults.

Unemployment rate was defined as the 'ratio of the number of unemployed economically active members to the total number of economically active members of the household'. The unemployed economically active members of the household were members who were neither full time at school nor full time employed. Education participation rate was calculated by dividing the number of economically active adults at school by the total number of economically active adults.

Education participation rate was defined as 'the ratio of the number of economically active members, who attended school (including FET and higher education) full-time to the total number of economically active members of the household'. It should be noted that the sum of the unemployment rate, labour participation rate and education participation rate equals 1.

Financial capital

All financial data were converted to an annual basis and no further transformations were done.

Social capital

Data pertaining to the likelihood of households successfully claiming money, food and labour against selected networks were transformed from the five-choice Likert scale to percentage scores as shown below.

Descriptor	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Percentage score	100%	75%	50%	25%	0%

Access

No transformations were done on data pertaining to access.

Livelihood activities

No transformations were done on data pertaining to livelihood activities. Only activities that generated income, be it in cash or in-kind, were considered.

Livelihood outcomes

Livelihood outcomes are multi-dimensional and should ideally be assessed using an appropriate set of indicators that reflect the degree of well-being. Consumption (or income) is widely used as a proxy for well-being but their use implies that a person's wellbeing is equated to his or her 'utility'. Income or consumption are measures of a person's ability to consume goods and services, which has also been referred to as a person's 'economic welfare' (Budlender *et al*., 2005). To add additional dimensions to the assessment of livelihood outcomes, use was also made of food security indicators, availability of private amenities that considered conducive for good health, indicators of safety and security and indicators of wealth in the form of selected physical assets.

Household income:

Income and expenditure of households were reconciled by creating the 'undisclosed income' and 'undisclosed expenditure' categories. For households where total income exceeded total expenditure, the difference between these two totals was considered 'undisclosed expenditure' and for households where total expenditure exceeded total income, the difference was considered 'undisclosed income'. In Thulamela, these two categories are relatively small (less than 5% overall), because households that where total expenditure and total income differed by more than 15% were revisited in order to resolve the discrepancy. Total expenditure exceeding total income was primarily due to the non-disclosure of income sources. Total incomes being greater than total expenditure were mostly due to under-reporting of expenses but also due incomes of migrants being reported in full, whereas only a part of this income was transferred to the household.

Adequacy of household income was assessed against three per capita income poverty lines. These were obtained by adjusting the three 2011 poverty lines generated by Budlender *et al*. (2015) for South Africa to the study period (1 July 2012 to 30 June 2013) using the Consumer Price Index (CPI) supplied by Statistics South Africa. All three of these lines are absolute money-metric lines. They are

developed by determining the level of consumption for a basket of goods and services, which is seen as the minimum basket needed to be called 'non-poor' (Budlender *et al*., 2015).

The food poverty line, which is the lowest line, is calculated by determining the daily cost of a basket of foods, which would satisfy the minimum recommended caloric requirement. This basket of foods is compiled in such a way that it reflects the food consumption habits of the poor. The food poverty line represents the cost of this food basket, with due respect for food item-shares, that would provide a person with 2100 kcal per day. For the period covered by this study (1 July 2012 to 30 June 2013) the food poverty line was valued at R345.79 per capita per month or **R4 149 per capita per annum**.

The lower-bound poverty line is determined by adding the non-food expenditure of households that have a total expenditure equal to the food poverty line, to the food poverty line. The idea here is that households have non-food expenses, which are considered so important that they skimp on food expenses (for example by buying cheaper items to meet their caloric requirements) to meet these essential non-food expenses. The lower-bound poverty line considers these 'essential expenses' and adds these to the food poverty line. The lower-bound poverty line that applied to the study period was R547.92 per capita per month or **R6 575 per capita per annum**.

The upper-bound poverty line is determined by calculating the non-food expenditure of households that have food expenditure equal to the food poverty line and adding this to the food poverty line. The upper-bound poverty line that applied to the study period was R1 069.17 per capita per month or **R12 830 per capita per annum**.

Engel coefficient

Household income adequacy was also assessed using the ratio of food expenditure to total expenditure, also referred to as the Engel coefficient. For South Africa, Budlender *et al*. (2015) indicate that an Engel coefficient greater than 0.35 suggested that a household was poor, but point out that Stats SA (2015) came up with an Engel coefficient of 0.43 as the threshold for poverty.

Income stability

Income stability of households, which is an indicator of the reliability of household income, was determined by expressing 'regular flows of income' as a percentage of 'total household income'.

Well-being and wealth indicators

One way in which well-being of households was assessed was to determine the extent to which they were in possession of amenities known to be conducive for good health, namely source of domestic water, source of energy used for cooking, and type of toilet. The other way was to assess perceptions of safety and security. This was done by 'measuring' various possible threats, including theft of one's belongings, assault on one's person, harassment by community members, and harassment by officials. Wealth of households was assessed by estimating the monetary of selected assets in their possession, namely farm assets, consumer durables and means of personal transportation. These consumer durables were obtained by visiting at least three stores where these goods were sold during 2013. Their retail prices were recorded and added up and the average

calculated. The prices of the different consumer durables that were used in the study are presented in Appendix 3.3. Estimates of the monetary value of farm assets were based on the information provided by Maake (2015), who collected detailed information on the value of these assets in Vhembe. The value of assets used for transportation were based on second-hand values of these assets, and reflect age and condition of their 'average' state.

Own food production and food security: The contribution of own production to total food expenditure was calculated by diving all agriculture income in kind (produce consumed) by total food expenditure. Food security of households was analysed by considering household food situation scores and nutrient density of the diet. The overall nutrient density of the diet was assessed by calculating the sum of the weekly intake frequencies of all nutrient dense food types/groups, and this sum was referred to as the 'nutrient density of diet indicator'. The theoretical range of this indicator is 0 to 42.

Farm enterprise income statements

Calculation of agricultural enterprise income statements was done for both crop and animal production enterprises. For animal enterprises an enterprise income statement for each livestock species was compiled using the procedures explained by Nelson (1973). This involved calculation of the total operating expenses and gross income obtained. Details are provided in the Agriculture & Entrepreneurship questionnaire presented in Appendix 3.2. For crop enterprises, operating expenses were obtained by adding all the reported variable costs (land preparation, fertilisers, seed, agro-chemicals, water, and hired labour). Net operating income was obtained by subtracting the operating expenses from gross income. Gross income was obtained by adding up the amounts of produce allocated to home consumption, gifts and sales. To estimate the monetary value of these amounts (crop harvest) farm gate prices were used as described by Baber (1996). Farmers reported crop yields using a variety of units such as bunches for leafy vegetables, heads for cabbages, bags or buckets for maize grains, buckets or mugs for cowpeas and peanuts, crates for tomatoes and sweet potatoes and plastic bags for onions and beetroot, and provided the sales prices of these units

Cropping intensity

Cropping intensity in home gardens and on arable land was calculated by dividing the area actually cultivated by the area set aside for cultivation.

Entrepreneurship and entrepreneurial behaviour

Entrepreneurship among 'farmers' was assessed quantitatively in terms of selected psychological factors, perceptions on uniqueness of the farm enterprise, goals and aspirations for the different components of the farm enterprise, and a cluster analysis aimed at identifying categories of entrepreneurship. The details on this cluster analysis are provided in Chapter 6 as no new data were used for its conduct.

Information on 'psychological factors' of the farmers included 'need for achievement', 'locus of control' and 'risk-taking propensity'. Uniqueness of different aspects of the farm enterprise, which was used as a proxy for innovation were farmers' was investigated by recording farmers' perceptions on 'uniqueness' of their farm enterprises relative to those of their neighbours.

The question used to assess 'goals' elicited responses for each of the different possible enterprises a farmer could be involved in, and was put as an open-ended question (Text box 1), providing the participant the opportunity to answer the question in his or her own words.

TEXT BOX 1: Question used in the survey research to measure the goals participants had for their different farming farm enterprises

For each of the different types of farming your household was involved in during the period July 2012 to June 2013, what was it you that you wanted to achieve during that period?

Type of farming	**Goal**
Crop production in home garden	
Crop production on dryland plot(s)	
Crop production on irrigation plot(s)	
Animal production on residential site	
Animal production on commonage	
Other (specify)	

The question on 'aspirations' (Text box 2) was a multiple choice question with explicit choices from which respondents had to select the one that applied to their farm enterprise as a whole.

TEXT BOX 2: Question used in the survey research to measure the aspiration of participants pertaining to their farm enterprise

Considering your farming enterprise as it was during the period July 2012 to June 2013, which of the following statements best reflects your aspiration for your farming enterprise?

Option	**Selection**
I want to quit farming	
I want to scale down my farming enterprise	
I want to keep my farming enterprise the way it is now	
I want to grow my farming enterprise	

The choices presented to participants were congruent with the rural livelihood aspirations and strategies of poor people proposed by Doward *et al*. (2009), which were used by Scoones *et al*. (2010), to make sense of the diverse rural livelihood pathways observed against the back drop of land reform in Zimbabwe. According to Scoones *et al*. (2010), this typology 'emphasizes the dynamic changes and wider aspirations of households', which is exactly the kind of information the current study required. Scoones *et al*. (2010) identified the following four 'types' of rural household strategies in relation to farming:

- ***Dropping out***: This strategy refers to homesteads that exist in a state of destitution, and lack the resources to (continue) engage in agriculture. Typically, they are reliant on various forms of social protection for their livelihood
- ***Stepping out***: This strategy refers to homesteads diversifying away from agriculture, both locally or through migration The aspiration of these households is to quit whatever farming they still practise, and to pursue livelihood opportunities in which agriculture *sensu strictu*, i.e. primary production, no longer plays part;
- ***Hanging in***: This strategy refers to homesteads with livelihoods that are dependent on farming and continue to be that way but with outcomes that are marginal resulting in a degree of poverty;
- ***Stepping up***: This strategy refers to homesteads with livelihoods in which agriculture plays an important role and accumulation of assets used in farming is occurring, resulting in growth of the farming enterprise.

Data analysis

Depending on the type of data, parametric or nonparametric statistical procedures were used to examine the data for site x group effects. The parametric test involved analysis of variance (ANOVA) (Hatcher, Stepanski & Edward, 1994) using the SAS® version 8 statistical package (SAS Institute Inc., 2000), and when these were shown to be significant ($p \leq 0.05$) the Fisher's Protected Least Significant Difference Test (LSD) at 5% probability was used to separate group means. The nonparametric test Chi-square analysis was used as the non-parametric test.

3.4 Qualitative research

The phenomenological research methods fall under the broader qualitative research paradigm or philosophy that often seeks to reconstruct the social world using the subjective narratives, thoughts and feelings as they are reported in language based on the informants' first-hand experience. "Qualitative research seeks depth over breadth and attempts to learn subtle nuances of life experiences as opposed to aggregate experiences" (Whittemore *et al*., 2001). This aligned well with this phase of research which aimed to understand individual farmers' aspirations in farming and different growth paths they follow in their various efforts to realise their goals. The qualitative paradigm allows for appreciation of research participants' uniqueness and attempts to understand them in their contexts. These are very crucial methodological tools to leverage because themes such as aspirations, goals and growth paths are often personal, subjective and unique from one farmer to the other, making it difficult to understand them using the positivist aggregative tradition. A very methodical appreciation of context in this study is needed because aspects that include individual farmers' background, socio-economic conditions, and their specific settlement location significantly influence what they are capable of doing and hence what they can practically aspire to achieve in their farming lives. Thus instead of surveying large populations of farmers, the study took a close look at individual farmers in naturalistic settings using semi-structured interview schedules capable of engaging the informants in a way that made them to reconstruct their historical farming practices, their present situations and their futures.

The individual farmers were treated as unique case studies whose experiential stories and aspirations for the future were appreciated as unique phenomena.

Such a data collection method is inductive; the process starts from individual specific observations to much broader generalisations that may lead to formulation of theories. The work aims to develop inductively based interpretations and theories of first-order description of events rather than using a deductive hypothesis (Babbie *et al*., 2001). Thus rather than beginning with an existing theory or hypothesis this work began with an immersion in the study site striving to accurately describe the study phenomena as they occur or have occurred. This led to the gradual building of second-order constructs, which is a grounded theory capable of capturing and usefully reflecting the observations. Inductive studies seek findings that are idiographic (unique) and are often not generalizable, yet have their own intrinsic worth, or are transferable from one context to another.

During the first phase, study population was taken from a sample frame of Rhulani village for the Greater Tzaneen site and using a random number generator as the sampling technique. The second phase purposefully sampled from the preceding study population focusing on households that engaged in irrigated farming including home gardeners, scheme members and independent irrigators. The two data collection phases produced numbers and statistical relationships between various variables, but a detailed and nuanced understanding what these statistical patterns and quantitative figures mean was scanty and patchy. To offset this limitation, the qualitative case study tradition was brought in. Besides being capable of providing thick interpretive descriptions of observed phenomena, qualitative research seeks to reconstruct the social world empathically using the categories and concepts used by the actors themselves in an attempt to stay true to the world of its study population (Babbie *et al.,* 2001). Study population was recruited using the non-probability purposive sampling technique with the aim to find information-rich cases that include critical cases (theoretically important cases), extreme cases, as well as typical cases (average cases) (Durrheim, 2006). This phase of the study was guided by the phenomenological ethic that among others uses open-ended interview questions and non-participatory field observations.

3.4.1 A phenomenological approach

Phenomenology is a qualitative method which is concerned about studying things (phenomena) as they appear in their real settings in order that the research product produces a clear and undistorted representation. The phenomenological tradition proceeds on a set of assumptions of which two are particularly relevant to this work. First, it rejects the concept of objectivity, which involves methodical efforts to separate the researcher form the subject of research (Lindegger, 2006). Instead it uses the concept of ethno-methodology which "refers to the methods by which people make sense of the situations in which they find themselves and how they manage to sustain an orderliness in their interactions with other people" (Babbie *et al.,* 2001). In phenomenology, the central object of social inquiry is how people deal with everyday life and how they their ordinary experiential encounters to make meaning of the world around them. "All people exist in a dialectical relationship with their lived world experience, and there can be no clear separation of self and the world, or subject and object" (Lindegger, 2006: 463).Second, phenomenology interests itself more

with discovering new insights and less with affirming on-going claims hence it implores researchers to use unrestrictive methods and instruments of inquiry.

Phenomenology recognizes the difference between the physical world and the lived world. The latter is the world of multiple personal experiences which "can only be understood by accessing the consciousness of the person…..Careful description based on suspension of all preconceptions is the key of phenomenological research" (Lindegger, 2006: 463). In contrast to quantitative surveys which concern themselves with numbers of respondents and aims to study them through coded tick-boxes of the activities they undertake, phenomenology was used to understand processes and experiences farmers go through in farming and how they influence decision making in order to draw holistic patterns of farming trajectories. Farming trajectories and aspirations are largely products of both historical and contemporary encounters which in turn combine to project unique possible futures to different actors. Such a social complexity could best be captured by phenomenological techniques because they are capable of asking and addressing not only the 'what' and 'why' questions, but more significantly the 'how' question in order that data is processed into a sense-making story line.

Another key element of phenomenology relevant to this work is the concept of multiple realities. Everyday life is made of multiple realities, facts or truths. The concept of multiple realities was very crucial in analysing processes of resources access especially land tenure security and how it shapes farmers' aspirations and goals. An important element about tenure security is about how it is perceived by the landholders. It is not about whether it is legally recognized and sanctioned by organs of the state (Murata. forthcoming). Recognition by local land users themselves is more important than recognition by public institutions to ensure tenure security and even shape investment behaviours (Cousins *et al.,* 2005). This is an argument about *de facto* understanding of property relations that is situated in real settings and shaped by everyday experiential encounters. Such an interpretation provided a useful analytical tool to apprehend confusions that arise from the plurality of legal orders that govern access at the study sites.

3.4.2 Qualitative sampling

Participants were drawn from three study populations: home gardeners, irrigation scheme farmers and independent irrigators. The sampling approach was purposive in which participants were chosen from each of the three groups on the basis of their relevance to research questions. Instead of sampling to meet statistical requirements, we opted for analytical sampling, because in phenomenology what matters is not the number of cases studied, but rather the kind of cases or units which are studied, as it is the nature of the phenomenon that is the true measure of the population to which one seeks to generalise (Oosthuizen *et al.,* 2005). Relevance of a case was determined in multiple ways. For instance the theme of farming trajectories is better investigated with farmers who have at least five seasons in farming than those with only two. Moreover, farmers who have a history of moving from one type of farming land, say dryland to and irrigated land are more likely to give thick narratives of farming trajectories. In the same vein, aspirations and goals inn farming are strongly associated with particular farmers' socio-economic circumstances. And

although there is no established pattern of relationship, age has been found to play a very significant role in influencing farming aspirations in South Africa.

Home gardeners were sampled from Rhulani village on the basis of data collected from the Agricultural Survey which we had conducted to among others determine farmers that were engaging in some sort of farming (home gardening, scheme farming and independent irrigation), their engagement with markets and farming resources available to them. Home gardeners were defined as households/individuals that that engage in irrigated/watered backyard farming. Most of them practise vegetable cropping in winter after harvesting the summer crops, mainly an inter crop of maize, pumpkins and beans. The Agricultural Survey showed that 21 households were doing home gardening. We then recruited 13 of them for in-depth phenomenological studies.

Scheme farmers were sampled from Julesburg irrigation scheme, about 300 m from Rhulani village. The scheme is 240 ha in size. It is divided into 5 ha plots, which in total are 48. When this study began in 2012, 35 of these being actively farmed. The number further reduced in 2013, during which only 27 plot holders were using their plots. The in-depth study started in late 2013 and concluded in mid-2015. We purposively sampled participants using both a list of plot holders we had acquired from the Julesburg Scheme Committee and our knowledge of the scheme that we had developed through interacting with the farmers for a period of about a year and a half. Out of the 27 we recruited 11 for phenomenological studies.

We defined independent irrigators as farmers that are solely responsible for their own irrigation system as they farm on stand-alone plots. Such farmers are scattered with few numbers across villages. Given that Julesburg Irrigation Scheme was our anchor in the Greater Tzaneen site, we opted to study independent irrigators that farm around and fairly close to the scheme in order that important issues such as markets, transport and extension are not experienced significantly different by scheme farmers, independent irrigators and home gardeners. In line with this thinking, we drew our sample from villages that fall under the Berlin Farm Agricultural Extension service area in which the Julesburg scheme is found. Berlin Farm is a branch of the Provincial Department of Agriculture which mainly deals with extension services to smallholder farmers. The villages include Mariveni, Nyanyukani, Bordeaux, Solani, Rhulani, Nkowankowa, Mashilwana, Ezekhaya, Hoveni, Burgersdorp, Masoma, Hwejtie and Makgopeng. From the 35 member-list we got from Extension Officers at Berlin Farm and confirmation from Agricultural Survey, we recruited 13 for in-depth study. In all the three groups, sampling was done to redundancy whereby attempts to add more participants were found to be not helpful because no more new insights were coming.

3.4.3 Unit of study

For all three groups, two units of analysis were used for data collection and analysis, namely the ‘homestead’ and the ‘gardener or irrigator’. The latter was an individual who was identified by the members of his or her homestead as the primary person responsible for making decisions that pertained to ‘farming’, with ‘farming’ referring to ‘home gardening’, in the case of the ‘home gardener group’, and ‘irrigated cropping’ for the ‘scheme farmer’ and ‘independent irrigator’ groups.

Spatial confinement is central to definitions of the 'homestead' concept, which, in its most elementary meaning, refers to a specific residential location (Makura-Paradza, 2010). Accordingly, for the purpose of this study, 'homestead' was defined as consisting of all the people, related or not, who reside on the residential site of the 'gardener' or 'irrigator' and share in the consumption of its resources. This definition places emphasis on both co-residence and shared consumption, but the co-residence requirement was ignored for members who temporarily lived elsewhere but who were entirely dependent on the 'homestead' for their consumption. Typically, this involved young people, who were related through kinship with the resident members of the homestead and who lived elsewhere mostly for educational purposes but in some instances because they were searching for employment. Such members were also included in the definition of homestead.

3.4.4 Analytical techniques

The design of phenomenological study is in itself analytic in that the way it frames its research questions, picks its samples and constructs its instrumentation is all influenced by a critical anticipation of data reduction which in itself is an essential component of the process of data analysis. "These choices have a focusing and bounding function, ruling out certain variables, relationships and associated data, and selecting others for attention" (Huberman & Miles, 1994: 430-431).

In contrast to quantitative surveys, qualitative studies have a unique life cycle that engages processes of data collection and analysis in a continuous iterative movement that spans across the whole period of research. Processes of analysis in these studies become cyclical and have a unique way of moving back and forth from inductive and deductive analysis in an attempt to address given research questions and engage emerging themes (Huberman & Miles, 1994; Murata *et al.,* 2015). When addressing a research question, an unanticipated theme or pattern arises inductively, the research approach spins and assumes a deductive mode in which the researcher moves to verify or confirm the discovered theme.

Every successive stage of inquiry in the research process calls for a different mode of analysis. In fact there is no distinct separation between preliminary analysis, interim analysis and final analysis as is often the case in quantitative studies. In qualitative studies, analysis is conducted in a continuous precessual manner with the intention that findings at an earlier stage influences the choice of choice of research questions, mode of instrumentation and techniques of analysis at a subsequent stage.
Because phenomenology subscribes to the philosophy that the world is made of multiple realities each of which is unique and ideographic in its own right, this work used a within-case as opposed to a cross-case analysis. While the latter is concerned with aggregating realities in order to draw conclusions on the basis of patterns, the former appreciates a case as a unique phenomenon and strives to find how it fits in and articulate with the differentiated broader social universe.

A within-case analysis seeks to apprehend the social universe using two techniques of knowledge generation: description and explanation. The descriptive technique concerns itself with addressing the questions, (i) *what is happening?* and (ii) *how is it happening?* Addressing these questions

reduces complex phenomena into sense-making story lines because it splits them into simple components of actor, setting, episode, time, intention and outcome. Story-telling is a very pervasive character and heritage of human beings (Huberman & Miles 1994). Our descriptive data is thus presented in a form of actors' *thick* narratives that are drawn from historical experiential encounters in farming and other related activities of living to address the theme of farming trajectories and aspirations.

The explanatory technique concerns itself with finding answers to the question: *why is it happening?* This is one of the most frequently asked questions in human day-to-day life, but its scope is least understood in scientific research circles. Scientific thinking falls into a narrow band of thinking that explanation is about making causal statements and supporting a claim only (Huberman & Miles 1994). Explanation is far broader than this: "…it includes providing requested information, justifying an action and giving reasons" (Huberman & Miles 1994: 432). And it is important to note that explanations should be read within contexts, and that they are inconclusive, partial and indeterminately applicable (Huberman & Miles 1994). Farming is an enterprise although it is not always pursued for monetary profits. It involves investment at varied levels and committing risk of equally different magnitudes both of which largely depend on the individual's capacity to invest and aspirations in farming. Choices to invest in farming especially among resource-poor families have to be made on the basis of compelling reasons and strong justifications. Hence, although our analysis does not seek to explain causal relations between variables, it is highly explanatory in that it presents reasons and justifications for decision-making by farmers.

While the knowledge produced from the study findings may not be strictly technical, it is capable of developing a deeper understanding of the phenomena. This is practical knowledge. To generate such knowledge is one of the achievements of applied/development research especially in light of the argument that if people understand their situation better they are much more empowered to formulate relevant tailor-made intervention strategies to their problems.

3.4.5 Participatory action research

Studying challenges encountered in farming with the ultimate aim to construct relevant intervention strategies is best conducted with active involvement of those that experience the challenges and aspire for the intervention strategies. It was therefore necessary at this stage to apply a Participatory Action Research (PAR) approach because it is capable of guiding researchers to generate knowledge with those affected for the purpose of finding practical solutions to their challenges and hence empower them. While PAR has its own distinct philosophical orientation and history, it shares valuable commonalities with phenomenology. Whereas positivism emphasise objectivity through among others maintaining distance between researcher and researched and precision of measurement, the two value active inter-subjective engagement between researcher and researched (Bhana, 2006). But unlike phenomenology which emphasises uniqueness and individual contexts, PAR values community contexts. And PAR sees the value of research in action consequences that it generates in contrast to phenomenology which emphasises the reflective truth of findings.

The main focus of PAR is to generate knowledge and apply it to change the world for the better. It believes that such knowledge can best be produced in collaborative efforts of democratic engagement between researchers and researched communities that are living in problematic situations (Bhana, 2006). This is a very critical methodological approach given the reality that from historical times, small holder farming has been one of the most problem-infested enterprises little wonder in spite of multiple intervention efforts it has hitherto failed to significantly grow and enter the mainstream agrarian commercial economy.

Moreover, PAR is concerned with mediating individual and collective interests. Instead of emphasising an instrumental approach to finding societal problems in which research looks for the most efficient solutions to problems, PAR aims to find shared solutions. In communities that are characterised by high levels of class differentiation such as the contemporary agrarian South African sector is, a narrow-minded pursuit for most efficient solutions has the risk of leading to development of strategies that work for the powerful and well-resourced but leave out the marginalised and resource-poor farmers. And what makes PAR the most relevant method with which to tackle this phase of the research is that it guides and enjoins "…researchers to try to know *with* others, rather than *about* them, and to reconceptualise and foster knowledge as something that exists among people, rather than as some sort of barrier between them" (Bhana, 2006).

We applied PAR through holding focus group discussion sessions with farmers twice over the life span of the research, the first in January 2015 and the second in November 2015. Farmers were grouped into two separate groups one of which comprised home gardeners and scheme farmers while the other was made exclusively of independent irrigators. After consulting case material that we had cumulatively gathered from these farmers over a period of three years, we found that it would not be significantly inconveniencing to group home gardeners and scheme farmers in one session because their concerns share a lot in common. Nevertheless, independent irrigators have quite different concerns hence we grouped them separately. This was done in spite of the research team's conscious realisation that farmers farming in the same location of land parcels say scheme farmers are not homogenous, but confront farming issues differently.

The case material that we had, had already exposed some development trajectories that some of the farmers went through in their various farming journeys. Because the case material was collected phenomenologically, it exposed far more detailed experiential and aspirational issues about the farmers. This then enabled us to build tentative cases of various development pathways of farming together with their typical attendant constraints and opportunities. The main aim of these focus group discussions was to test how relevant these tentative cases were to farmers. This could have as well been accomplished by use of a one-on-one interview method but such interviews would not have allowed us the opportunity to hear the farmers debating among each other on these issues. Our interests were not merely to hear and document ideas and narratives of individual farmers on their respective journeys in farming, but rather we wanted to, in active collaboration with the farmers, distil and co-create typical cases that we could group into a set of development trajectories

or pathways. The process of distillation had to be done in the way participant farmers understand farming.

Discussions were led by the research team in collaboration with translation assistance of two Xitsonga-speaking field assistants. The languages of discussion were English and Tsonga and minor contributions from Sipedi. The translation approach presented one problem that we discovered when we were discussing constraints and the degrees to which each one of them obstructs opportunities to grow at different farming levels. Our measurement of these different severities was structured according to a calibrated scale which started from none, minor, moderate, major and critical. We found that it was not easily possible to communicate especially the last two measures of severity in a way that talks to how they affected farmers in a differential way. This was because our translators could not find directs equivalents of these words in the either Xitsonga or Sipedi lexicons. The team responded to this problem by using extensive explanations as well as day-to-day life experiences such as situations of sickness and processes of running vehicles as examples. This worked well because participants started to respond relevantly and actively to questions. However, examples, just like jokes, risk the tragedy of being misunderstood by the audience and hence it is the duty of the speaker to ensure that they give appropriate and leading context.

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Chapter 4 Livelihoods of Households in Thulamela and Greater Tzaneen

4.1 Introduction

In this chapter, the results of an analysis of the data that were collected by means of survey research are presented. These data were collected with the aim of quantitatively describing the livelihoods of rural households at the two study sites. At both sites the survey covered three types of households, namely, 'home gardeners', 'scheme irrigators' and 'independent irrigators'. This categorisation reflects the centrality of irrigation in the study. Presentation of the results is done by way of category means for the two study sites. As far as smallholder irrigated farming is concerned, home gardener households do not practise this activity beyond the boundaries of their residential site. Accordingly, this group of households can be seen as a reference group with which the two other groups can be compared. Scheme irrigator households all held irrigated land holdings on an irrigation scheme, i.e. the Dzindi canal scheme in Thulamela and the Julesburg irrigation scheme in Greater Tzaneen. Independent irrigator households accessed water directly from source to irrigate land situated outside the boundaries of their residential sites. In other countries, particularly in Asia but also in Africa, independent irrigation has been responsible for most of the areal expansion of irrigation since about 1980, whilst for various reasons the area on schemes has been declining during this same period. The success of independent irrigation, also called "atomistic irrigation", relative to irrigation practised on public and community schemes has been ascribed to its ability to provide farmers with a reliable, timely and adequate supply of irrigation water, which, in turn, has helped them keep up with changing market conditions and agricultural practices.

The survey data were analysed statistically using the full data set, which was subdivided into six categories of households, i.e. the three types or categories of households at the two study sites. Depending on the type of data, use was made of chi-square analysis or analysis of variance to test for differences between categories of households. When the results of the analysis of variance showed the category effect to be significant ($p<0.05$) the least significant difference t-test ($p=0.05$) was performed to separate category means. Presentation of the results follows the logic of the sustainable livelihoods framework, which was explained in Chapter 2, section 2.1.1 of this report.

4.2 Assets

4.2.1 Human capital

The results of the analysis of data pertaining to human capital of households are presented in Table 4.1 for Thulamela and Table 4.2 for Greater Tzaneen. In Thulamela (Table 4.1), home gardener households were smaller (4.5 persons on average) than scheme farmer households (5.6) and independent irrigator households (5.7). Looking at the age distribution it is evident that the difference in household size between home gardener households and the two types of irrigator households was primarily due to a lower number of adults in the economically active category among home gardener households. This meant that the pool of potential labour for farming was greater among irrigator households than among home gardener households. Independent irrigators had a significantly greater number of aged adults than home gardener households. The number of unemployed economically active adults tended to be higher in irrigator households than in home gardener households but the proportion of adults in this category who were unemployed, as indicated by the unemployment rate, tended to be higher in home gardener households (52%) than in scheme irrigator households (43%) and independent irrigator households (42%). The proportion of economically active adults who were still at school, as expressed by the education participation rate, did not differ by much among the three types of households. Accordingly, the proportion of economically active adults who were employed, as indicated by the labour participation rate, tended to be higher among the two types of irrigator households than among home gardener households. Education levels differed significantly among the three types of households, with irrigator households containing twice as many members who completed secondary education than home gardener households and six times as many members who completed tertiary education. The heads of home gardener households differed from those of irrigator households in that they were predominantly female (66%) and younger. The majority of irrigator households were headed by men.

In Greater Tzaneen (Table 4.2), households were slightly larger than in Thulamela but differences in household size among the three types of households were not significant. The tendency for the unemployment rate to be higher in home garden households than in irrigator households, as identified at the Thulamela site, was also evident in Greater Tzaneen. Differences in education level among household types were less prominent than in Thulamela, but still the number of members of irrigator households who had completed high school was double that in home gardener households ($p<0.05$).

TABLE 4.1: Human capital indicators of households of home gardeners, scheme irrigators and independent irrigators in Thulamela Municipality (2012-13)

Human capital indicator	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance/ LSD (p=0.05)
Household size and composition					
Household size	4.5b	5.6a	5.7a	5.2	LSD = 1.06
Number of generations	2.4a	2.5a	2.3a	2.4	NSD
Number of children (<15 yr old)	1.6a	1.8a	1.7a	1.7	NSD
Number of economically active adults (15-64 yr old)	2.6b	3.4a	3.4a	3.1	LSD = 0.74
Number of aged adults (>64 yr old)	0.4b	0.5a	0.7a	0.5	LSD = 0.26
Number of adult equivalents in household	3.6a	4.0a	4.1a	3.9	NSD
Occupational status of the economically active adult component of households					
Labour force ratio	0.57	0.58	0.58	0.57	N/A
Number of unemployed economically active adults	1.1a	1.4a	1.3a	1.3	NSD
Unemployment rate	0.52b	0.43a	0.42a	0.43	NSD
Labour participation rate	0.23b	0.30a	0.34a	0.31	NSD
Education participation rate	0.25a	0.27a	0.24a	0.26	NSD
Educational status of household					
Number of household members who completed secondary education	0.63b	1.25a	1.25a	1.01	LSD = 0.26
Number of household members who completed tertiary education	0.05b	0.30a	0.29a	0.20	LSD = 0.214
Age and gender of the head of household					
Proportion of female heads of household (%)	66	36	23	40	P<0.0001
Age of head of household (years)	55b	61ab	67a	58	5.8

TABLE 4.2: Human capital indicators of households of home gardeners, scheme irrigators and independent irrigators in Greater Tzaneen Municipality (2012-13)

Human capital indicator	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance/ LSD (p=0.05)
Household size and composition					
Household size	5.6a	5.2a	5.7a	5.6	NSD
Number of generations	2.5a	2.5a	2.3a	2.4	NSD
Number of children (<15 yr old)	1.8a	1.3b	1.7ab	1.7	NSD
Number of economically active adults (15-64 yr old)	3.6a	3.3a	3.6a	3.5	NSD
Number of aged adults (>64 yr old)	0.3b	0.6a	0.5ab	0.4	LSD = 0.26
Number of adult equivalents in household	4.0a	3.9a	4.1a	4.0	
Occupational status of the economically active adult component of households					
Labour force ratio	0.7	0.6	0.6	0.7	N/A
Number of unemployed economically active adults	1.6a	1.2a	1.3a	1.4	NSD
Unemployment rate	0.46a	0.34b	0.33b	0.39	NSD
Labour participation rate	0.37b	0.44ab	0.45a	0.41	NSD
Education participation rate	0.15a	0.23a	0.22a	0.19	NSD
Educational status of household					
Number of household members who completed secondary education	1.3b	1.7a	1.3b	1.4	LSD = 0.26
Number of household members who completed tertiary education	0.2a	0.2a	0.4a	0.3	NSD
Age and gender of the head of household					
Proportion of households with female heads (%)	62	5	17	36.1	P<0.0001
Age of head of household (years)	56b	64a	59ab	58	5.8

The majority of home gardener households in Greater Tzaneen were also headed by females (62%), as in Thulamela, whilst the heads of irrigator households were also mostly male (>80%). In line with Thulamela, heads of irrigator households in Greater Tzaneen tended to be older than those of home gardener households, and in the case of scheme irrigators the difference in age was significant ($p<0.05$).

The results of the analysis of data pertaining to the human capital indicators of the farmers in the households are presented in Table 4.3 for Thulamela and Greater Tzaneen.

In Thulamela, the majority of the farmers in home gardener households were female (65%). In scheme irrigator households, exactly half of the farmers were female and in independent irrigator households 31% were female. Across household types, the head was also the farmer in the majority (84.5%) of households. Where this was not the case, it was usually the spouse of the head who had that role. This explains why the age of the farmer did not differ much from the age of the head of household, implying that farmers were generally quite old. Education level of farmers did not differ significantly among household types, but experience in farming and irrigation was longest (27 years) among those farming at the Dzindi scheme. Surprisingly, differences in the share of the total farm labour that was performed by farmers themselves did not differ significantly among types of households.

In Greater Tzaneen, differences in gender of the farmer among types of households mirrored those identified for the head of households, i.e. females dominating among home gardeners (81%) and males among the two types of irrigator households. As in Thulamela, the majority of heads of households were also the farmer, and if not, it was the spouse of the head who was the farmer. Farmers tended to be old, as in Thulamela, and irrigators tended to be better educated than home gardeners, but had less experience in farming. Independent irrigators had the longest irrigation experience of all, and the irrigation of home gardens was clearly a recent development at this study site.

TABLE 4.3: Human capital indicators of the farmer in the households of home gardeners, scheme irrigators and independent irrigators in the Thulamela and Greater Tzaneen municipalities (2012-13)

Human capital indicator	Home gardeners	Scheme irrigators	Independent irrigators	All	Statistical significance/ LSD (p=0.05)
Characteristics of the farmer in the household (Thulamela) (n=324)					
Proportion of households with female farmers	64.8	50.0	30.6		
Relationship of farmer to head of household					<0.0001
• Self	88.0	72.0	92.9	84.5	
• Spouse	9.6	17.0	7.1	11.2	
• Other	2.4	9.0	0.0	4.4	
Age of farmer (years)	53b	59ab	60a	55	LSD = 6.1
Formal education of farmer (years)	6.5a	6.6a	6.3a	6.5	LSD = 1.9
Farming experience of farmer (years)	19b	27a	14b	20	LSD = 5.8
Irrigation experience of farmers who irrigate (years)	16b	27a	13b	19	LSD = 5.1
Farmer's contribution to farm labour (%)	65a	54a	62a	61	NSD

Characteristics of the farmer in the household (Greater Tzaneen) (n=97)					
Proportion of households with female farmers	80.9	23.8	31.0	53.6	N/A
Relationship of farmer to head of household					<0.0001
• Self	72.3	81.0	79.3	76.3	
• Spouse	27.7	14.3	17.2	21.6	
• Other	0.0	4.8	3.4	2.1	
Age of farmer (years)	53b	62a	54b	55	LSD = 6.1
Formal education of farmer (years)	5.0b	8.0a	7.7a	6.5	LSD = 1.9
Farming experience of farmer (years)	21.0a	10.0b	17.9a	17.7	LSD = 5.8
Irrigation experience of farmers who irrigate (years)	0.8b	5.8ab	9.6a	4.5	LSD = 5.1
Farmer's contribution to farm labour (%)	59.9a	40.2b	39.0b	49.4	LSD = 12.5

4.2.2 Natural capital

The natural capital indicators are presented in Table 4.4 for Thulamela and Table 4.5 for Greater Tzaneen. In Thulamela, home gardener households tended to have larger areas on their residential sites set aside for crop production than irrigator households but differences among the means were not significant. Home gardener households were also more likely to irrigate the crops growing on their residential sites than the other household types. The degree of adequacy score for the water source used for home garden irrigation was reasonable (66% on average) across household types. Noteworthy, however, was that tap water was the dominant (72%) type of water used in home garden irrigation. Very few (2 households) home gardeners held land that could be used for crop production other than their residential site. By implication, the home gardener group of households in Thulamela represented a landless rural population.

Scheme irrigators held on average 10 535 m^2 of scheme land, which was about 20% less than the 12 848 m^2 area of a plot at Dzindi. This reduction in size was mainly the result of plot transfer processes, which often resulted in the (unofficial) subdivision of plots, with parts being allocated to brothers or sisters of the plot holder. The adequacy score for irrigation water at Dzindi was low, indicating a serious water problem. Two scheme irrigators also held independently irrigated land, and the source of water used to irrigate that land was considerably more adequate than the canal water on the scheme.

Independent irrigators held about 2.1 ha of irrigation land, on average, and some also held irrigation land on a scheme, but their scheme plots had little or no water, as indicated by the lowest possible score of 25% for adequacy of the water source. The degree of adequacy of the water source used to irrigate the independent plot was much higher, receiving a score of 90% on average, which is close to the maximum. Direct extraction from rivers was the main way in which independent irrigators obtained water, followed by water flowing from springs.

TABLE 4.4: Natural resources (land and water) used for crop production among home gardeners, scheme irrigators and independent irrigators in Thulamela Municipality (2012-13)

Natural capital indicator	**Home gardeners (n=125)**	**Scheme irrigators (n=101)**	**Independent irrigators (n=98)**	**All (n=324)**	**Statistical significance/ LSD (p=0.05)**
Home garden					
Residential area set aside for cultivation (m^2)	1 132$_a$	900$_a$	540$_a$	878	LSD = 1 343
Irrigation (% of participants)	44.8	14.5	21.4	-	<0.0001
Source of water for irrigation (%)					**<0.0001**
• Tap	75.0	66.7	66.7	72.5	
• River by direct extraction	7.1	33.3	9.5	8.8	
• Canal	12.5	0.0	0.0	8.8	
• Ground by means of borehole	0.0	0.0	9.5	2.5	
• Spring	0.0	0.0	14.3	3.7	
• Dam	5.4	0.0	0.0	3.7	
Adequacy of water source score (25-100%)	58	N/A	86	66	<0.0001
Rainfed arable land					
Total area (m^2)	107$_a$	658$_a$	6 051$_a$	2 076	LSD = 6 234
Irrigation scheme land					
Total area (m^2)	0$_b$	10 535$_a$	1 224$_b$	3 654	LSD = 2 729
Source of water for irrigation (%)					<0.0001
• River by direct extraction	N/A	0.0	100.0	7.3	
• Canal	N/A	100.0	0.0	92.7	
• Dam	N/A	0.0	0.0	0.0	
Adequacy of water source score (25-100%)	N/A	39	25	38	<0.0001

TABLE 4.4: continued

Natural capital indicator	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance/ LSD (p=0.05)
Independently irrigated land					
Total area (m^2)	0b	443b	21 936a	9 456	LSD = 11 523
Source of water for irrigation (%)					<0.0001
• Roof	N/A	25.0	0.0	1.0	
• River by direct extraction	N/A	25.0	69.4	67.6	
• Canal	N/A	25.0	0.0	1.0	
• Ground by means of borehole	N/A	0.0	4.1	3.9	
• Spring	N/A	0.0	22.5	21.6	
• Dam	N/A	0.0	2.0	2.0	
• Runoff (canal leaks or unused irrigation water)	N/A	25.0	2.0	2.9	
Adequacy of water source score (25-100%)	N/A	67	90	89	<0.0001

TABLE 4.5: Natural resources (land and water) used for crop production among home gardeners, scheme irrigators and independent irrigators in Greater Tzaneen Municipality (2012-13)

Natural capital indicator	**Home gardeners (n=47)**	**Scheme irrigators (n=21)**	**Independent irrigators (n=29)**	**All (n=97)**	**Statistical significance/ LSD (p=0.05)**
Home garden					
Residential area set aside for cultivation (m^2)	1 041$_b$	2 756$_a$	1 958$_{ab}$	1 686	LSD = 1 343
Irrigation (% of participants)	6.4	9.5	10.3	8.2	
Source of water for irrigation (%)					<0.0001
• Tap	0.0	0.0	100.0	12.5	
• River by direct extraction	0.0	0.0	0.0	0.0	
• Canal	0.0	33.3	0.0	12.5	
• Ground by means of borehole	25.0	0.0	0.0	12.5	
• Spring	0.0	0.0	0.0	0.0	
• Dam	75.0	66.7	0.0	62.5	
Adequacy of water source score (25-100%)	67	N/A	N/A	67	
Rainfed arable land					
Total area (m^2)	4 443	5 119	4 589	4 633	LSD = 6 234
Irrigation scheme land					
Total area (m^2)	0$_b$	59 190$_a$	0$_b$	12 814	LSD = 2 729
Source of water for irrigation (%)					<0.0001
• River by direct extraction	14.3	40.0	88.9	52.4	
• Canal	28.6	0.0	0.0	9.5	
• Dam	57.1	60.0	11.1	38.1	
Adequacy of water source score (25-100%)	N/A	67	N/A	67	

TABLE 4.5: continued

Natural capital indicator	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance/ LSD (p=0.05)
Independently irrigated land					
Total area (m^2)	0b	0b	61 605a	18 418	LSD = 11 523
Source of water for irrigation (%)					<0.0001
• Roof	0.0	0.0	0.0		
• River by direct extraction	33.3	30.0	57.1		
• Canal	11.1	10.0	14.3		
• Ground by means of borehole	22.2	20.0	28.6		
• Spring	0.0	0.0	0.0		
• Dam	33.3	40.0	0.0		
• Runoff (canal leaks or unused irrigation water)	0.0	0.0	0.0		
Adequacy of water source score (25-100%)	N/A	N/A	66	66	

Land was generally more abundant among households in Greater Tzaneen. Home gardens tended to be larger, households held more rainfed arable land, and both scheme plots and independently irrigated plots were about six times larger than in Thulamela. The degree of adequacy of water used for home garden irrigation was similar as in Thulamela but a smaller proportion of households irrigated their home gardens in Greater Tzaneen. The degree of adequacy of the source of water for irrigation on the Julesburg scheme was higher than at Dzindi but independent irrigators in Greater Tzaneen rated their source of water as less adequate than their counterparts in Thulamela. The majority of them extracted water directly from the river.

4.2.3 Financial capital

Financial capital indicators for Thulamela are presented in Table 4.6 and for Greater Tzaneen in Table 4.7. In Thulamela, substantial differences in the size of regular monetary flows were found between home gardener households on the one hand and irrigator households on the other. Differences among the three types of households in flows arising from different types of claims against the state (social grants) were not significant but income derived from salaries and wages was more than three times higher among irrigator households than among home gardener households. Scheme irrigator households also derived significantly more income from remittances. This suggested that family members of scheme irrigators, who lived elsewhere, and for this reason were not included as household members, were investing in their rural households. The greater regular flows of income received by irrigator households were reflected in their greater capacity to save. Saving among home gardener households was practically non-existent. All types of households invested money in insurance, primarily in the form of funeral policies, both formal and informal.

In Greater Tzaneen, only scheme irrigators received flows of regular income that were significantly greater than those received by the other types of households. This was also primarily as a result of more income being earned in the form of salaries and wages. Home gardeners in Greater Tzaneen had higher incomes than their counterparts in Thulamela, and this was reflected in their greater capacity to save. However, the amount of money invested in savings by irrigator households in Greater Tzaneen was still significantly more than that invested by home gardener households. As in Thulamela, all types of households invested in insurance. Independent irrigators in Greater Tzaneen stood out for having the highest debt repayments of all types of households.

TABLE 4.6: Financial capital indicators of households of home gardeners, scheme irrigators and independent irrigators in Thulamela Municipality (2012-13)

Financial capital indicator	**Home gardeners (n=125)**	**Scheme irrigators (n=101)**	**Independent irrigators (n=98)**	**All (n=324)**	**LSD (p=0.05)**
Regular flows of income (Rand)					
Income from salaries and wages (2012-13)	8 681$_{b}$	30 063$_{a}$	26 697$_{ab}$	20 850	22 724
Income from remittances (2012-13)	1 966$_{b}$	9 577$_{a}$	858$_{b}$	4 198	4 413
Income from old-age grants (2012-13)	6 411$_{a}$	10 570$_{a}$	12 232$_{a}$	9 405	4 251
Income from child-support grants (2012-13)	5 263$_{a}$	5 272$_{a}$	5 362$_{a}$	5 319	2 162
Income from other grants (2012-13)	1 675$_{a}$	1 868$_{a}$	1 036$_{a}$	1 587	2 549
Total income from regular income flows	23 997$_{b}$	57 350$_{a}$	46 185$_{a}$	41 359	22 058
Saving, insurance and debt repayment (Rand)					
Payments into saving instruments (2012-13)	491$_{b}$	7 778$_{a}$	4 926$_{ab}$	4 093	4 563
Insurance payments (2012-13)	1 399$_{b}$	1 903$_{ab}$	2 451$_{a}$	1 874	997
Debt repayments (2012-13)	198$_{a}$	3 863$_{a}$	2 185$_{a}$	1 936	4 238

TABLE 4.7: Financial capital indicators of households of home gardeners, scheme irrigators and independent irrigators in Greater Tzaneen Municipality (2012-13)

Financial capital indicator	**Home gardeners (n=47)**	**Scheme irrigators (n=21)**	**Independent irrigators (n=29)**	**All (n=97)**	**LSD (p=0.05)**
Regular flows of income (Rand)					
Income from salaries and wages (2012-13)	31 140$_{b}$	58 905$_{a}$	36 855$_{ab}$	38 860	22 724
Income from remittances (2012-13)	3 813$_{a}$	1 600$_{a}$	1 207$_{a}$	2 555	4 413
Income from old-age grants (2012-13)	7 277$_{b}$	14 263$_{a}$	7 771$_{b}$	8 937	4 251
Income from child-support grants (2012-13)	5 377$_{a}$	2 771$_{b}$	5 336$_{a}$	4 801	2 162
Income from other grants (2012-13)	965$_{b}$	4 970$_{a}$	4 352$_{a}$	2 845	2 549
Total income from regular income flows	48 572$_{b}$	82 509$_{a}$	55 521$_{b}$	57 997	22 058
Saving, insurance and debt repayment (Rand)					
Payments into saving instruments (2012-13)	2 994$_{b}$	8 250$_{a}$	9 216$_{a}$	5 992	4 563
Insurance payments (2012-13)	1 901$_{a}$	2 595$_{a}$	2 121$_{a}$	2 117	997
Debt repayments (2012-13)	385$_{b}$	564$_{b}$	5 345$_{a}$	1 907	4 238

4.2.4 Physical capital

Indicators for the physical capital assets held by households are presented in Table 4.8 for Thulamela and Table 4.9 for Greater Tzaneen. It must be noted that the scope of the investigation was limited to 'production goods and privately owned infrastructure' used in agriculture, and excluded public infrastructure and producer goods used in livelihood activities that are part of other economic sectors, such as construction. Tables 4.8 and 4.9 show that the physical assets owned by the majority of households across type and site were limited to basic hand tools, particularly hand hoes and spades. Ownership of knapsack sprayers was common among scheme and independent irrigators but rare among home gardeners. Ownership of wheel barrows, on the other hand, was widespread among home gardeners, particularly in Greater Tzaneen. Ownership of the means to cultivate land using draught power, be it animals or tractors, was limited at both study sites. Of significance was that ownership of cattle, which can be used to provide draught power was considerably more widespread than ownership of animal-drawn cultivation implements, particularly in Greater Tzaneen. This suggests that only a fraction of the households who owned cattle used these animals to provide draught power for cultivation (not more than half in Thulamela and about one-fifth in Greater Tzaneen).

In Thulamela, 4.3 % of households owned a tractor. All of them were part of the scheme irrigator or independent irrigator groups. In Greater Tzaneen, the proportion of households that owned a tractor was greater at 10.3% and here too ownership was limited to households in the scheme and independent irrigator groups. While none of the home gardener households at both study sites owned a tractor, this was not necessarily a constraint to cultivation, because the small size of the home gardens makes it feasible to cultivate by hand. This does not apply to the irrigated holdings of scheme and independent irrigators. Limited ownership of the means to cultivate using draught power amongst households in these two groups suggests that the majority among them hired the services of land preparation enterprises operating in their communities, which probably included other farmers, who owned the means to provide these services.

Ownership of mechanised transportation other than *bakkies* and trucks was low in Thulamela, but somewhat higher in Greater Tzaneen. Particularly significant was the total absence of ownership of such assets among home gardener households in Thulamela. At both study sites, ownership of *bakkies* or trucks was highest among independent irrigators. Ownership of irrigation equipment was unevenly spread among household types and between sites, with Greater Tzaneen showing a higher level of ownership than Thulamela.

TABLE 4.8: Ownership (%) of physical capital items used for farming among home gardeners, scheme irrigators and independent irrigators in Thulamela Municipality (2012-13)

Variable name	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance
Basic tools					
Hand hoe	98.4	100.0	100.0	99.4	0.137
Spade	88.8	92.0	81.6	87.6	0.251
Rake	73.6	79.0	58.2	70.6	0.004
Knapsack sprayer	9.6	78.0	52.0	43.7	0.000
Wheel barrow	69.6	77.0	66.3	70.9	0.000
Draught animals and implements					
Cattle	2.4	5.0	14.3	6.8	0.000
Horses	0.0	0.0	0.0	0.0	-
Donkeys	0.0	0.0	0.0	0.0	0.000
Animal-drawn plough	0.8	2.0	7.1	3.1	0.111
Animal-drawn harrow	0.0	1.0	1.0	0.6	0.547
Animal-drawn ridger	0.0	2.0	0.0	0.6	0.345
Animal-drawn planter	0.0	0.0	0.0	0.0	-
Animal-drawn cultivator	0.8	1.0	0.0	0.6	0.774
Tractor and implements					
Tractor	0.0	8.0	6.1	4.3	0.000
Tractor-drawn plough	0.0	7.0	4.1	3.4	0.000
Tractor-drawn disk	0.0	5.0	3.1	2.5	0.095
Tractor-drawn ridger	0.0	7.0	0.0	2.2	0.000
Tractor-drawn planter	0.0	0.0	0.0	0.0	-
Tractor-drawn cultivator	0.0	0.0	1.0	0.3	0.655

TABLE 4.8: continued

Variable name	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance
Transportation					
Tractor-drawn trailer	0.0	2.0	1.0	0.9	0.000
Animal-drawn cart	0.0	1.0	2.0	0.9	0.284
Bakkie or truck	0.0	20.0	37.8	17.7	0.000
Irrigation equipment					
Water pump	0.0	6.0	50.0	17.0	0.000
Irrigation pipes	4.0	16.0	67.4	26.9	0.000
Water storage facility	0.0	1.0	6.1	2.2	0.003
Other physical farm assets					
Poultry production facility	0.0	1.0	1.0	0.3	0.042
Farm shed	4.8	10.0	22.5	11.8	0.000
Grain storage facility	0.0	4.0	9.2	4.0	0.007
Grain mill	0.0	1.0	0.0	0.3	0.005

Comparing the six household groups, it is clear that ownership of irrigation pumps and pipes was highest among independent irrigators in Thulamela. Also significant was the exceptionally low levels of irrigation equipment ownership among home gardeners in Thulamela.

Privately owned infrastructure for use in agriculture, which included poultry production facilities, farm sheds, grain storage facilities and grain mills, were owned most commonly by independent irrigator households, especially in Thulamela, whilst in Greater Tzaneen, scheme irrigators had the highest levels of farm shed and grain mill ownership.

TABLE 4.9: Ownership (%) of physical capital items used for farming among home gardeners, scheme irrigators and independent irrigators in Greater Tzaneen Municipality (2012-13)

Variable name	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance
Basic tools					
Hand hoe	95.7	100.0	100.0	97.9	0.137
Spade	85.1	95.2	86.2	87.6	0.251
Rake	63.8	47.6	58.6	58.8	0.004
Knapsack sprayer	2.1	90.5	75.9	43.3	0.000
Wheel barrow	89.4	33.3	55.2	67.0	0.000
Draught animals and implements					
Cattle	10.6	28.6	37.9	22.7	0.000
Horses	0.0	0.0	0.0	0.0	-
Donkeys	0.0	4.8	10.3	4.1	0.000
Animal-drawn plough	2.1	4.8	6.9	4.1	0.111
Animal-drawn harrow	2.1	0.0	3.4	2.1	0.547
Animal-drawn ridger	2.1	0.0	0.0	1.0	0.345
Animal-drawn planter	0.0	0.0	0.0	0.0	-
Animal-drawn cultivator	2.1	0.0	0.0	1.0	0.774
Tractor and implements					
Tractor	0.0	14.3	24.1	10.3	0.000
Tractor-drawn plough	0.0	9.5	20.7	8.2	0.000
Tractor-drawn disk	0.0	4.8	6.9	3.1	0.095
Tractor-drawn ridger	0.0	0.0	10.3	3.1	0.000
Tractor-drawn planter	0.0	0.0	0.0	0.0	-
Tractor-drawn cultivator	0.0	0.0	0.0	0.0	0.655

TABLE 4.9: continued

Variable name	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance
Transportation					
Tractor-drawn trailer	0.0	14.3	10.3	6.2	0.000
Animal-drawn cart	0.0	4.8	3.4	2.1	0.284
Bakkie or truck	6.4	23.8	27.6	16.5	0.000
Irrigation equipment					
Water pump	0.0	28.6	37.9	17.5	0.000
Irrigation pipes	8.5	61.9	69.0	38.1	0.000
Water storage facility	10.6	4.8	10.3	9.3	0.003
Other physical farm assets					
Poultry production facility	2.1	0.0	13.8	5.2	0.042
Farm shed	0.0	23.8	20.7	11.3	0.000
Grain storage facility	4.3	4.8	13.8	7.2	0.007
Grain mill	2.1	9.5	3.4	4.1	0.005

4.2.5 Social capital

Tables 4.10 and 4.11 show the social capital indicators for Thulamela and Greater Tzaneen, respectively. At both sites, membership of religious organisations (churches) and burial societies was very high, exceeding 70% across study sites and household types, and almost universal in Thulamela. Whilst this was of great significance from a livelihood perspective, because it indicates that these two types of organisations connect people and bring them together on a frequent basis, these two types of organisations have little to do with farming. Membership of farmers' associations or cooperatives was considerably lower than membership of religious organisations and burial societies at both study sites. This was partly due to the low membership of agriculture-related organisations among the home gardener group. Among the other two groups, membership ranged from 28.3% among independent irrigators in Thulamela to 99% among scheme irrigators at Dzindi. In Greater Tzaneen, membership was also higher among scheme irrigators than among independent irrigators. The difference in membership of agriculture-related organisations between home gardeners on the one hand, and scheme and independent irrigators on the other, could be seen as a reflection of the relative importance of farming in the livelihoods of households in these groups. Membership of political parties and village committees is important for empowerment and political action. Membership of a political party (especially a governing party) connects households to people who could influence policy and perhaps more importantly who could influence the ways in which policies are implemented at community level. This has relevance for the allocation of government-issued goods and services for use in agriculture, such as fertilisers,

pesticides, seed and subsidised tractor services. Membership of village committees links households to governance at the local level, where in many cases decisions or recommendations on natural capital allocations are made. A significant finding was that at both study sites independent irrigator households were more likely to be members of political parties and village committees than households in the other two groups. Other important results were the exceptionally high membership of saving and credit groups among home gardeners in Thulamela and the lack of significance of water user associations in this municipality.

There were considerable differences in the ability to claim livelihood resources from others (social networks) among the two sites, suggesting cultural differences. The results indicated that a substantial proportion of households at both study sites were likely to successfully claim livelihood resources against others when it times of need, but this likelihood was by no means universal, with Thulamela scoring lower than Greater Tzaneen.

When in unforeseen need of money, households in Thulamela were most likely to claim successfully against family members, whilst in Greater Tzaneen they were more likely to be successful when claiming against friends or neighbours. The same pattern applied to claims for food and to a lesser extent labour. This suggests that households in Greater Tzaneen were socially better embedded in their communities than in Thulamela.

TABLE 4.10: Social capital indicators of households of home gardeners, scheme irrigators and independent irrigators in Thulamela Municipality (2012-13)

Social capital indicator	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance/ (LSD p=0.05)
Household membership of organisations (%)					
Farmer association or cooperative	0.0	99.0	28.6	39.3	p<0.0001
Water user association	0.0	0.0	2.0	0.6	p<0.0001
Trade union	0.8	11.0	13.3	7.7	p = 0.003
Village committee	23.2	32.0	51.0	34.4	p<0.0001
Religious group	95.2	98.0	90.8	94.7	p = 0.015
Political party	12.0	24.0	30.6	21.4	p = 0.001
Cultural association	12.0	8.0	20.4	13.3	p = 0.056
Burial society	94.4	97.0	93.9	95.7	p<0.0001
Credit or savings group	92.0	79.0	32.7	70.0	p<0.0001
Non- governmental or civic organisation	4.8	23.0	22.5	15.8	p<0.0001
Trust and expectations of household networks (%)					
Likelihood of successfully claiming money in an emergency					
Against family	51.6$_{a}$	58.5$_{a}$	49.7$_{a}$	53.1	LSD = 18.8
Against friends	23.6$_{a}$	26.8$_{a}$	29.8$_{a}$	26.5	LSD = 16.0
Against neighbours	21.2$_{a}$	25.5$_{a}$	21.7$_{a}$	22.7	LSD = 14.8
Against an organisation	16.4$_{a}$	30.8$_{a}$	28.1$_{a}$	24.4	LSD = 15.2
Likelihood of successfully claiming food in an emergency					
Against family	53.8$_{a}$	65.3$_{a}$	68.4$_{a}$	61.8	LSD = 17.9
Against friends	28.2$_{a}$	31.8$_{a}$	30.6$_{a}$	30.0	LSD = 16.5
Against neighbours	18.0$_{a}$	27.0$_{a}$	26.3$_{a}$	23.3	LSD = 15.5
Against an organisation	14.2$_{b}$	28.0$_{ab}$	30.6$_{a}$	23.5	LSD = 15.3

TABLE 4.10: continued

Social capital indicator	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	LSD (p=0.05)
Likelihood of successfully claiming labour in an emergency					
Against family	87.8a	80.3a	64.0b	78.3	LSD = 14.6
Against friends	79.2a	43.5b	22.7c	51.0	LSD = 16.4
Against neighbours	79.6a	38.3b	15.3c	47.3	LSD = 15.4
Against an organisation	62.0a	34.8b	17.6c	40.1	LSD = 16.7

TABLE 4.11: Social capital indicators of households of home gardeners, scheme irrigators and independent irrigators in Greater Tzaneen Municipality (2012-13)

Social capital indicator	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance (LSD p=0.05)
Household membership of organisations (%)					
Farmer association or cooperative	2.1	71.4	41.4	28.9	p<0.0001
Water user association	0.0	28.6	10.3	9.3	p<0.0001
Trade union	2.1	4.8	6.9	4.1	p = 0.003
Village committee	12.8	14.3	27.6	17.5	p<0.0001
Religious group	85.1	90.5	82.8	85.6	p = 0.015
Political party	29.8	33.3	44.8	35.1	p = 0.001
Cultural association	8.5	4.8	20.7	11.3	p = 0.056
Burial society	83.0	90.5	72.4	81.4	p<0.0001
Credit or savings group	29.8	42.9	27.6	32.0	p<0.0001
Non-governmental or civic organisation	8.5	4.8	6.9	7.2	p<0.0001

TABLE 4.11: continued

Social capital indicator	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance (LSD p=0.05)
Trust and expectations of household networks (%)					
Likelihood of successfully claiming money in an emergency					
Against family	27.1	22.6	48.3	32.5	LSD = 18.8
Against friends	64.4	78.6	59.5	66.0	LSD = 16.0
Against neighbours	54.3	65.5	63.8	59.5	LSD = 14.8
Against an organisation	33.0	33.3	45.7	36.8	LSD = 15.2
Likelihood of successfully claiming food in an emergency					
Against family	21.8	15.5	24.1	21.1	LSD = 17.9
Against friends	60.1	64.3	51.7	58.5	LSD = 16.5
Against neighbours	47.3	42.9	60.3	50.3	LSD = 15.5
Against an organisation	46.3	45.2	43.1	45.1	LSD = 15.3
Likelihood of successfully claiming labour in an emergency					
Against family	14.4	9.5	11.2	12.4	LSD = 14.6
Against friends	25.5	39.3	23.3	27.8	LSD = 16.4
Against neighbours	19.7	23.8	33.6	24.7	LSD = 15.4
Against an organisation	17.6	21.4	27.6	21.4	LSD = 16.7

4.3 Access

The results pertaining to access to livelihood resources are presented in Table 4.12 for Thulamela and Table 4.13 for Greater Tzaneen. The resources that were investigated included land (security of tenure), support services (training and advice) and produce (output) markets.

Across the two study sites and without exceptions, residential land was held by means of rights that were registered, indicating secure tenure. To a large extent, this also applied to land held on irrigation schemes at both sites, but not to independently irrigated land in Thulamela. Almost half of the farmers in Thulamela held their independently irrigated plots by means of rights that were not registered, suggesting tenure security risks, particularly for those who accessed land opportunistically (36%).

In terms of having accessed support services, the results indicated large differences between home gardener households and irrigator households. Irrigators, particularly scheme irrigators, had accessed both training and advisory services more frequently than home gardeners. Irrigation schemes have been the focus of (public) extension services for

decades, and this probably explains the difference in access between scheme irrigators and independent irrigators. However, the significant difference in accessing training and advice between independent irrigators and home gardeners suggest that the former have been seeking such access more actively than home gardeners. Also clearly evident from the results at both sites is that advice and training in production and irrigation is more easily accessed than advice and training in marketing and farm management.

In Thulamela, farmers accessing finance for farming, be it production or capital items, by means of loans was rare. Accessing finance for farming by means of grants was more common, and receiving farm inputs in the form of a donation (usually from the Provincial Department of Agriculture) was common among scheme irrigators. For example, during the year 0 1 July 2012 to 30 June 2013, all farmers at Dzindi received pesticides free of charge from the Provincial Department of Agriculture. In Greater Tzaneen, farmers were more likely to have accessed finance for farming through a loan than in Thulamela, but they were less likely to have received donations.

Access to the different types of markets reflected the degree of sophistication and risk inherent to these markets. In Thulamela, home gardeners only sold directly to local consumers. Irrigators accessed a wider array of markets but very few had accessed markets beyond the local. In Greater Tzaneen, the general picture was similar, but the absence of a nearby town was clearly evident by the lack of sales to street traders. As a result farmers transporting produce to sell to consumers was very common among them. As in Thulamela, accessing distant markets was not common.

TABLE 4 12: Access to resources among households of home gardeners, scheme irrigators and independent irrigators in Thulamela Municipality (2012-13)

Resource	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance
Land					
Residential land					N/A
Registered right (%)	100.0	100.0	100.0	100.0	
Rainfed arable land					N/A
Registered right (%)	100.0	100.0	100.0	100.0	
Unconditional usufruct (%)	0.0	0.0	0.0	0.0	
Rented from someone else (%)	0.0	0.0	0.0	0.0	
Sharecropping arrangement (%)	0.0	0.0	0.0	0.0	
Scheme land					**0.152**
Registered right (%)	N/A	97.0	90.9	96.4	
Unconditional usufruct (%)	N/A	0.0	9.1	0.9	
Sharecropping arrangement (%)	N/A	3.0	0.0	2.7	
Independently irrigated land					**0.0496**
Registered right (%)	N/A	100.0	51.0	52.0	
Unconditional usufruct (%)	N/A	0.0	10.2	10.1	
Rented from someone else (%)	N/A	0.0	1.0	1.0	
Sharecropping arrangement (%)	N/A	0.0	1.0	1.0	
Opportunistic and unregistered access (%)	N/A	0.0	36.7	35.9	

TABLE 4.12: continued

Resource	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance
Training service					
Training in production of crops	1.6	82.3	24.5	33.6	<0.0001
Training in irrigation of crops	0.8	72.3	23.5	29.9	<0.0001
Training in marketing of crops	0.0	47.5	20.4	21.0	<0.0001
Training in Business management	0.0	28.7	19.4	14.8	<0.0001
Training in financial management	0.0	14.9	12.2	8.3	<0.0001
Advisory service					
Crop production advice	8.0	93.1	38.8	43.8	<0.0001
Irrigation advice	0.8	82.2	28.6	34.6	<0.0001
Crop marketing advice	0.0	58.4	26.5	26.2	<0.0001
Business management advice	0.0	36.6	22.5	18.2	<0.0001
Financial management advice	0.0	19.8	15.3	10.8	<0.0001
Loans					
Loan to purchase farm equipment	0.0	1.0	0.0	0.3	0.002
Production loan	0.0	1.0	0.0	0.3	0.005
Grants and donations					
Grant to purchase equipment	0.0	47.5	11.2	18.2	<0.0001
Grant to purchase production inputs	0.0	8.9	2.0	3.4	0.011
Donation of farm inputs	0.0	100.0	11.2	34.2	<0.0001

TABLE 4.12: continued

Resource	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance
Access to produce markets					
Sold produce in 2012-13 (%)	8.0	97.0	77.6	56.8	<0.0001
Types of markets accessed by those who sold produce					
On-farm sales directly to local consumers (%)	100.0	76.2	82.9	80.2	0.0073
Off-farm sales directly to local consumers (%)	0.0	59.4	43.4	52.5	<0.0001
On-farm sales to street traders (%)	0.0	37.6	30.3	34.5	<0.0001
On-farm sales to *bakkie* traders (%)	0.0	26.7	32.9	29.4	<0.0001
Sales to local shops or supermarkets (%)	0.0	15.8	17.1	16.4	<0.0001
Sales to national fresh produce markets (%)	0.0	2.0	14.3	7.3	<0.0001
Sales to other distant markets (%)	0.0	0.0	0.0	0.0	N/A

TABLE 4.13: Access to resources among households of home gardeners, scheme irrigators and independent irrigators in Greater Tzaneen Municipality (2012-13)

Resource	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance
Land					
Residential land					**N/A**
Registered right (%)	100.0	100.0	100.0	100.0	
Rainfed arable land					N/A
Registered right (%)	66.7	66.7	100.0	73.7	
Unconditional usufruct (%)	16.7	0.0	0.0	10.5	
Rented from someone else (%)	8.3	33.3	0.0	10.5	
Sharecropping arrangement (%)	8.3	0.0	0.0	5.3	
Scheme land					**0.152**
Registered right (%)	100.0	100.0	100.0	100.0	
Unconditional usufruct (%)	0.0	0.0	0.0	0.0	
Sharecropping arrangement (%)	0.0	0.0	0.0	0.0	
Independently irrigated land					**0.0496**
Registered right (%)	100.0	70.0	100.0	89.7	
Unconditional usufruct (%)	0.0	20.0	0.0	6.9	
Rented from someone else (%)	0.0	10.0	0.0	3.4	
Sharecropping arrangement (%)	0.0	0.0	0.0	0.0	
Opportunistic and unregistered access (%)	0.0	0.0	0.0	0.0	

TABLE 4.13: continued

Resource	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance
Training service					
Training in production of crops	27.7	57.1	27.6	34.0	<0.0001
Training in irrigation of crops	10.6	42.9	24.1	21.6	<0.0001
Training in marketing of crops	10.6	42.9	10.3	17.5	<0.0001
Training in Business management	10.6	47.6	10.3	18.6	<0.0001
Training in financial management	8.5	38.1	10.3	15.5	<0.0001
Advisory service					
Crop production advice	27.7	52.4	17.2	29.9	<0.0001
Irrigation advice	14.9	42.9	17.2	21.6	<0.0001
Crop marketing advice	17.0	42.9	10.3	20.6	<0.0001
Business management advice	10.6	52.4	6.9	18.6	<0.0001
Financial management advice	8.5	38.1	6.9	14.4	<0.0001
Loans					
Loan to purchase farm equipment	4.3	9.5	6.9	6.2	0.002
Production loan	6.4	4.8	6.9	6.2	0.005
Grants and donations					
Grant to purchase equipment	4.3	4.8	6.9	5.2	<0.0001
Grant to purchase production inputs	2.1	4.8	3.4	3.1	0.011
Donation of farm inputs	6.4	9.5	3.4	6.2	<0.0001

TABLE 4.13: continued

Resource	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)	All (n=97)	Statistical significance
Access to produce markets					
Sold produce in 2012- 13 (%)	10.6	95.2	89.7	52.6	<0.0001
Types of markets accessed by those who sold produce					
On-farm sales directly to local consumers (%)	8.5	9.5	41.4	18.6	0.0073
Off-farm sales directly to consumers elsewhere (%)	2.1	95.2	55.2	38.1	<0.0001
On-farm sales to street traders (%)	0.0	0.0	0.0	0.0	N/A
On-farm sales to *bakkie* traders (%)	0.0	23.8	6.9	7.2	<0.0001
Sales to local shops or supermarkets (%)	0.0	4.8	13.8	5.2	<0.0001
Sales to national fresh produce markets (%)	0.0	9.5	24.1	9.3	<0.0001
Sales to other distant markets (%)	0.0	0.0	3.4	1.0	N/A

4.4 Livelihood strategy and activities

Information on the livelihood strategies of households is presented in Table 4.14 for Thulamela, and Table 4.16 for Greater Tzaneen. In Thulamela, the likelihood of households deriving income from being employed (salaries and wages), claiming against the state (social grants) or being self-employed, differed little among the three types of households. However, there was a large difference between home gardeners and irrigator households in the likelihood of deriving money from agriculture through the sale of produce. Scheme irrigators were also more likely to derive income from remittances, which supports the observation made under the heading of financial capital.

A different picture emerged in Greater Tzaneen where home gardener households were more likely to derive income as salaries and wages and from remittances than irrigator households. However, as in Thulamela, irrigators were much more likely to derive money from agriculture through the sale of produce than home gardeners.

TABLE 4.14: Indicators of the livelihood strategy of households of home gardeners, scheme irrigators and independent irrigators in the Thulamela and Greater Tzaneen municipalities (2012-13)

Livelihood strategy indicator	Home gardeners	Scheme irrigators	Independent irrigators	All	Statistical significance/ LSD (p=0.05)
Likelihood of inclusion of source of monetary income in livelihood portfolio (%)					
Thulamela (n=324)					
Salaries and wages	34.4	32.7	37.8	34.9	0.0001
Remittances	23.2	37.6	19.4	26.5	0.010
Social grants	87.2	86.1	87.8	87.0	0.918
Local economic activity excluding agriculture	38.4	36.6	42.9	39.2	0.815
Agriculture (commercial)	8.0	97.0	77.6	56.8	<0.0001
Greater Tzaneen (n=97)					
Salaries and wages	70.2	57.1	31.0	55.7	0.0001
Remittances	34.0	14.3	13.8	23.7	0.010
Social grants	83.0	81.0	82.8	82.5	0.918
Local economic activity excluding agriculture	46.8	38.1	34.5	41.2	0.815
Agriculture (commercial)	10.6	95.2	79.3	49.5	<0.0001
Cropping intensity of different types of land					
Thulamela (n=324)					
Home garden (%)	108	97	54	87	LSD = 19.4
Rainfed arable land (%)	100	80	8	12	LSD = 34.3
Land on irrigation scheme (%)	N/A	89	7	49	LSD = 12.3
Independently irrigated land (%)	N/A	8	79	78	LSD = 38.0
Greater Tzaneen (n=97)					
Home garden (%)	100	89	85	96	LSD = 19.4
Rainfed arable land (%)	67	91	32	62	LSD = 34.3
Land on irrigation scheme (%)	N/A	53	N/A	-	-
Independently irrigated land (%)	N/A	N/A	46	-	-

4.5 Livelihood outcomes

The livelihood outcome indicators for Thulamela are presented in Table 4.15 and for Greater Tzaneen in Table 4.16.

In Thulamela, total income and per capita income of irrigator households was more than double that of home gardener households. Part of the difference in income between irrigators and home gardeners was due to the difference in farm income, which was about R20 000 among the two irrigator household categories and less than R1 000 for home gardener households. However, the main cause for the observed differences in household income difference was the difference in regular income flows received by households. Whereas irrigator households received about R50 000 in the form of regular flows of income, home gardener households only obtained about R17 000 in this manner. Yet, the proportional contribution of regular flows of income to total household income was higher among home gardeners (77.4%) than among irrigator households (62.2% and 61.7% for scheme and independent irrigators, respectively). Per capita income of home gardener households was less than R12 000 per annum or R1 000 per month, which more or less represented the poverty line at the time of the survey.

In Greater Tzaneen, household incomes were higher than in Thulamela, including the income of home gardeners. Per capita income of all three categories of households exceeded R12 000 per annum. As in Thulamela, both income from farming and income derived from regular flows of income accounted for most of the difference in household income between irrigators and home gardeners.

As could be expected, expenditure on agriculture (operating expenses) was significantly higher among irrigator households than among home gardeners, in line with the scale of their operations. Noteworthy was that relative to scheme irrigators, independent irrigators tended to have higher operating costs, which implied smaller margins, because gross incomes were similar. Pumping costs were most likely the reason for the difference in operating expenses between scheme irrigators and independent irrigators. In Greater Tzaneen, operating costs were high relative to gross income, especially among scheme irrigators.

Food security indicators provided mixed messages at both study sites. In Thulamela, irrigator households tended to spend more money on food than home gardener households and they also obtained more of their food through own production. As a result, total food expenditure of irrigator households in Thulamela was about 50% higher than in home gardener households. Yet, the ratio of food expenditure to total expenditure was higher among home gardeners than among irrigator households, and since it exceeded the value of 0.3, there is an indication that the livelihoods of home gardeners were under strain, as was already suggested by their low per capita income. However, when comparing the 'food situation' among the three types of households it would appear that all of them consider that food is inadequate some of the time. The quality of diet indicator, which considers the frequency with which a range of nutrient dense foods are consumed, scheme irrigator households scored higher than the other two types of households. In Greater Tzaneen, household expenditure on food was lower than in Thulamela, but all of

the other food security indicators suggested that the food security of households across categories was higher than in Thulamela. In Greater Tzaneen, there was also a tendency for irrigator households to rate their food situation as more secure than home gardener households, but this was not reflected in the quality of diet indicator.

Asset accumulation was associated with household income in Thulamela for all three asset classes that were considered. In Greater Tzaneen, differences in asset value among households were less prominent, except for farm physical capital, which was significantly higher among irrigator households than among home gardener households.

Quality of life indicators pertaining to energy, domestic water and sanitation tended to reflect income differences among households in both Thulamela and Greater Tzaneen, but the threat of having one's possessions stolen appeared to be greater among irrigators than among home gardeners. At both sites and across types of households, threats of assault or harassment by officials or members of the community were perceived to be very low.

TABLE 4.15: Livelihood outcome indicators of households of home gardeners, scheme irrigators and independent irrigators in Thulamela Municipality (2012-13)

Outcome indicator	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance/ LSD (p=0.05)
Household income (1 July 2012 to 30 June 20-13)					
Income from regular flows (Rand)	23 997$_b$	57 350$_a$	46 185$_a$	41 359	22 058
Income from other flows excluding agriculture (Rand)	6 851	9 788	11 275	9 721	p>0.05
Undisclosed income (Rand)	279$_a$	4 049$_a$	2 080$_a$	2 169	5 126
Gross income from agriculture (Rand)	917$_b$	21 128$_a$	19 870$_a$	13 358	12 459
Total household income (Rand)	32 044$_b$	92 208$_a$	79 410$_a$	66 634	29 180
Total household income per person (Rand)	8 502$_b$	20 153$_a$	20 926$_a$	15 910	10 517
Degree of income regularity (%)	77.4$_a$	62.2$_b$	61.7$_b$	67.9	12.9
Food security					
Food expenditure and own production					
Total expenditure of food purchases (Rand)	9 498$_b$	12 324$_a$	11 531$_{ab}$	10 976	2 581
Value of consumption of own production (Rand)	680$_b$	2 741$_a$	3 528$_a$	2 383	1 677
Total food expenditure (Rand)	10 178$_b$	15 065$_a$	15 059$_a$	13 339	3 306
Ratio of food to total expenditure	0.36$_a$	0.23$_b$	0.26$_{ab}$	0.28	0.1097
Relative contribution of own production to total food exp. (%)	7.6$_b$	16.6$_b$	22.4$_a$	16.6	10.94
Expenditure on agriculture (all operating costs) (Rand)	363$_b$	10 855$_a$	14 696$_a$	2 383	7 976
Household food situation					**<0.0001**
• Food is never enough	11.2	5.0	5.1	7.4	
• Food is not enough most of the time	43.2	53.5	46.9	47.5	
• Food is not enough half of the time	25.6	9.9	18.4	18.5	
• Food is enough most of the time	3.2	19.8	11.2	10.8	
• Food is always enough	16.8	11.9	18.4	15.7	

TABLE 4.15: continued

Outcome indicator	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance/ LSD (p=0.05)
Quality of the household diet					
Frequency of legume consumption per week	1.29$_{a}$	1.65$_{a}$	1.20$_{a}$	1.38	p>0.05
Frequency of vegetable consumption per week	3.90$_{b}$	4.95$_{a}$	5.57$_{a}$	4.73	0.943
Frequency of fruit consumption per week	3.26$_{b}$	4.85$_{a}$	4.59$_{a}$	4.16	1.106
Frequency of meat consumption per week	3.18	3.71	2.95	3.27	p>0.05
Frequency of egg consumption per week	2.58$_{ab}$	3.35$_{a}$	2.33$_{b}$	2.74	1.033
Frequency of dairy consumption per week	2.75	3.72	2.73	3.05	p>0.05
Indicator of nutrient dense food in diet	16.96$_{b}$	22.24$_{a}$	18.17$_{b}$	18.97	3.177
Monetary value of selected assets					
Consumer durables	20 430$_{b}$	39 646$_{a}$	25 519$_{b}$	27 959	7 531
Personal transportation assets	2 176$_{b}$	25 485$_{a}$	11 235$_{b}$	12 182	13 984
Farm assets	4 081$_{b}$	43 972$_{a}$	53 381$_{a}$	31 428	27 977
Quality of life (energy), water and sanitation)					
Source of energy used for cooking (%)					0.0017
• Electricity	48.8	56.4	38.8	48.2	
• Gas	0.0	1.0	3.1	1.2	
• Coal/paraffin	0.0	0.0	1.0	0.3	
• Wood	51.2	42.6	57.1	50.3	

TABLE 4.15: continued

Outcome indicator	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance
Quality of life (domestic water)					
Source of water used for domestic purposes					<0.0001
• Piped in dwelling	0.8	14.9	16.3	9.9	
• Stand pipe on residential site	44.8	68.3	39.8	50.6	
• Public stand pipe	40.8	16.8	12.3	24.7	
• Borehole	2.4	0.0	6.1	2.8	
• Open source (dam/river/canal)	0.0	0.0	5.1	1.5	
• Roof water tank	0.0	0.0	0.0	0.0	
• Spring	0.0	0.0	7.1	2.2	
• Purchase from neighbours	11.2	0.0	13.3	8.3	
Quality of life (sanitation)					
Type of toilet					<0.0001
• Water borne sewerage	2.4	2.0	4.1	2.8	
• French drain (flushing toilet)	2.4	22.8	16.3	13.0	
• Enclosed pit latrine	94.4	74.3	77.6	83.0	
• Open pit	0.0	1.0	0.0	0.3	
• No toilet	0.8	0.0	2.0	0.9	
Quality of life (security of possessions)					
Threat of belongings being stolen					<0.001
• Always	25.6	5.9	33.7	27.9	
• Most of the time	4.0	2.0	9.2	4.9	
• Some of the time	22.4	20.8	13.3	19.1	
• Mostly not	0.0	5.9	4.1	0.3	
• Never	48.0	64.4	39.8	50.6	

TABLE 4.15: continued

Outcome indicator	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)	All (n=324)	Statistical significance
Quality of life (personal safety)					
Threat of being assaulted					0.0156
• Always	9.6	2.0	10.2	7.4	
• Most of the time	0.8	0.0	6.1	2.2	
• Some of the time	5.6	3.0	3.1	4.0	
• Mostly not	0.0	3.0	2.0	1.5	
• Never	84.0	92.0	78.6	84.9	
Quality of life (harassment)					
Threat of being harassed by officials					0.5185
• Always	0.8	2.0	1.0	1.2	
• Most of the time	0.8	0.0	1.0	0.6	
• Some of the time	2.4	2.0	5.1	3.1	
• Mostly not	0.0	1.0	0.0	0.3	
• Never	96.0	96.0	92.9	94.8	
Threat of being harassed by community members					**0.0893**
• Always	3.2	2.0	0.0	1.9	
• Most of the time	0.8	0.0	3.1	1.2	
• Some of the time	1.6	6.9	2.0	3.4	
• Mostly not	0.0	2.0	3.1	1.5	
• Never	94.4	89.1	91.8	92.0	

TABLE 4.16: Livelihood outcome indicators of households of home gardeners, scheme irrigators and independent irrigators in Greater Tzaneen Municipality (2012-13)

Outcome indicator	**Home gardeners (n=46)**	**Scheme irrigators (n=18)**	**Independent irrigators (n=26)**	**All (n=90)**	**Statistical significance/ LSD (p=0.05)**
Household income (1 July 2012 to 30 June 2013)					
Income from regular flows (Rand)	48 704$_{b}$	79 631$_{a}$	52 144$_{b}$	55 883	22 978
Income from other flows excluding agriculture (Rand)	4 153	4 044	8 611	5 419	p>0.05
Undisclosed income (Rand)	8 476$_{b}$	9 739$_{ab}$	13 787$_{a}$	10 263	5 126
Gross income from agriculture (Rand)	1 454$_{b}$	38 954$_{a}$	39 090$_{a}$	19 826	12 459
Total household income (Rand)	62 787$_{b}$	132 369$_{a}$	113 632$_{a}$	91 392	29 180
Total household income per person (Rand)	12 868$_{c}$	27 778$_{a}$	27 195$_{a}$	19 989	10 517
Degree of income regularity (%)	72.8$_{a}$	57.2$_{b}$	48.5$_{b}$	62.7	12.9
Food security					
Food expenditure and own production					
Total expenditure of food purchases (Rand)	7 933$_{a}$	8 913$_{a}$	10 304$_{a}$	8 814	2 581
Value of consumption of own production (Rand)	1 454$_{a}$	2 510$_{a}$	2 532$_{a}$	1 977	1 677
Total food expenditure (Rand)	9 387$_{b}$	11 423$_{ab}$	12 836$_{a}$	10 791	3 306
Ratio of food to total expenditure	0.18$_{a}$	0.12$_{a}$	0.15$_{a}$	0.16	0.1097
Relative contribution of own production to total food exp. (%)	15.2$_{a}$	17.5$_{a}$	18.2$_{a}$	16.5	10.94
Expenditure on agriculture (all operating costs) (Rand)	2 017$_{c}$	34 902$_{a}$	22 574$_{b}$	14 533	7 700
Household food situation					<0.0001
• Food is never enough	2.2	5.6	11.5	5.6	
• Food is not enough most of the time	39.1	27.8	11.5	28.9	
• Food is not enough half of the time	23.9	27.8	26.9	25.6	
• Food is enough most of the time	26.1	22.2	23.1	24.4	
• Food is always enough	8.7	16.7	26.9	15.6	

TABLE 4.16: continued

Outcome indicator	Home gardeners (n=46)	Scheme irrigators (n=18)	Independent irrigators (n=26)	All (n=90)	Statistical significance/ LSD (p=0.05)
Quality of the household diet					
Frequency of legume consumption per week	0.96	2.06	2.46	1.61	p>0.05
Frequency of vegetable consumption per week	4.09$_{b}$	4.78$_{ab}$	5.23$_{a}$	4.56	0.943
Frequency of fruit consumption per week	3.54$_{ab}$	2.78$_{b}$	4.19$_{a}$	3.58	1.106
Frequency of meat consumption per week	3.50	4.17	2.92	3.47	p>0.05
Frequency of egg consumption per week	3.13$_{a}$	2.39$_{ab}$	1.69$_{b}$	2.57	1.033
Frequency of dairy consumption per week	3.33	4.00	2.85	3.32	p>0.05
Indicator of nutrient dense food in diet	18.54$_{a}$	20.17$_{a}$	19.35$_{a}$	19.10	3.177
Monetary value of selected assets					
Consumer durables	27 237$_{a}$	30 528$_{a}$	25 788$_{a}$	27 477	7 531
Personal transportation assets	10 696$_{a}$	7 611$_{a}$	15 692$_{a}$	11 522	13 984
Farm assets	9 283$_{b}$	34 267$_{b}$	71 631$_{a}$	32 291	27 977
Quality of life (energy), water and sanitation)					
Source of energy used for cooking (%)					**0.0017**
• Electricity	69.6	88.9	65.4	72.2	
• Gas	0.0	0.0	0.0	0.0	
• Coal/paraffin	0.0	0.0	0.0	0.0	
• Wood	30.4	11.1	34.6	27.8	

TABLE 4.16: continued

Outcome indicator	Home gardeners (n=46)	Scheme irrigators (n=18)	Independent irrigators (n=26)	All (n=90)	Statistical significance
Quality of life (domestic water)					
Source of water used for domestic purposes (%)					<0.0001
• Piped in dwelling	0.0	5.6	23.1	7.8	
• Stand pipe on residential site	23.9	16.7	34.6	25.6	
• Public stand pipe	45.7	50.0	23.1	40.0	
• Borehole	26.1	22.2	15.4	22.2	
• Open source (dam/river/canal)	2.2	0.0	3.8	2.2	
• Roof water tank	0.0	0.0	0.0	0.0	
• Spring	2.2	5.6	0.0	2.2	
• Purchase water from neighbours	0.0	0.0	0.0	0.0	
Quality of life (sanitation)					
Type of toilet (%)					<0.0001
• Water borne sewerage	0.0	5.6	0.0	1.1	
• French drain (flushing toilet)	0.0	11.1	26.9	10.0	
• Enclosed pit latrine	95.7	83.3	57.7	82.2	
• Open pit	2.2	0.0	15.4	5.6	
• No toilet	2.2	0.0	0.0	1.1	
Quality of life (security of possessions)					
Threat of belongings being stolen (%)					<0.001
• Always	2.2	0.0	0.0	1.1	
• Most of the time	2.2	11.1	11.5	6.7	
• Some of the time	6.5	16.7	3.8	7.8	
• Mostly not	8.7	11.1	30.8	15.6	
• Never	80.4	61.1	53.8	68.9	

TABLE 4.16: continued

Outcome indicator	Home gardeners (n=46)	Scheme irrigators (n=18)	Independent irrigators (n=26)	All (n=90)	Statistical significance
Quality of life (personal safety)					
Threat of being assaulted (%)					0.0156
• Always	2.2	0.0	0.0	1.1	
• Most of the time	2.2	0.0	3.8	2.2	
• Some of the time	6.5	11.1	3.8	6.7	
• Mostly not	0.0	0.0	7.7	2.2	
• Never	89.1	88.9	84.6	87.8	
Quality of life (harassment)					
Threat of being harassed by officials (%)					0.5185
• Always	0.0	0.0	0.0	0.0	
• Most of the time	0.0	0.0	0.0	0.0	
• Some of the time	0.0	0.0	0.0	0.0	
• Mostly not	4.3	0.0	3.8	3.3	
• Never	95.7	100.0	96.2	96.7	
Threat of being harassed by community members (%)					0.0893
• Always	0.0	0.0	0.0	0.0	
• Most of the time	0.0	0.0	0.0	0.0	
• Some of the time	4.3	11.1	0.0	4.4	
• Mostly not	2.2	0.0	7.7	3.3	
• Never	93.5	88.9	92.3	92.2	

Livelihood outcomes in relation to local, provincial and national statistics are presented in Table 4.17 for Thulamela and in Table 4.18 for Greater Tzaneen.

Although the household size did not markedly differ among home gardeners, scheme and independent irrigators, it was noticeably higher in comparison to local, provincial and national household size. The majority (62%) of home gardener households were female-headed and nearly half of local, provincial and national households were also headed by females. Considerable differences were found with the irrigators, which were mainly headed by males. This suggests an exclusion of women in irrigation farming in Greater Tzaneen.

Age and educational level did not differ substantially across household types and at local, provincial and national level. A large proportion (>60%) of the household members across household type and at local, provincial and national levels were in the age brackets of 15 to 64 years. The proportion of members who completed grade 12 was greater in all the six groups. The education levels differed slightly among the groups, with scheme irrigators having the highest proportion of members who completed grade 12 and independent irrigators had the highest proportion of members with a tertiary qualification. With regard to the unemployment rate, home gardener households had the highest proportion (54.5%) of unemployed household members. Surprisingly, the three household types showed a higher proportion of unemployed household members compared to that of Greater Tzaneen, Mopani, Limpopo and South Africa.

Scheme and independent irrigators had far higher household income than home gardeners. There was little difference between scheme irrigators, independent irrigators and the national household income, whilst home gardeners did not differ much in comparison to local and provincial household income. This indicates that irrigation fosters diversity in farm production, hence high farm income. Electricity is the most common source of energy used for cooking across the household types, with the remainder using wood for cooking. This is consistent with the households at national level. However, locally, wood is the predominant source of energy. More than half (57.1%) of independent irrigators had municipal water piped in their yards while a large proportion of home gardeners (44.7%) and scheme irrigators (42.9%) depended on public stand pipes. At local, provincial and national levels, there's a high dependence on water sources piped in yard. Noteworthy, a significant number of the household types still have no access to piped water compared to local, provincial and national levels. Comparing the three household types, a majority of households used pit latrines, which are also predominant at both local and provincial levels. However, use of pit latrines at national level is significantly low (28%).

TABLE 4.17: Selected human development indicators of home gardener, scheme and independent irrigator households in Thulamela (n=324; 2012-13) in relation to local, provincial and national statistics (2011 census)

Indicator	Home gardeners (2012-13)	Scheme irrigators (2012-13)	Independent irrigators (2012-13)	Thulamela (2011)	Vhembe (2011)	Limpopo (2011)	South Africa (2011)
Household size	**4.5**	**5.7**	**5.6**	**3.5**	**3.6**	**3.7**	**3.6**
Female-headed households (%)	**56.0**	**36.6**	**23.5**	**47.8**	**50.9**	**50.4**	**41.2**
Age							
• 0-14 years old (%)	35.0	31.3	29.2	31.8	33.8	34.0	29.2
• 15-64 years old (%)	57.0	59.5	59.4	62.4	60.5	59.8	65.5
• 65+ years old (%)	8.0	9.2	11.4	5.7	5.7	6.2	5.3
Education (20 years and older)							
• No schooling (%)	17.0	10.1	12.0	18.7	21.2	17.3	8.6
• Completed grade 12 (%)	24.0	38.0	36.7	21.8	20.8	22.4	28.9
• Tertiary education (%)	4.0	20.8	15.5	8.7	8.2	9.5	11.8
Unemployment rate (%)	54.5	42.1	42.0	36.7	39.8	38.9	29.8
Household income (R)	32.044	92 300	84 396	54 627	51 121	56 841	103 204
Source of energy for cooking							
• Electricity (%)	70.2	56.4	38.8	30.6	62.6	40.4	73.9
• Wood (%)	29.8	42.6	57.2	67.1	28.0	57.5	12.5
• Animal dung (%)	0.0	0.0	0.0	0.0	0.1	0.0	0.3
• Paraffin (%)	0.0	0.0	1.0	0.7	6.9	1.0	8.5
• Coal (%)	0.0	0.0	0.0	0.1	0.1	0.1	0.7
• Gas (%)	0.0	0.0	0.0	0.1	0.1	0.9	3.5
• Solar (%)	0.0	0.0	3.0	1.2	0.0	0.1	0.2
• Candles (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
• None	0.0	0.0	0.0	0.2.	0.0	0.0	0.0
• Other (%)	0.0	0.0	0.0	0.0	0.1	0.0	0.2

TABLE 4.17: continued

Indicator	Home gardeners (2012-13)	Scheme irrigators (2012-13)	Independent irrigators (2012-13)	Thulamela (2011)	Vhembe (2011)	Limpopo (2011)	South Africa (2011)
Access to municipal water							
• Piped in dwelling or yard (%)	44.8	23.8	57.2	41.9	43.5	52.3	73.4
• Public standpipe (%)	42.8	42.9	7.1	47.0	44.8	33.7	17.9
• No access (%)	12.4	33.3	35.7	11.1	11.7	14.0	8.8
Type of toilet							
• Flushing /chemical toilet (%)	2.4	23.8	19.4	16.3	16.3	22.7	62.6
• Pit latrines (%)	94.4	76.2	77.6	73.2	73.2	68.0	28.0
• Bucket (%)	0.0	0.0	0.0	0.4	0.4	0.6	2.1
• Other (%)	0.0	0.0	0.0	1.2	1.2	1.5	2.1
• None (%)	0.8	0.0	3.0	8.9	8.9	7.2	5.2
Consumer durables							
• Cell phone (%)	95.7	98.0	96.6	90.8	89.7	88.5	88.9
• Radio (%)	36.2	76.2	48.3	64.7	64.6	62.1	67.5
• Computer (%)	21.3	32.7	24.1	12.2	12.1	12.4	21.4
• Fridge (%)	89.4	96.0	93.1	67.5	67.5	68.0	68.4
• Television (%)	93.6	97.0	86.2	72.2	72.2	70.9	74.5

TABLE 4.18a: Human capital indicators of home gardener, scheme and independent irrigator households in Greater Tzaneen (n=97; 2012-13) in relation to local, provincial and national statistics (2011 census)

Indicator	Home gardeners (2012-13)	Scheme irrigators (2012-13)	Independent irrigators (2012-13)	Greater Tzaneen (2011)	Mopani (2011)	Limpopo (2011)	South Africa (2011)
Household size	**5.6**	**5.2**	**5.7**	**3.5**	**3.6**	**3.7**	**3.6**
Female-headed households (%)	**62.0**	**5.0**	**17**	**47.8**	**50.9**	**50.4**	**41.2**
Age							
• 0-14 years old (%)	32.1	24.5	29.5	31.8	33.8	34.0	29.2
• 15-64 years old (%)	63.0	63.6	62.0	62.4	60.5	59.8	65.5
• 65+ years old (%)	4.9	11.8	8.4	5.7	5.7	6.2	5.3
Education (20 years and older)							
• No schooling (%)	11.1	12.3	9.4	18.7	21.2	17.3	8.6
• Completed grade 12 (%)	29.6	34.2	18.8	21.8	20.8	22.4	28.9
• Tertiary education (%)	8.6	12.3	14.6	8.7	8.2	9.5	11.8
Unemployment rate (%)	54.5	45.7	53.4	36.7	39.8	38.9	29.8

TABLE 4.18b: Selected livelihood outcomes of home gardener, scheme and independent irrigator households in Greater Tzaneen (n=97; 2012-13) in relation to local, provincial and national statistics

Livelihood outcome	Home gardeners (2012-13)	Scheme irrigators (2012-13)	Independent irrigators (2012-13)	Greater Tzaneen (2011)	Mopani (2011)	Limpopo (2011)	South Africa (2011)
Household income (R)	**52 581**	**125 713**	**105 506**	**54 627**	**51 121**	**56 841**	**103 204**
Source of energy for cooking							
• Electricity (%)	70.2	85.7	69.0	47.3	40.3	50.0	74.0
• Wood (%)	29.8	14.3	31.0	50.0	-	57.5	12.5
• Animal dung (%)	0.0	0.0	0.0	0.0	-	0.0	0.3
• Paraffin (%)	0.0	0.0	0.0	1.3	-	1.0	8.5
• Coal (%)	0.0	0.0	0.0	0.1	-	0.1	0.7
Access to municipal water							
• Piped in yard (%)	25.5	23.8	57.1	16.1	50.4	52.3	73.4
• Public standpipe (%)	44.7	42.9	25.0	-	33.8	33.7	17.9
• No access (%)	29.8	33.3	17.9	-	15.8	14.0	8.8
Type of toilet							
• Flushing /chemical toilet (%)	0.0	23.8	31.0	19.7	19.7	22.7	62.6
• Pit latrines (%)	97.9	76.2	69.0	68.7	67.2	68.0	28.0
• Bucket (%)	0.0	0.0	0.0	0.3	0.4	0.6	2.1
• None (%)	2.1	0.0	0.0	11.4	12.8	7.2	5.2
Consumer durables							
• Cell phone (%)	95.7	95.2	96.6	87.9	88.5	88.5	88.9
• Radio (%)	36.2	71.4	48.3	62.9	59.8	62.1	67.5
• Computer (%)	21.3	28.6	24.1	11.5	11.1	12.4	21.4
• Fridge (%)	89.4	33.3	93.1	66.2	68.6	68.0	68.4
• Television (%)	93.6	90.5	86.2	68.8	70.1	70.9	74.5

About 63% of households in the country use a flushing/chemical toilet system. Noteworthy is that while all irrigator households had access to decent types of toilets, a small number of households at the local, provincial and national levels were either using the bucket toilet system or did not have access to any toilet system. The latter was also the case among home gardeners. This indicates that irrigating households had the capacity to build a decent toilet system compared to ordinary households in the country.

Ownership of consumer durables such as cell phones, televisions and refrigerators was common in all the six groups, with the exception of refrigerator ownership which was not common among scheme irrigators. A small proportion of households owned a computer. Ownership of these household assets was significantly higher among the three household types compared to local, provincial and national levels. Radio ownership, on the other hand, varied among households with the largest proportion of radio owners among scheme irrigators, while only 36.2% were home gardeners.

4.6 Summary of the findings

This chapter presented a quantitative description of the livelihoods of rural households at the two research sites, Thulamela and Greater Tzaneen. Survey data for three types of farming households, namely 'home gardeners', 'scheme irrigators' and 'independent irrigators' were statistically analysed. Data analysis and presentation was guided by the Sustainable Livelihoods Framework.

An analysis of human capital indicators revealed that home gardener households were smaller compared to scheme and independent irrigator households. The difference in household size was due to a lower number of adults in the economically active category among home gardener households, implying that the pool of potential labour for farming was greater among irrigator households than among home gardener households. Independent irrigators had a significantly greater number of aged adults than home gardener households. Although the number of unemployed economically active adults tended to be higher in irrigation households than in home gardener households, the unemployment rate was lower among irrigator households. Independent irrigators had better education than home gardener and scheme irrigator households. Therefore, independent irrigators are more likely to adopt new technologies and ideas when only education level is considered.

There were differences in gender of the farmer among the three types of households mirrored those identified for the head of households. Female household heads dominated among home gardeners while the heads of irrigator households were mostly male in both Thulamela and Greater Tzaneen. In addition, for both study sites, heads of irrigator households tended to be older than those of home gardener households. Consistent with household headship, the majority of farmers in home gardener households were female while among irrigators, the farmers were male. Noteworthy is that, across household types, the household head was also the farmer in most households. Less female participation in irrigation farming indicates exclusion of women. However, the willingness of females to participate in irrigation should be established. Natural capital indicators showed that land

was generally more abundant among households in Greater Tzaneen compared to households in Thulamela. Home gardens tended to be larger, households held more rainfed arable land, and both scheme plots and independently irrigated plots were about six times larger than in Thulamela. Irrigation water was predominantly obtained through direct extraction from rivers for independent irrigators, followed by water flowing from springs.

Financial capital across all the households surveyed took the form of investments in insurance, almost invariably in the form of funeral policies taken out with formal and informal (community-based) institutions. This result suggests that insuring against death in the family took priority over saving money. Independent irrigators in Greater Tzaneen had the highest debt repayments of all types of households. Both income from farming and income derived from regular flows of income accounted for the difference in household income between irrigators and home gardeners. Salaries and wages contributed significantly to household income of both home gardeners and irrigators.

Indicators for the physical assets held by households showed that the physical assets owned by the majority of households across type at both study sites were limited to basic hand tools, particularly hand hoes and spades. Ownership of knapsack sprayers was common among scheme and independent irrigators. Ownership of wheel barrows, on the other hand, was widespread among home gardeners, particularly in Greater Tzaneen. Ownership of the means to cultivate land using draught power was limited at both study sites. However, ownership of cattle, which could be used for draught power purposes, was considerably more widespread than ownership of animal-drawn cultivation implements. This suggests that only a fraction of the households who owned cattle used these animals to provide draught power for cultivation. Ownership of tractors was among scheme and independent irrigator households. The limited ownership of the means to cultivate using draught power amongst households in both study sites suggests that the majority of households hired the services of land preparation enterprises operating in their communities, which probably included other farmers, who owned the means to provide these services.

Ownership of mechanised transportation such as *bakkies* and trucks was highest among independent irrigators in both Thulamela and Greater Tzaneen. Ownership of irrigation equipment was unevenly spread among household types and also between study sites, with Greater Tzaneen showing a higher level of ownership. Ownership of irrigation pumps and pipes was highest among independent irrigators in Thulamela. Ownership of irrigation equipment was exceptionally low among home gardeners at both sites.

The social capital base was relatively strong although most of the associations that households were members of had little to do with farming. At both sites, membership of religious organisations (churches) and burial societies was high. Such membership was, however, of great significance from a livelihood perspective. Membership of farmers' associations or cooperatives was considerably lower. Membership of agriculture-related organisations, although generally low, was higher among scheme farmers and independent irrigators. The difference in membership of agriculture-related organisations between home gardeners on the one hand, and scheme and independent irrigators on the other, could be seen as a reflection of the relative importance of farming in the livelihoods of

households in these groups. It was notable that independent irrigator households were more likely to be members of political parties and village committees than home gardener and scheme irrigator households. Home gardener households in Thulamela had an exceptionally high membership of savings and credit groups.

A substantial proportion of households at both study sites were likely to successfully claim livelihood resources against others in times of need. There were, however, considerable differences in the ability to claim livelihood resources from others between the two sites, with Thulamela scoring lower than Greater Tzaneen.

There were marked differences in access to land and support services among the three types of households with scheme irrigator households seemingly in a privileged position relative to the other types of households. At the two study sites, residential land was held by means of rights that were registered, indicating secure tenure. To a large extent, this also applied to land held on irrigation schemes at both sites. Tenure security was most problematic among independent irrigators in Thulamela, where almost half of the farmers held their independently irrigated plots by means of rights that were not registered, and suggesting tenure security risks, particularly for those who accessed land opportunistically.

In terms of access to support services, there were large differences between home gardener households and irrigator households. Scheme irrigators accessed both training and advisory services more frequently than home gardeners. At both sites, advice and training in production and irrigation was more easily accessed than advice and training in marketing and farm management. Access to finance for farming, be it production or capital items, by means of loans was rare in Thulamela but farmers were more likely to have accessed finance for farming through a loan in Greater Tzaneen but were less likely to have received donations. Accessing finance for farming by means of grants was more common, and receiving farm inputs in the form of a donation (usually from the Provincial Department of Agriculture) was very common among scheme irrigators.

Access to produce markets was limited to local markets and only a small proportion of farmers accessed national fresh produce markets or other distant markets. Home gardeners only sold directly to local consumers. Irrigators, on the other hand, accessed a wider array of markets. The absence of a nearby town in Greater Tzaneen was clearly evident by farmers transporting produce to sell to consumers. Farmer access to the different types of markets reflected the degree of sophistication and risk inherent to these markets.

Regarding livelihood outcomes, there was compelling evidence that smallholder irrigation farming makes a significant contribution to rural livelihoods through its positive effect on household income. In addition, non-irrigators were found to be under strain than their irrigating counterparts regarding food security indicators considered in the study. Irrigation households received higher regular income flows and had lower unemployment rates.

Overall, results identified substantial differences in the capital base among home gardener, scheme and independent irrigator households. Households involved in irrigation farming had a stronger capital base in terms of natural, physical and financial capital suggesting that participation in irrigation farming positively affects the overall capital base of rural households. The results of this study have provided compelling evidence that irrigation is associated with improved livelihoods of rural households, but also that this association is not just simply the result of household income (and food) being raised by producing crops under irrigation. Irrigation was also shown to be positively associated with the size of regular income flows received by households, which appear to be linked with better education levels among household members and lower unemployment rates.

Chapter 5 Farming by Households in Thulamela and Greater Tzaneen

5.1 Introduction

In this chapter, farming by the households that were part of the Thulamela and Greater Tzaneen samples is described. This is done by means of summary tables in which the various types of farm enterprises practised by the three groups of households that made up the study site sample, i.e. home gardeners; irrigation scheme farmers and independent irrigators. Presentation of the material for each study site starts with a general description of the farming activities of the three types of households and is followed by a more detailed analysis of the different activities, with specific attention to crop production in home gardens, on scheme plots and on independently irrigated land. Information includes the main crops grown as well as gross income statements for these crops.

5.2 Thulamela

5.2.1 General description of agriculture at the Thulamela study site

For the purpose of describing farming by households in the Thulamela sample, farming was subdivided into six types of activities, namely,

- Crop production in home gardens;
- Crop production on rainfed arable land (dryland cropping)
- Crop production on irrigation scheme land;
- Crop production on independently irrigated land;
- Micro-livestock production (pigs and poultry); and
- Small and large livestock production (goats, sheep and cattle).

Salient information on these six farming activities as practised by the three types of households in the Thulamela sample is presented in Table 5.1.

The sample of 125 **home gardener households** generated a combined gross income of R194 530 from agriculture, of which R82 095 (42%) was in the form of crops grown in their home gardens. The production of small and large livestock made a larger contribution to gross income from agriculture, which amounted to R106 800 (55%) but participation in this activity was limited to only three of the 125 households, whereas all 125 households produced some crops in their home gardens. Table 5.1 also shows that most of gross income from agriculture was in the form of income in-kind. This meant crops that had been produced were either consumed by the farming household, or partly consumed and partly saved in the case of livestock. The term ‘saving’ in livestock production refers to net increases in the number of animal numbers owned during the 2012-13 production year. Evidence of the building of cattle herds or goat flocks was evident among all types of households, not only the home gardeners group.

TABLE 5.1: Characteristics of the various farm enterprises of households in the Thulamela study area (2012/13)

Variable	Farm enterprise						
	Home garden	**Dryland plot**	**Scheme plot**	**Independently irrigated plot**	**Micro-livestock**	**Small and large livestock**	**All enterprises**
Home gardeners (n=125)							
Number of participants	125	2	0	0	12	3	125
Gross income (sum for all participants) (R)	82 095	2 400	0	0	3 235	106 800	194 530
Gross income per participant (mean) (R)	657	1 200	0	0	216	21 360	1 556
Proportion of gross income derived from sales (%)	2	0	-	-	18	0	4
Net operating income (sum for all participants) (R)	49 257	1 545	0	0	2 187	97 800	150 789
Net operating income per participant (mean) (R)	394	773	0	0	273	19 560	1 206
Scheme farmers (n=101)							
Number of participants	59	2	101	2	9	5	101
Gross income (sum for all participants) (R)	66 404	12 000	1 807 359	64 700	38 053	148 560	2 142 895
Gross income per participant (mean) (R)	1 105	6 000	17 895	32 350	4 228	29 712	21 217
Proportion of gross income derived from sales (%)	53	0	88	100	63	23	82
Net operating income (sum for all participants) (R)	39 863	6 155	871 018	53 124	-4 678	98 152	1 066 896
Net operating income per participant (mean) (R)	676	3 078	8 624	26 512	-520	19 630	10 563
Independent irrigators (n=98)							
Number of participants	51	10	9	98	24	22	98
Gross income (sum for all participants) (R)	67 117	112 050	205 240	1 419 162	38 150	327 035	2 168 755
Gross income per participant (mean) (R)	1 316	1 144	22 804	14 481	1 590	14 865	22 130
Proportion of gross income derived from sales (%)	12	2	8	52	69	82	52
Net operating income (sum for all participants) (R)	23 515	73 329	123 601	265 628	33 915	206 385	726 023
Net operating income per participant (mean) (R)	461	7 333	15 450	2 710	1 413	9 381	7 408

Characteristic of households belonging to the home gardeners group was that they rarely sold crops and selling of livestock was also limited in extent and restricted to micro-livestock. Based on these findings the farming system practised by households in the home gardener group could best be described as a micro-scale subsistence farming system in which the production of summer crops in home gardens was the dominant farming activity.

The sample of 101 **scheme farmer households** generated a combined gross income of R2 142 895 from agriculture to which crop production on the plots of Dzindi Irrigation Scheme contributed 84%. Crop production in home gardens was the other farming activity in which many (58%) scheme farmers were involved. Contrary to the subsistence farming system practised by home gardener households, scheme farmer households were mainly involved in 'commercial farming'. As a group, they generated 82% of their total gross farm income from selling produce. The commercial orientation of farming was particularly evident from the contribution produce sales made to gross income derived from crop production on scheme plots (88%) and independently irrigated land (100%) but even home garden production was considerably more commercially oriented than among the home gardener group with 53% of gross income being realised from the sale of produce. The only farming activity in which income from sales did not make the main contribution to gross income was the production of small and large livestock. It was found that the primary objective of the five farmers involved in this activity was to grow their livestock holdings.

The combined gross income generated by the sample of 98 **independent irrigator households** amounted to 2 168 755, and the mean gross income per participant of R22 130 was slightly higher than that of scheme farmers. Generally, independent irrigator households were more likely to engage in a variety of farm enterprises than the other two groups of households. They were also considerably more commercially oriented than households in the home gardener group but less so that scheme farmer households. This is evident from the lower proportion of gross farm income derived from sales (52%) than scheme farmers (82%).

For the independent irrigator group as a whole, crop production on independently irrigated land was the most important farming activity, contributing 70% to total gross income generated from agriculture. Roughly half of the gross income generated by this activity was realised by selling produce, and the other half (48%) as food for home consumption, with small amounts used as donations. Just over half of the independent irrigator households also produced crops in home gardens, primarily for home consumption with only 12% of gross income being derived from selling crops. In contrast with the other two groups of households, livestock production by independent irrigators was primarily a 'commercial activity' with income from sales being the principal contributor to gross income obtained from the production of both micro livestock and small and large livestock. Based on the evidence presented, the farming system of independent irrigators is probably best summarised as a dual purpose system that served both the consumption and the monetary income needs of this group of households.

The difference in the farming system practised in home gardens, dryland plots, scheme plots and on independently irrigated plots is illustrated in Table 5.2, which shows 'average' income statements for maize production on a standardised area of 1000 m^2.

TABLE 5.2: Summary income statements for maize production enterprises in home gardens and on dryland, scheme and independently irrigated plots

	Home garden	**Dryland**	**Scheme plot**	**Independently irrigated plot**
	(n=136)	(n=4)	(n=89)	(n=64)
Cost land preparation (R 1000 m^{-2})	97	107	259	161
Cost of fertilisers (R 1000 m^{-2})	36	56	325	181
Cost of seed (R 1000 m^{-2})	97	24	82	82
Cost of agro-chemicals (R 1000 m^{-2})	2	2	16	16
Cost of water (R 1000 m^{-2})	0	0	0	0
Cost of pumping (R 1000 m^{-2})	0	0	0	203
Cost of hired labour (R 1000 m^{-2})	16	56	262	389
All other costs (R 1000 m^{-2})	0	3	9	19
Total operating expenses (R 1000 m^{-2})	248	248	954	1 051
Gross cash receipts (R 1000 m^{-2})	26	0	1 257	476
Gross in-kind receipts (R 1000 m^{-2})	521	404	275	537
Gross income (R 1000 m^{-2})	547	404	1 532	1 013
Net operating income (R 1000 m^{-2})	-24	43	578	-38
Net cash operating income (R 1000 m^{-2})	96	-135	275	-575
Proportion of gross income as sales (%)	5	0	82	47

In the study area, home garden and dryland maize production were almost exclusively rainfed systems, whilst on scheme plots and independently irrigated plots maize was almost exclusively grown under irrigation. Table 5.2 shows that the two irrigated systems had substantially higher operating expenses than the two rainfed systems, costing more in land preparation, fertilisers and labour. To that had to be added the pumping costs incurred by independent irrigators. Among these cost items, fertilisers are important, because as the suppliers of plant nutrients fertilisers are expected to raise production. This is evident from the gross incomes obtained from irrigated maize, which are two to three times higher than those obtained from rainfed maize.

The important difference between the two irrigated maize production systems was that on scheme plots 82% of gross income from maize was derived from sales, whereas on independently irrigated plots this was only 47%, indicating that scheme production of maize was substantially more commercialised than on independently irrigated plots. A comparison of the operating expenses of these two irrigated maize production systems shows that scheme farmers spent considerably more on fertilisers than independent irrigators, whilst expenditure on other growth factors (seed and plant protectants) was similar. This suggests that commercialisation of maize production and application of fertilisers was positively associated. Other differences in operating costs, such as labour, water, land preparation and 'other costs', were mainly irrigation system dependent (pumping and labour costs) and did not necessarily reflect differences in plant growth factors between the two systems. Accordingly, evidence from Thulamela indicates that irrigation and commercialisation of maize are both positively associated with the application of fertilisers.

5.2.2 Crop production

Home gardens

Of the 125 home gardener households in the sample, 118 produced rainfed (summer) crops in their home gardens. Cultivation for the production of rainfed crops was mostly done by hand (69%) but hiring tractors services for primary cultivation was not uncommon (31%). The majority (64%) of home gardeners purchased maize seed but for cowpeas and pumpkins they used saved seeds or obtained seed from neighbours or friends at no cost. Use of fertilisers in rainfed crop production was rare, with less than one-fifth (18%) having applied any kind of fertiliser during the 2012-13 summer. Among those who did, 37% applied animal manure, and 63% chemical fertilisers. None of the participants made use of purchased crop protectants. Hiring of labour for home gardening was unusual (2%) and was only done on a casual basis (piece work) to do weeding.

Fifty-five of the 125 home gardeners in the sample produced irrigated crops. Cultivation for the production of crops under irrigation was exclusively done by hand. Irrigation raised the use of fertilisers, which were applied by 36% of home gardeners who produced irrigated crops. Animal manure dominated (56%), followed by chemical fertilisers (32%), the combination of chemical fertilisers and animal manure (6%), and compost (6%). Three-quarter purchased seed and 15% applied purchased crop protectants. None made use of hired labour for the cultivation of irrigated crops.

Table 5.3 provides information on the important crops grown in home gardens. In this table the crops grown under irrigation are separated from those grown under rainfed conditions.

TABLE 5.3: Area planted and monetary value of the different crops and mixed crop combinations grown in home gardens of 'home gardener households' (Thulamela, 2012/13, n=125)

Crop or mixed crop combination	Number of participants involved	Total area planted (m^2)	Total gross income generated (R)	Mean gross income per 1000 m^2
Dryland crops				
Maize	82	91 178	36 740	403
Maize-pumpkin	22	29 290	12 595	430
Maize-cowpea-pumpkin	12	15 783	9 285	588
Irrigated crops				
Chinese cabbage	51	3 776	8 495	2 250
Swiss chard	10	693	2 410	3 478
Tomatoes	10	402	2 250	5 597

Maize, cowpeas and pumpkins were the commonly grown dryland crops in home gardens and all were produced during summer. Chinese cabbage, Swiss chard and tomatoes were the most important irrigated crops, and these were all grown during winter. In terms of area planted, maize was by far the most important home garden crop. Maize mono-cropping prevailed but intercropping with pumpkin and cowpeas was also common. Chinese cabbage was the dominant crop grown

under irrigation. The total area planted to rainfed crops exceeded the total area planted to irrigated crops by a ratio of 24 to 1. Accessing irrigation water was the key factor responsible for this difference. On average, gross income per unit area planted to irrigated crops was about six times higher than that planted to rainfed crops (Table 5.3).

Irrigation scheme plots

Dzindi Irrigation Scheme is a canal scheme and irrigation of crops is invariably done using short furrow irrigation (Van Averbeke, 2013). Plots are subdivided in border strips that run almost perpendicular to the slope whilst allowing for the necessary gradient from furrow to end of the strip to maintain flow of water over the length of the strip. The border strips are the production units at the Scheme. Cultivation of a strip in preparation for planting and irrigation of crops is nearly always done using hired tractor services (Maake, 2015). Tractor cultivation typically involves three operations, namely ploughing, disking and ridging, the latter being a necessary operation for the practise of short furrow irrigation (De Lange, 1994; Maake, 2015). In 2013, when the survey was done, Dzindi was 58 years old, and the irrigation infrastructure was in a poor state of repair. This had a detrimental effect on the availability of irrigation water, especially for the tail-enders (De Beer & Van Averbeke, 2013). Table 5.4 presents information on the main crops grown on the scheme.

TABLE 5.4: Area planted and monetary value of the different crops grown on plots at Dzindi Irrigation Scheme by scheme farmer households (Thulamela, 2012/13, n=101)

Crop	Number of participants involved	Total area planted (m^2)	Total gross income generated (R)	Mean gross income per 1000 m^2
Maize	89	490 391	751 256	1 532
Chinese cabbage	65	172 145	290 208	2 345
Nightshade	49	81 317	156 494	1 924
Swiss chard	25	32 062	75 200	2 345
White cabbage	18	57 897	298 590	5 157
Groundnuts	14	21 171	25 420	1 201

Maize, Chinese cabbage, nightshade, Swiss chard and white cabbage were the main crops grown at Dzindi. These crops were primarily sold locally through a network of street traders (Manyelo *et al*., 2015). Production of groundnuts was new at the scheme, and appeared to be in response to water shortages. Among the listed crops, white cabbage clearly provided the highest gross income. This was already the case 10 years ago (Van Averbeke & Mohamed, 2006). A few of the 'new crops' also generated high gross incomes and could present opportunity for expansion. However, local demand for these crops tends to be limited, which presents a risk to those seeking to raise production levels of these crops.

Independently irrigated plots

Independent irrigators used various ways to accessed and transfer irrigation water to their plots. Three main ways were identified, namely pumping, diverting and collecting. Pumping, practised by 42 of the 98 independent irrigators in the sample, involved the extraction of irrigation water from the source by means of a pump and conveying this water from source to plot by means of a pipe. The majority of pumpers (86%) used surface irrigation (short-furrow method) to apply irrigation water. Others used drip irrigation (12%) or sprinkler (2%). Diverting, which was practised by 21 participants, involved the redirecting of an existing water flow to the location of the plot. Conveying water from the point of diversion to the plot was typically done by means of an unlined earthen furrow (71.4%) but some made use of pipes (28.6%). The large majority of diverters (90%) practised short furrow irrigation to irrigate their plots and the others used sprinkler irrigation. The latter method of irrigation was invariably linked to the use of pipes for water conveyance. The remaining 35 independent irrigators collected their irrigation water. They manually extracted, conveyed and applied irrigation water using buckets. Table 5.4 provides information on the main crops grown on independently irrigated land.

TABLE 5.5: Area planted and monetary value of the different crops grown on the plots of independent irrigators (Thulamela, 2012/13, n=98)

Crop	**No of participants involved**	**Total area planted** (m^2)	**Total gross income generated** (R)	**Mean gross income per 1000 m^2**
Maize	64	454 640	460 559	R1 013
Chinese cabbage	35	83 201	242 699	R2 917
Nightshade	15	58 203	172 524	R2 964
White cabbage	13	32 086	231 721	R6 137
Tomatoes	13	108 885	215 268	R1 977

The crops commonly grown by independent irrigators (Table 5.5) resembled those commonly grown by farmers at Dzindi (Table 5.4). Among the top five crops for both groups the only difference was the absence of tomatoes from the list of scheme farmers, and the absence of Swiss chard from the independent irrigator list. Dzindi farmers discontinued tomato production in 1986, following a failed contract initiated by AGRIVEN, the parastatal tasked with agricultural development in Venda during the homeland era. Financed by means of production loans, large quantities of tomatoes were produced but the promised purchase of the crop for processing purposes did not materialise, causing serious losses and debt among farmers (Van Averbeke, 2008). It has been making a timid comeback with 5 Dzindi farmers trying it out during 2012-13.

Comparing the gross income per unit area obtained by independent irrigators with those of scheme farmers for the same crops (Tables 5.4 and 5.5), no consistent trend could be identified. On average scheme farmers achieved a higher gross income than independent irrigators for maize but the opposite applied for Chinese cabbage, nightshade and white cabbage. On average, independent irrigators achieved an average gross income that was 24% higher for Chinese cabbage, 54% higher for nightshade and 19% higher for white cabbage than that of scheme farmers.

5.2.3 Income statements of different types of irrigated enterprises

Using method of water extraction and conveyance as the discriminating variable, irrigators (excluding home gardeners) could be grouped into four categories, namely scheme farmers, diverters, collectors and pumpers. Scheme farmers and diverters both used a gravity fed extraction and conveyance system, collectors used a manual system and pumpers used a pumped system.. Table 5.6 contains the average income statement for maize by irrigator type, and Table 5.7 for Chinese cabbage. These two crops were selected because they were commonly grown by all types of irrigators. To facilitate comparison between irrigator types, the income statements are presented for production units that are 1000 m^2 in size.

TABLE 5.6: Average income statement for 1000 m^2 maize by type of irrigator (Thulamela, 2012-13)

Expenses	**Scheme farmers** (n=89)	**Diverters** (n=11)	**Collectors** (n=29)	**Pumpers** (n=24)
Cost land preparation (R 1000 m^{-2})	259	117	204	167
Cost of fertilisers (R 1000 m^{-2})	325	240	118	176
Cost of seed (R 1000 m^{-2})	82	51	114	85
Cost of agro-chemicals (R 1000 m^{-2})	16	27	11	12
Cost of water (R 1000 m^{-2})	0	0	0	0
Cost of pumping (R 1000 m^{-2})	0	0	0	390
Cost of hired labour (R 1000 m^{-2})	262	192	216	561
All other costs (R 1000 m^{-2})	9	44	5	11
Total operating expenses (R 1000 m^{-2})	954	671	667	1 372
Income				
Gross cash receipts (R 1000 m^{-2})	1 257	541	119	586
Gross in-kind receipts (R 1000 m^{-2})	275	352	725	557
Gross income (R 1000 m^{-2})	1 532	893	844	1 143
Net operating income (R 1000 m^{-2})	578	222	176	-229
Net cash operating income (R 1000 m^{-2})	275	-130	-549	-786
Proportion of gross income as sales (%)	82	61	14	51

Table 5.6 confirms the higher fertiliser use by scheme farmers relative to the three groups of independent irrigators and also the higher gross income and the higher cash receipts. A substantial proportion of the gross income from maize grown by independent irrigators was in-kind income, particularly among collectors. As a result, only scheme farmers realised a positive net cash operating income. All three independent irrigator groups had negative cash operating incomes for maize. This meant that they spent money in order to obtain food. This would not be a serious concern was it not that pumpers also had a negative operating income, as their operating expenses exceeded their gross income. The cost of pumping, which other types of irrigators did not incur, and also the substantially higher cost of labour appeared to be responsible for the net loss incurred by pumpers growing maize.

TABLE 5.7: Average income statement for 1000 m^2 Chinese cabbage by type of irrigator (Thulamela, 2012-13)

Expenses	**Scheme farmers** (n=89)	**Diverters** (n=11)	**Collectors** (n=29)	**Pumpers** (n=24)
Cost land preparation (R 1000 m^{-2})	282	137	8	93
Cost of fertilisers (R 1000 m^{-2})	379	316	130	479
Cost of seed (R 1000 m^{-2})	92	38	94	44
Cost of agro-chemicals (R 1000 m^{-2})	24	46	156	101
Cost of water (R 1000 m^{-2})	0	0	667	0
Cost of pumping (R 1000 m^{-2})	0	0	0	1 000
Cost of hired labour (R 1000 m^{-2})	263	571	2 755	2 872
All other costs (R 1000 m^{-2})	8	123	0	7
Total operating expenses (R 1000 m^{-2})	1 048	1 231	3 808	4 597
Income				
Gross cash receipts (R 1000 m^{-2})	1 313	1 550	246	3 033
Gross in-kind receipts (R 1000 m^{-2})	254	910	748	356
Gross income (R 1000 m^{-2})	1 667	2 460	994	3 389
Net operating income (R 1000 m^{-2})	619	1 229	-2 814	-1208
Net cash operating income (R 1000 m^{-2})	265	319	-3 562	-1564
Proportion of gross income as sales (%)	79	63	25	89

The average income statements for Chinese cabbage accentuate the differences among types of irrigators. Chinese cabbage is typically grown during winter and in Thulamela the crop relies almost entirely on irrigation for its water requirements. For pumpers this meant that they had to switch on their pumps at least once a week, and for collectors it meant carrying lots of water, which they pursued by hiring labour. As a result, the operating expenses associated with irrigation (pumping and or labour) were extremely high for these two types of irrigators. The high operating costs resulted in negative operating incomes despite high gross incomes, at least in the case of the pumpers. Scheme farmers and diverters, who relied on gravity to get water to their plots and did not incur these irrigation-related costs both realised positive net operating incomes and positive net cash operating incomes for Chinese cabbage. The high (irrigation-related) operating expenses recorded by both pumpers and collectors, who made up 77 of the 98 independent irrigators, were reflected in the average income statement of the independently irrigated enterprises as a whole, which are shown in Table 5.8.

TABLE 5.8: Average income statement of scheme plot and independently irrigated enterprises (Thulamela, 2012-13)

Financial indicator	**Independent irrigators** (n=98)	**Scheme farmers** (n=101)
Total area cultivated and irrigated (ha)	1.2	0.9
Total enterprise operating expenses (R)	11 771	9 271
Gross cash receipts (R)	12 407	15 687
Gross in-kind receipts	2 074	2 032
Gross enterprise income (R)	14 481	17 895
Net operating income (R)	2 710	8 624
Net cash operating income (R)	629	6 398

Table 5.8 clearly illustrates the difference in financial performance of the irrigation enterprise between scheme irrigators and independent irrigators. Independent irrigators incur incurred greater operating expenses than scheme farmers and realised lower gross incomes, despite cultivating and irrigating on average 0.3 ha more. This squeezed the net operating incomes realised by independent irrigators. Whilst scheme irrigators got an average return of R1.93 per Rand invested in operating costs, for independent irrigator this return was only R1.17. In Table 5.9 the financial performance of the irrigation enterprises of the three types of independent irrigators are compared.

TABLE 5.9 Average income statement of the three types of independently irrigated enterprises (n= 98; Thulamela, 2012-13)

Financial indicator	**Collectors** (n=35)	**Diverters** (n=21)	**Pumpers** (n=42)
Total area cultivated and irrigated (ha)	0.4	1.1	1.8
Total enterprise operating expenses (R)	9 586	7 153	14 546
Gross cash receipts (R)	2 463	13 077	15 000
Gross in-kind receipts	6 052	4 495	2 871
Gross enterprise income (R)	8 698	17 572	17 871
Net operating income (R)	-888	10 419	3 325
Net cash operating income (R)	-6 940	5 924	454

Table 5.9 shows that the high operating expenses incurred by independent irrigators as a whole was actually brought about by the high operating expenses of pumpers and especially collectors. On average, collectors spent R5 020 on hired labour, which made up 52% of total operating expenditure. The main reason collectors hired so much labour, despite the relative small average area they cultivated and irrigated (0.4 ha) was to help extract water from source and carry it to the plants needing water. As a result of their high cost of production collectors as a group operated at a loss (negative operating income).

Pumpers spent on average R3 334 on pumping and R4 394 on labour. These two cost items contributed 23% and 30% to total operating expenses, respectively. Compared to diverters, who spent an average of R2 343 on hired labour (33% of their total operating expenditure), pumper's expenditure on hired labour is not really at variance, because they cultivated and irrigated more land (1.8 ha) than diverters (1.1 ha). The important difference between diverters and pumpers was the cost of pumping. Pumping costs raised the operating expenses of pumpers and squeezed their margins. This partly explained why the average net operating income of pumpers was only about one-third of that obtained by diverters, despite gross incomes that were very similar.

5.3 Greater Tzaneen

This section provides results on agricultural activities in Greater Tzaneen. Agriculture was practiced on five types of land namely, residential land, rainfed arable land, irrigation scheme, on independently irrigated farm plots and commonage. The first part describes the various farm enterprises in the home gardens and dryland plots. The second section presents a description of farm enterprises on the irrigation scheme. The third section presents a description of farm enterprises on independently irrigated land. The final section is a presentation of the results on the areas planted as well as the monetary values of the different crops grown in the home gardens. A description of the agricultural inputs used for production activities is not presented as some of the data was unavailable hence numerous gaps in the data.

5.3.1 Rainfed crops

Rainfed crops cultivated by households in Greater Tzaneen included maize, groundnut, sugar beans, pumpkin, cowpeas, groundnuts, sweet potatoes and butternut. These crops were grown on home gardens and dryland plots. Rainfed crops were generally grown with minimal fertiliser and agro-chemicals use. They were grown with use of retained seed, with little investment on purchasing improved seed varieties.

5.3.2 Irrigated crops

Crops that were cultivated under irrigation included, in order of importance, green beans, okra, maize, chillies, tomatoes, green pepper, butternut, sugar beans, sugar cane, onions, cabbage, groundnut, mustard, paprika, Swiss chard, beet root and groundnuts. Most of the households that cultivated irrigated crops invested considerably in fertiliser use while some applied manure. Households also invested in the use of agro-chemicals for pest and disease control. Seeds for crops grown under irrigation were usually bought. This indicates households' willingness to invest in agricultural inputs when farming is practised under irrigation.

5.3.3 Livestock keeping

Agriculture in Greater Tzaneen, just like in Thulamela, involved livestock husbandry. Livestock were kept for home consumption and for sales. Micro-livestock were mostly reared within the residential land while small and large stock was reared on commonage. Table 5.10 shows the frequency distribution of the types of micro, small and large stock kept by households in Greater Tzaneen. Cattle, chickens, goats and pigs were the most important livestock species kept by households in Greater Tzaneen. Cattle were the most predominant livestock type within the area (21.6%), with the majority of cattle keepers among independent irrigators (41.4%) followed by scheme irrigators (23.8%).

TABLE 5.10: The frequency distribution of households keeping micro, small and large stock in Greater Tzaneen (n=97; 2012-13)

Animal type	**Home gardeners** (n=47)	**Scheme irrigators** (n=21)	**Independent irrigators** (n=29)	**All** (n=97)
	Micro-livestock			
Chickens (%)	14.9	0.0	24.1	14.4
Ducks (%)	nd	nd	nd	nd
Geese (%)	nd	nd	nd	nd
Pigs (%)	2.1	0.0	6.9	3.1
	Small and large stock			
Goats (%)	2.1	0.0	6.9	3.1
Cattle (%)	8.5	23.8	41.4	21.6

5.3.4 Characteristics of farm enterprises

Table 5.11 shows characteristics of the various farm enterprises of home gardeners in Greater Tzaneen. Almost all of the households in Greater Tzaneen owned a home garden while only 19% of the households cultivated a rainfed arable field.

Generally, a limited number of households kept livestock. Micro- livestock was kept by 17% of the home gardener households while 11% kept small and large livestock. Generally, home gardener households in Greater Tzaneen obtained most of their agriculture income from the home garden, followed by dryland plot and micro-livestock. Income from small and large livestock was negative, which could be because of livestock mortality or low off-take while continually investing in operating costs. The proportion of income from agriculture produce sales to household income was highest (44%) for micro-livestock compared to the proportion of income from sale of home garden produce (4%). This result shows that home gardener households sold micro-livestock more while keeping produce from the home garden and dryland plot for home consumption. The net operating income for the home garden crops was highest compared to other enterprises for home gardeners. Operating expenses included costs of land preparation, fertilisers, seed, agro-chemicals and hired

labour. For livestock, the net operating income was higher for micro-livestock compared to that for small and large livestock. Operating expenses for livestock included cost of feed, health care, hired labour, purchased animals and the value of animals that died.

Tables 5.12 and 5.13 show characteristics of the various farm enterprises of scheme and independent irrigator households in Greater Tzaneen. At least 30% of scheme irrigator households in Greater Tzaneen cultivated crops on a home garden and 19% of the households cultivated a rainfed arable plot. Similar to home gardeners, a limited number of scheme irrigator households kept livestock. Those that kept livestock reared small and large livestock (23.8%). None of the scheme irrigators kept micro-livestock.

As expected, scheme irrigator households in Greater Tzaneen obtained most of their agriculture income from the scheme plots, followed by dryland plots and home gardens. Income from small and large livestock was also significant implying that households sold some of their livestock. The proportion of income from agriculture produce sales to household income was highest for irrigation plots (100%), followed by sales of small and large livestock (92%) and sales from dryland plots (85%). These results indicate that scheme irrigator households actively participated in crop and livestock markets. The net operating income for the scheme irrigation plot was highest compared to other enterprises.

Among independent irrigators, 34% of the households cultivated crops on a home garden and 17% of the households cultivated a rainfed arable plot. A higher proportion of independent irrigator households reared livestock; 44.8% kept small and large livestock and 24.1% kept micro-livestock. Most of the agriculture income for independent irrigators came from the irrigation plot, followed by small and large livestock and home gardens. Income from micro-livestock was also significant. The dryland plot played a less significant role in contributing to household income for independent irrigators. The proportion of income from agriculture produce sales to household income was highest for irrigation plots (100%), followed by sales of small and large livestock (92%) and sales from dryland plots (87%) followed by home gardens (69%). Sales from both micro and small and large livestock contributed each 48% to gross income. These results indicate that independent irrigator households, just like scheme irrigators, actively participated in crop and livestock markets. The net operating income for the home garden was highest compared to other enterprises.

TABLE 5.11: Characteristics of the various farm enterprises of home gardeners in Greater Tzaneen (2012/13, n=47)

Variable	Farm enterprises			
	Home garden	**Dry land plot**	**Micro-livestock**	**Small and large livestock**
Frequency of participation (%)	98	19	17	11
Gross income (sum for all participants) (R)	50 425	22 472	10 285	-4 700
Gross income per participant (mean) (R)	1 073	2 497	1 469	-1 567
% gross income derived from sales	4	12	44	-255
Net operating income (sum for all participants) (R)	32 194	8 659	-4 885	-51 202
Net operating income per participant (mean) (R)	700	962	-611	-12 801

TABLE 5.12: Characteristics of the various farm enterprises of scheme irrigators in Greater Tzaneen (2012/13, n=21)

Variable	Farm enterprises				
	Home garden	**Irrigation plot**	**Dry land plot**	**Micro-livestock**	**Small and large livestock**
Frequency of participation (%)	33	100	19	0	23.8
Gross income (sum for all participants) (R)	30 450	5 737 812	59 040	0	18 460
Gross income per participant (mean) (R)	4 350	273 229	14 760	0	3 692
% gross income derived from sales	2	100	85	0	92
Net operating income (sum for all participants) (R)	24 139	4 133 766	19 500	0	-1 435
Net operating income per participant (mean) (R)	3 448	196 846	4 875	0	-359

TABLE 5.12: Characteristics of the various farm enterprises of independent irrigators in Greater Tzaneen (2012/13, n=29)

Variable	**Farm enterprises**				
	Home garden	**Irrigation plot**	**Dry land plot**	**Micro-livestock**	**Small and large livestock**
Frequency of participation (%)	34	97	17	24.1	44.8
Gross income (sum for all participants) (R)	27 440	464 995	4 750	19 415	89 500
Gross income per participant (mean) (R)	2 744	16 607	950	2 774	6 885
% gross income derived from sales	69	87	0	48	48
Net operating income (sum for all participants) (R)	14 530	704	-89 083.20	-89 221	-118 599
Net operating income per participant (mean) (R)	1453	352	-3182	-12746	-9123

Table 5.13 shows planted areas and monetary values of the different crops grown in the home gardens, dryland, scheme and independent irrigation plots of Greater Tzaneen. Households cultivated more than one crop on their plot, although mixed crop combinations could not be presented because of data limitations.

A high proportion (47%) of households in Greater Tzaneen cultivated maize under rain-fed conditions during the period 1 July 2012 to 30 June 2013. Other important dryland crops were groundnut (18%), sugar beans (17%) and pumpkin (10%). The most important crop grown under irrigation was green beans (19%). Fifteen percent of the households grew okra while 13% grew maize under irrigation. Chillies were grown by 10% of the households under irrigation.

The total land area planted to irrigated crops was significantly higher compared to the area planted to dryland crops. This could have been as a result of multiple cropping on irrigation plots during the study period. The total gross income obtained from irrigated crops was higher compared to that of dryland crops because of the higher market value of cash crops grown under irrigation, receiving income from a wider variety of crops and also growing crops more than once on a single irrigation plot in a year.

Consistent with the total gross income, the mean gross income per 1 000 m^2 was higher for irrigated crops compared to dryland crops.

5.3.5 Indicative gross margins – home gardener

The income statement presented in Table 5.14 is for a home gardener household. In addition to cultivating 5 500 m^2 to maize and pumpkin on the homestead, the household cultivated 45 ha of rainfed arable land to maize, cowpeas and groundnuts.

None of the produce was taken to the market but was kept for home consumption. Farming was practised with minimal input use. Noteworthy is that the farmer hired labour. The farmer generated a gross income of R 10 090 from the cropping season 2012/13.

TABLE 5.13: Area planted and monetary value of the different crops grown in home gardens, dryland, scheme and independently irrigated plots of Greater Tzaneen (2012/13, n=97)

Crop	**Proportion of participants involved** (%)	**Total area planted** (m^2)	**Total gross income generated** (R)	**Mean gross income per 1000 m^2**
	Dryland crops			
Maize	47	242 607	113 616	468
Groundnut	18	45 055	21 321	473
Sugar beans	17	38 267	6 466	169
Pumpkin	10	12 983	2 570	198
Cowpeas	4	29 151	3 879	133
Groundnuts	1	5 042	200	40
Sweet potatoes	1	198	320	1 616
Butternut	1	13 094	10 995	840
All	**100**	**386 397**	**159 367**	**3937**
	Irrigated crops			
Green beans	19	351 540	526 597	1 498
Okra	15	325 261	1 641 835	5 048
Maize	13	170 240	69 700	409
Chillies	10	83 238	3 047 555	36 613
Tomatoes	8	74 875	65 650	877
Green pepper	8	90 594	515 850	5 694
Butternut	5	75 200	46 115	613
Sugar beans	5	114 312	51 545	451
Sugar cane	4	45 000	14 800	329
Onions	3	31 736	6 380	201
Cabbage	2	16 747	19 160	1 144
Groundnut	2	900	26 380	29 311
Mustard	2	13 847	33 330	2 407
Paprika	1	30 000	119 710	3 990
Swiss chard	1	10 023	7 700	768
Beet root	1	44 047	1 900	43
Groundnuts	1	15 167	10 700	705
All	**100**	**1492727**	**6204907**	**90102**

TABLE 5.14: Income statement for a home gardener household in Greater Tzaneen

HOME GARDEN		
CROP	**Maize**	**Pumpkin**
Cultivated area (m^2)	5 000.00	500.00
Total cost land preparation	R 1 000.00	R 0.00
Total cost fertilisers	R 0.00	R 0.00
Total cost seed	R 550.00	R 70.00
Total cost agro-chemicals	R 0.00	R 0.00
Total cost water	R 0.00	R 0.00
Total cost labour	R 300.00	R 0.00
Total other costs	R 150.00	R 0.00
Total operating expenses	R 2 000.00	R 70.00
Gross cash receipts	R 0.00	R 0.00
Gross in-kind receipts	R 4 400.00	R 240.00
Gross income	R 4 400.00	R 240.00
Net operating income	R 2 400.00	R 170.00
Net cash operating income	-R 2 000.00	-R 70.00
Proportion of gross income as sales (%)	R 0.00	R 0.00

Dryland plot			
CROP	**Maize**	**Cowpeas**	**Groundnuts**
Area planted (m^2)	15 000	15 000	15 000
Total cost land preparation (R)	R 333.33	R 333.33	R 333.33
Total cost fertilisers (R)	R 0.00	R 0.00	R 0.00
Total cost seed (R)	R 450.00	R 90.00	R 85.00
Total cost agro-chemicals (R)	R 0.00	R 0.00	R 0.00
Total cost water (R)	R 0.00	R 0.00	R 0.00
Total cost labour (R)	R 150.00	R 150.00	R 150.00
Total other costs (R)	R 0.00	R 200.00	R 0.00
Total operating expenses (R)	R 933.33	R 773.33	R 568.33
Gross cash receipts (R)	R 0.00	R 0.00	R 0.00
Gross in-kind receipts (R)	R 4 200.00	R 470.00	R 780.00
Gross income (R)	R 4 200.00	R 470.00	R 780.00
Net operating income (R)	R 3 266.67	-R 303.33	R 211.67
Net cash operating income	-R 933.33	-R 773.33	-R 568.33
Proportion of gross income as sales (%)	0.0	0.0	0.0

Dryland plot income	**All crops**
Gross farm income (R)	R 10 090.00
Total farm operating expenses	R 4 344.99
Gross cash receipts (R)	R 0.00
Gross in-kind receipts	R 10 090.00
Net operating income (R)	R 5 745.01
Net cash operating income (R)	R 1 105.01

Farm income statement	**All enterprises**
Gross farm income (R)	R 10 090.00
Total farm operating expenses	R 4 344.99
Gross cash receipts (R)	R 0.00
Gross in-kind receipts	R 10 090.00
Net operating income (R)	R 5 745.01
Net cash operating income (R)	R 1 105.01

5.3.6 Indicative gross margins – Scheme irrigator

Table 5.15 shows an income statement for a scheme irrigator household that participated in farming as a main source of income. The household grew green beans and okra for the market and generated an income of R120 000 from the two crops during the period July 2012 to June 2013. The household spent a considerable amount on operating expenses which included hired labour, packaging material and transport to the market. The scheme plot was operated on a commercial basis as none of the produce was taken for home consumption.

TABLE 5.15: Income statement for a scheme irrigator household in Greater Tzaneen

JULESBRG IRRIGATION SCHEME PLOT		
Gross irrigated land area (m^2)	30000	
Gross cultivated area (m^2)	30000	
Number of crops	2	
Cropping intensity (%)	100	
CROP	**Green beans**	**Okra**
Area planted (m^2)	10 000	20 000
Total cost land preparation (R)	R 2 000.00	R 4 000.00
Total cost fertilisers (R)	R 200.00	R 400.00
Total cost seed (R)	R 1 200.00	R 1 000.00
Total cost agro-chemicals (R)	R 1 000.00	R 2 000.00
Total cost water (R)	R 0.00	R 0.00
Total cost labour (R)	R 12 840.00	R 13 440.00
Total other costs (R)	R 18 000.00	R 43 000.00
Total operating expenses (R)	R 35 240.00	R 63 840.00
Gross cash receipts (R)	R 90 000.00	R 30 000.00
Gross in-kind receipts (R)	R 0.00	R 0.00
Gross income (R)	R 90 000.00	R 30 000.00
Net operating income (R)	R 54 760.00	-R 33 840.00
Net cash operating income	R 54 760.00	-R 33 840.00
Proportion of gross income as sales (%)	100.0	100.0

Julesburg plot income statement	**All crops**
Gross income	R 120 000.00
Total operating expenses	R 99 080.00
Gross cash receipts	R 120 000.00
Gross in-kind receipts	R 0.00
Net operating income	R 20 920.00
Net cash operating income	R 20 920.00

Farm income statement	**All enterprises**
Gross farm income (R)	R 120 000.00
Total farm operating expenses	R 99 080.00
Gross cash receipts (R)	R 120 000.00
Gross in-kind receipts	R 0.00
Net operating income	R 20 920.00
Net cash operating income	R 20 920.00

5.3.7 Indicative gross margins – Independent irrigator

An income statement for an independent irrigator practising organic farming is presented in Table 5.16. During the 2012-2013 cropping season, he had planted one hectare of maize and half a hectare each of green beans, sugar beans and butternut were planted on the independently irrigated plot. For the maize crop, compost manure was applied that the farmer produced himself to enhance soil fertility., he applied A mixture of garlic and chillies was sprayed to the maize crop for pests and disease control. The cost of compost and the herbal spray could not be established. A gross income of R33 410 was generated during the period July 2012 to June 2013.

TABLE 5.16: Income statement for an independent irrigator household in Greater Tzaneen

INDEPENDENT IRRIGATION PLOT				
Gross irrigated land area (m^2)	10000			
Gross cultivated area (m^2)	25000			
Number of crops	4			
Cropping intensity (%)	350			
CROP	**Maize**	**Green beans**	**Sugar beans**	**Butternut**
Area planted (m2)	10 000	5 000	5 000	5 000
Total cost land preparation (R)	R 2 000.00	R 1 000.00	R 1 000.00	R 1 000.00
Total cost fertilisers (R)	R 0.00	R 0.00	R 0.00	R 0.00
Total cost seed (R)	R 800.00	R 500.00	R 400.00	R 0.00
Total cost agro-chemicals (R)	R 300.00	R 300.00	R 0.00	R 0.00
Total cost water (R)	R 45.00	R 135.00	R 135.00	R 135.00
Total cost labour (R)	R 700.00	R 800.00	R 200.00	R 750.00
Total other costs (R)	R 100.00	R 1 200.00	R 200.00	R 200.00
Total operating expenses (R)	R 3 945.00	R 3 935.00	R 1 935.00	R 2 085.00
Gross cash receipts (R)	R 11 000.00	R 1 000.00	R 9 500.00	R 10 000.00
Gross in-kind receipts (R)	R 1 500.00	R 75.00	R 120.00	R 215.00
Gross income (R)	R 12 500.00	R 1 075.00	R 9 620.00	R 10 215.00
Net operating income (R)	R 8 555.00	-R 2 860.00	R 7 685.00	R 8 130.00
Net cash operating income	R 7 055.00	-R 2 935.00	R 7 565.00	R 7 915.00
Proportion of gross income as sales (%)	88.0	93.0	98.8	97.9

Independent irrigation plot income statement	**All crops**
Gross income	R 33 410.00
Total operating expenses	R 11 900.00
Gross cash receipts	R 31 500.00
Gross in-kind receipts	R 1 910.00
Net operating income	R 21 510.00
Net cash operating income	R 19 600.00

5.4 Summary of the findings

Six types of farming activities were identified among the sample of households at the two study sites, namely,

- Crop production in home gardens;
- Crop production on rainfed arable land (dryland cropping)
- Crop production on irrigation scheme land;
- Crop production on independently irrigated land;
- Micro-livestock production (pigs and poultry); and
- Small and large livestock production (goats, sheep and cattle).

Of interest to the current study was crop production in home gardens, on irrigation scheme land and on independently irrigated land.

Crop production in home gardens: At both sites, the main purpose of producing crops in home gardens was to have an additional source of food. It primarily involved the production of relatively drought resistant cereals (maize) and pulses (cowpeas and ground nuts) during summer, and involved a LEISA (low external input system of agriculture) farming system. Production of irrigated crops also occurred in home gardens but on a much smaller scale and primarily during winter. Using retail prices to value production, the mean produce value obtained from home gardening for the year under consideration in Thulamela was R657 (home gardener group), R1 105 (scheme farmers) and R1 316 (independent irrigators). In Greater Tzaneen, these values were higher, namely R1 073 (home gardener group), R4 330 (scheme farmers) and R2 744 (independent irrigators). In Thulamela, the value of produce per unit home garden area obtained under irrigation was between five and ten times higher than that under rainfed conditions.

Crop production on irrigation scheme land and independently irrigated land: At both study sites, the main purpose of producing crops on irrigated land was to generate cash income through the sale of produce. The average proportion of gross income generated from irrigated cropping that was realised as sales exceeded 50%. There was a clear positive association between irrigation and commercialisation and the application of fertilisers in Thulamela. Not all irrigated enterprises generated positive net operating incomes. In Thulamela, pumpers and collectors generally had higher operating costs (cost of pumping and labour for collectors) than scheme farmers and diverters, and this squeezed margins.

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Chapter 6 Entrepreneurship among rural households in Thulamela and Greater Tzaneen

6.1 Introduction

6.1.1 Rural and agricultural entrepreneurship: operationalizing the concept

In the review of literature on entrepreneurship in the context of South African smallholder agriculture, presented in Chapter 2, the following conclusions were reached.

- Entrepreneurship is made up of entrepreneurial processes that manifest in intentions (aspirations and goals), identification of opportunity, mobilising resources (access to capitals) and outcomes.
- Entrepreneurial processes take place within a regime of policies, rules and regulations.
- An entrepreneur can be defined as "someone who identifies a need in the market and develops products and services by making decisions about bringing resources together (raw materials, financial and human resources) to satisfy that need, taking risks in doing this and being rewarded with the profits of his or her actions.
- The above definition of entrepreneur fails to cater for people who instead of consciously identifying opportunity are forced by extreme survival needs to supply a good or service, only to discover later that there was indeed a market opportunity. Such people are commonly referred to as 'survivalist entrepreneurs'. Typically they start their enterprise when all other means of generating an income, including finding a job, have failed.

The Global Entrepreneurship Monitor defines **e**ntrepreneurship as 'any attempt at new business or new venture creation, such as self-employment, a new business organisation or the expansion of an existing business, by an individual, a team of individuals, or an established business (Herrington & Kew, 2016). From this definition it can be derived that a business, however small, is a tangible outcome of entrepreneurship. Griffin and Ebert (1996) defined business as 'an organisation that provides goods or services in order to earn profit'. This definition is easily applied to the various economic activities encountered in rural areas that involve the provision of goods or services against payment.

Farming is 'business' when it involves the sale of produce. Accordingly, for the purpose of this study entrepreneurship in smallholder farming is defined as the production of crops and animals for markets. Conceptually this definition is aligned with contemporary perspectives on entrepreneurship in small-scale agriculture. For example Kahan (2012) defined a small-scale farmer entrepreneur as 'someone who produces for the market', whilst LEISA (2012) equated small-scale farmers becoming entrepreneurial to 'increasingly producing for markets with a profit motive', and Djurfeldt (2013) who considered participation in markets as a pivotal aspect of smallholder entrepreneurship.

Referring to the findings of a study by De Wolf and Schoorlemmer, who investigated the skills required to succeed in the 'farm business' Vesala (2008) listed five categories of skills.

These were:

- Professional skills, which encompass the technical skills to produce crops and animals:
- Management skills, which encompass skills in financial management, administration, human resource management and general planning;
- Opportunity skills, which encompass the skills to recognise a business opportunity, to be market and customer oriented, to assess and manage risk, and to innovate;
- Strategic skills, which encompass the skills to receive and make use of feedback, to reflect, to monitor and evaluate, to conceptualise, to plan strategically, and to set goals; and
- Cooperation and networking skills, which encompass the skills to cooperate with other farmers, to create and maintain networks, to work as part of a team, and to lead.

Vesala (2008) pointed out that De Wolf and Schoorlemmer considered professional and management skills to be basic requirement for being a farmer, and that only the latter three categories of skills should be considered as entrepreneurial. However, several researchers who studied irrigated smallholder farming in South Africa lamented the lack of professional and managerial skills among them (Crosby *et al*., 2000; Du Plessis & van der Stoep, 2001; Fanadzo *et al*., 2010.

Being a farmer does not prevent one from engaging in other economic activities. Combining farming with other business ventures is referred to as pluri-activity (Hennon, 2012). Pluri-activity has long been part of smallholder farming. It is a strategy that is aimed at improving the standard of living of the homestead group or to invest in the farm (Alsos *et al*., 2003). Historically, economic activity other than farming among African smallholders in South Africa typically involved employment by others, be it casually, seasonally or even for a sustained period of time, and was closely linked to male migration (Hebinck *et al*., 2007). In other words, the majority of rural people who sought income from sources other than farming were 'job takers'. However, it is also possible for farmers to engage in non-farm economic activity as 'job makers'. 'Job-making' refers to entrepreneurial activity (business). In the literature farmers who engage in business activities other than farming are referred to as 'portfolio entrepreneurs' (Hennon, 2012).

The business sector in South Africa has been described as dualistic, consisting of a formal and an informal subsector (Rolfe *et al*., 2010; Charman, 2012), even though there are strong linkages between these two sectors. There appears to be no internationally accepted definition of the 'informal sector' (Abedian & Desmidt, 1990; Devey *et al*., 2003), but typically the term is used to refer to economic activities not recorded in national accounts and not subject to formal rules of contract, licensing, labour inspection, reporting and taxation (Morris & Pitt, 1995; Ligthelm, 2006). For South Africa, Rolfe *et al*. (2010) defined the informal sector operationally as all self-employed individuals without value-added tax (VAT) numbers. They noted that this sector was dominated by small-scale entrepreneurship, which was virtually synonymous with self-employment.

In the urban environment of Gauteng, Rogerson (1996) identified two categories of informal enterprise, namely survivalist enterprises and micro- or growth enterprises. He defined survivalist enterprises as a set of business activities undertaken by people unable to secure regular wage employment or access to an economic sector of their choice. He pointed out that incomes generated from survivalist enterprises usually fell short of even a minimum standard of income. In Gauteng

these survivalist enterprises had been set up with little capital investment and were usually run by women with virtually no skills training. Rogerson (1996) considered the opportunities of survivalist enterprises to expand into a viable business to be 'constrained'. Micro-enterprises, also called 'growth enterprises' were defined as very small businesses, often involving only the owner, some family members and at most one to four paid employees (Rogerson, 1996) described. These enterprises usually lacked all the trappings of formality, in terms of business licences, formal premises, operating permits and accounting procedures and most had only a limited capital base. Typically, their operators only had rudimentary business skills but Rogerson (1996) was of the opinion that many of these micro-enterprises had the potential to develop and flourish into larger formal small business enterprises. His perspective was in line with that of Morris and Pitt (1995) who worked in the Khayelitsha township of Cape Town. They reported that a minority (10%) of the informal enterprises in that township appeared to be motivated by opportunity, whilst the rest were motivated by necessity.

In its most recent conceptual framework of entrepreneurship, the Global Entrepreneurship Monitor identifies 'motivation' as one of the important 'individual attributes', the latter being one of the sets of factors that are thought to determine the prevalence of entrepreneurship in a particular place and time (Herrington & Kew, 2016). In this framework, a distinction is made between necessity and opportunity as motivations for entrepreneurship. Rogerson (1996) identified 'poverty and a desperate attempt to survive' as the motivations of people engaged in survivalist enterprises, clearly entrepreneurship motivated by 'necessity'. Rogerson (1996) did not dwell on the factors that motivated participants in micro enterprises, but it is not unreasonable to assume that 'opportunity' played a greater role than in the case of survivalist enterprises.

In the discourse on entrepreneurship, motivation is often linked to aspirations and goals. Aspirations and goals are used interchangeably. For example, Hessels *et al*. (2008) refer to aspirations as ambitions, goals, growth intentions or growth attitudes. In this study, goals were understood to be different from aspirations, even though both relate to a vision of the future and the psychological drive to achieve.

Aspirations, as viewed in this study, relate to broader life-orientation and longer-term ambitions, longings or aims. "They refer to something desired that is not currently possessed"; "how one wants to see oneself", and "who one wants to be" (Farmer, Yao & Kung-Macintyre, 2011). Some authors refer to aspirations as "possible identities" (Carsrud & Brannback, 2011) and "imagined selves" (Hessels *et al*., 2008). Aspirations thus embody future targets and while at different levels of resolution and clarity they have the consequence that they give direction to trajectories of change, or roadmaps, that lead the aspirant from where they are to their desired future. Aspirations therefore guide and motivate goal-oriented behaviour, so that a possible identity becomes a real one (Farmer *et al*., 2011:246). Accordingly, goals arise from aspirations.

Goals are specific, measurable and tangible outcomes that can be conceptualised as milestones on the road to achieving aspirations. A goal can be defined as "every positive outcome that one seeks to gain through reasoned behaviour" (Carsrud & Brannback, 2011). Goals are critical in aspirations in that they serve as the important link between intention and action. Aspirations which are subjective and qualitative are thus achieved by way of numerous more definable intermediate goals. Motives

and goals can change over time. Being able to set goals and change them to align to re-defined aspirations is necessary to adjust to shifting circumstances or contingencies (Carsrud & Brannback, 2011). For instance a farmer who initially would farm just to provide food to his or her household may become motivated to farm with increased sales in mind as a result of initial successes, which provide the proof to "I can do it" (Carsrud & Brannback, 2011). This elevates the aspiration and in the process leads to changed goals.

In order to achieve one's aspirations, one has to be proactive in order to identify opportunities and set goals to take advantage of the opportunity; then one acts, monitors, and adjusts one's aspirations (Farmer *et al*., 2015). Individuals can have several aspirations, but not all are acted upon. Some aspirations may be fleeting and nebulous with little or no difference from wish lists. This would apply, for example, to farmers who express an aspiration to become commercial but have not taken any concrete step or set any goals to achieve this aspiration.

From this brief review of entrepreneurship in the informal economy of South Africa, which encompasses small-scale agriculture, the following deductions were made towards the current study:

- Business activity is tangible evidence of entrepreneurship;
- Entrepreneurship in smallholder agriculture can be equated to the production of crops and animals for markets;
- Professional and managerial skills are important for success in farming;
- Entrepreneurship among farmers can extend beyond agriculture;
- Opportunity and necessity are both important motivators for entrepreneurship in contemporary urban and rural South Africa
- Capital investment and income can be used as indicators to predict to what extent entrepreneurship was motivated by necessity or by opportunity.

6.1.2 Assessment of entrepreneurship

In this chapter, entrepreneurship among home gardeners, scheme farmers and independent irrigators at the two study sites is investigated. Whilst the farm enterprise was the focus, attention was also given to entrepreneurial activity that did not involve the production of crops (or livestock). These activities included 'buying and selling', 'making and selling' and 'service provision against payment'.

In the first part of this empirical section, the findings on selected personal attributes associated with entrepreneurship of the 'farmer' in the households are presented. Personal attributes are considered important in the shaping of the life of entrepreneurs (Abtahi *et al*., 2013). This is also the view of the Global Entrepreneurship Monitor, which refers to these attributes as 'psychological factors' (Herrington & Kew, 2016). Reviewing a wide range of cross-cultural studies, Gupta and Fernandez (2009) identified a multitude of personal traits that could be attributed to entrepreneurs. These included being energetic, competitive, goal-oriented, confident, individualistic, innovative, dominant and persevering; favouring independence; having a relatively high risk taking propensity, internal locus of control (assuming responsibility); and having a need for achievement, autonomy and to continuously learn. In this study, the three groups of farmers are assessed in terms of three

'psychological factors', namely need for achievement, locus of control and risk-taking propensity. Also investigated were farmers' perceptions of the 'uniqueness 'of their own farm enterprise relative to those of their neighbours.

The second part of the findings is concerned with the goals and aspirations of farmers in the three population groups with specific reference to their farm or garden enterprise. The basic idea here was to find out whether goals and aspirations differed amongst farmers in the three population groups at the two study sites.

In the third part, entrepreneurship in the combined sample of households is assessed from an entrepreneurial activity perspective. This was done by means of a cluster analysis involving seven variables, namely:

- **Degree of commercialisation** as an indicator of market participation. This indicator was captured as the ratio of gross farm income realised as sales and gross farm income;
- **Capitalisation of the farm enterprise** as an indicator of entrepreneurial motivation. This indicator expressed the estimated monetary value of all farm-related physical assets owned by the household and was captured as the ratio of actual value and the highest value recorded within the sample, which was R632 000 for Thulamela and R335 200 for Greater Tzaneen.
- **Efficiency** as an indicator of professional and managerial skills of the farmer. This indicator was captured as the ratio of gross income and total operating expenses, and reflects the monetary return on purchased resources used in farming.
- **Gross farm income** as an indicator of scale of farming and its importance for the livelihood of the farmer household.
- **Gross income derived from entrepreneurial activity other than farming** as an indicator of entrepreneurial pluri-activity;
- **Contribution of entrepreneurial activity to household income** as an indicator of the importance of entrepreneurial activity in the livelihood portfolio of rural households. This indicator was captured as the ratio of the combined gross income derived from farming and other entrepreneurial activity and total household income.
- **Wealth status of the household** as an indicator of the extent to which entrepreneurial activity was motivated by necessity or opportunity. This variable was captured by dividing per capita household income by the per capita upper-bound poverty line for 2012/13 valued at R12 830 per person per annum. This indicator was captured as the ratio of the 2012-13 per capita household income and R12 830.

Following the presentation of the results for each site, the findings are summarised.

6.2 Thulamela

6.2.1 Personal attributes of farmers

Selected personality traits associated with entrepreneurship in the Thulamela sample are shown in Table 6.1 for the three groups of farmers. Table 6.1 also provides information on the perception of farmers about the uniqueness of different aspects of their farm in relation to those of their neighbours. Uniqueness was used as a proxy for innovation.

TABLE 6.1: Psychological traits associated with entrepreneurship and perception on uniqueness of the farm enterprise among home gardeners, scheme irrigators and independent irrigators in Thulamela (2013)

Indicators	Home gardeners (n=125)	Scheme irrigators (n=101)	Independent irrigators (n=98)
Psychological traits			
Need for achievement (%)	81	99	96
Locus of control (%)	77	81	88
Risk-taking propensity (%)	96	99	95
Degree of uniqueness of:			
Object of farming (%)	7	2	10
Farming practices (%)	6	2	10
Farming inputs (%)	16	1	6
Farming equipment (%)	0	0	10
Produce markets (%)	36	5	20

On average, independent irrigators and scheme farmers scored higher for 'need for achievement' and 'internal locus of control' than home gardeners. Scheme irrigators also scored highest for risk taking propensity but independent irrigators scored lowest for this attribute. This was unexpected, because the results in Chapter 5 clearly showed that starting up an independently irrigated enterprise was risky. Overall, however, farmers in all three populations scored very high for the selected psychological traits, and relative to the average scores they attained, differences between the three population groups were small. A very different picture applied to perceived degree of uniqueness of the farm enterprise. Generally, the scores were very low. Home gardeners and independent irrigators consistently scored higher for uniqueness than scheme farmers. Home gardeners scoring highest for innovation in farming inputs and produce markets appears inconsistent with reality, but it should be remembered that farmers were asked to score themselves in relation to others in their immediate surroundings. Among home gardeners running a small commercial broiler enterprise was perceived as unique, as was the mere act of selling produce, because the large majority of others in the village did not do so.

6.2.2 Goals and aspirations of farmers

Goals

As explained in Chapter 5, the three populations combined practised a total of five different farming enterprises, when irrigated cropping on scheme land and independently irrigated land is taken as the same activity. These five farming activities were:

1. crop production in home gardens
2. crop production on dryland plots
3. crop production on irrigated land;
4. micro-livestock production on residential sites(poultry and pigs); and
5. small- and large livestock production on commonage (cattle and goats).

The frequency distribution of the goals of crop production in home gardens among the three groups of households in Thulamela (n=237) combined, shown in Figure 6.1, demonstrates that the overriding goal for the production of crops in home gardens was to produce food.

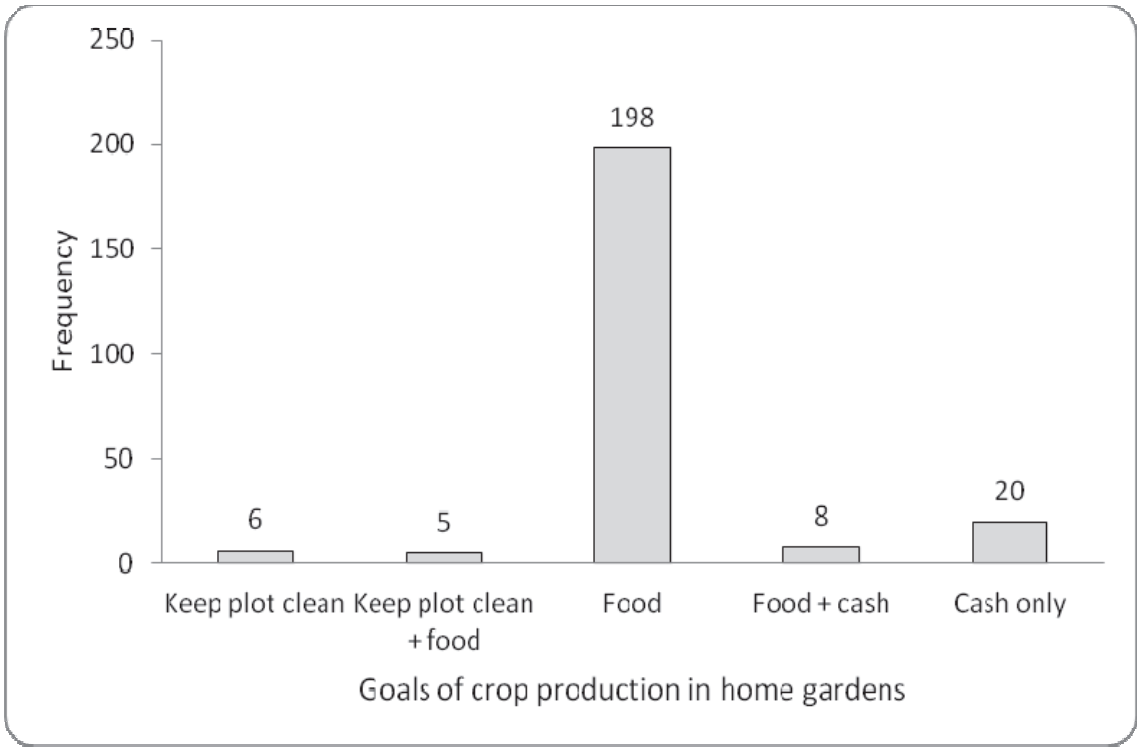

FIGURE 6.1: Frequency distribution of the goals of crop production in home gardens among the three groups of households in Thulamela (n=237; 2013)

Figure 6.2 depicts the frequency distribution of the goals of crop production on dryland plots. This type of enterprise was practised by 16 of the 325 participants who were surveyed. The data show that this activity was sometimes practised for purposes other than the production of food for own consumption, even though the latter was still the dominant goal.

Figure 6.3 depicts the frequency distribution of the goals of crop production on irrigation plots. Obviously, the home gardener group did not feature in this analysis. The results show that for the

majority of participants in this activity the goal was to generate monetary income. This indicates that irrigation farming was largely market-oriented, making it a business activity, and therefore an expression of entrepreneurship as defined for the purpose of this study.

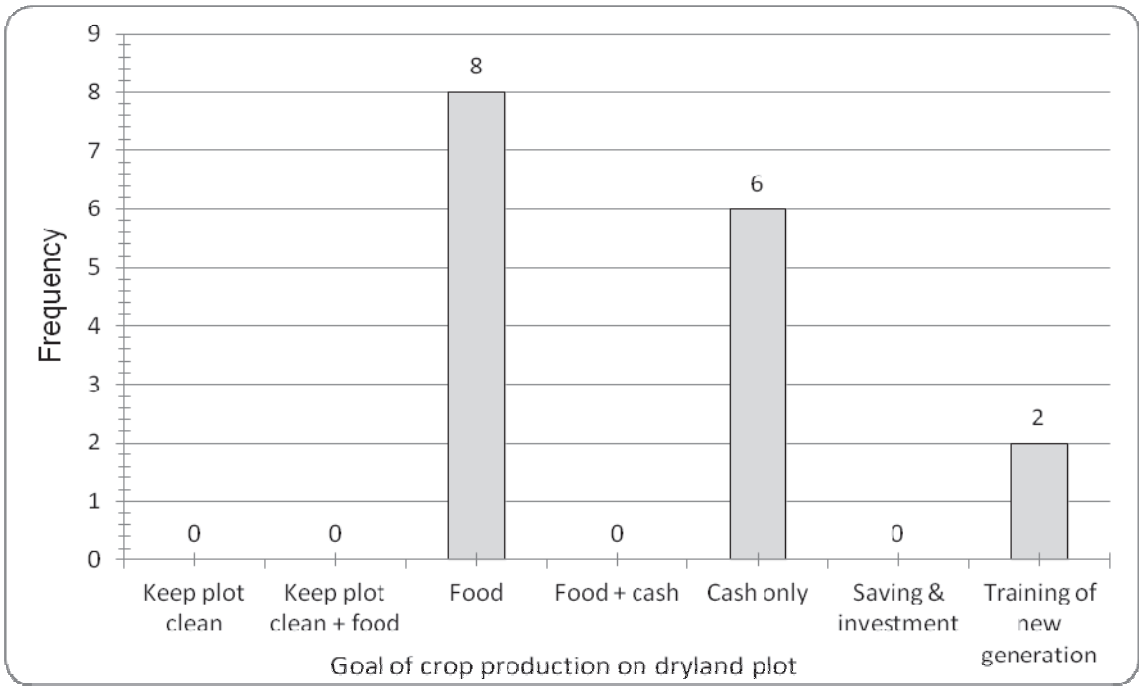

FIGURE 6.2: Frequency distribution of the goals of crop production on dryland plots among the three groups of households in Thulamela (n=16; 2013)

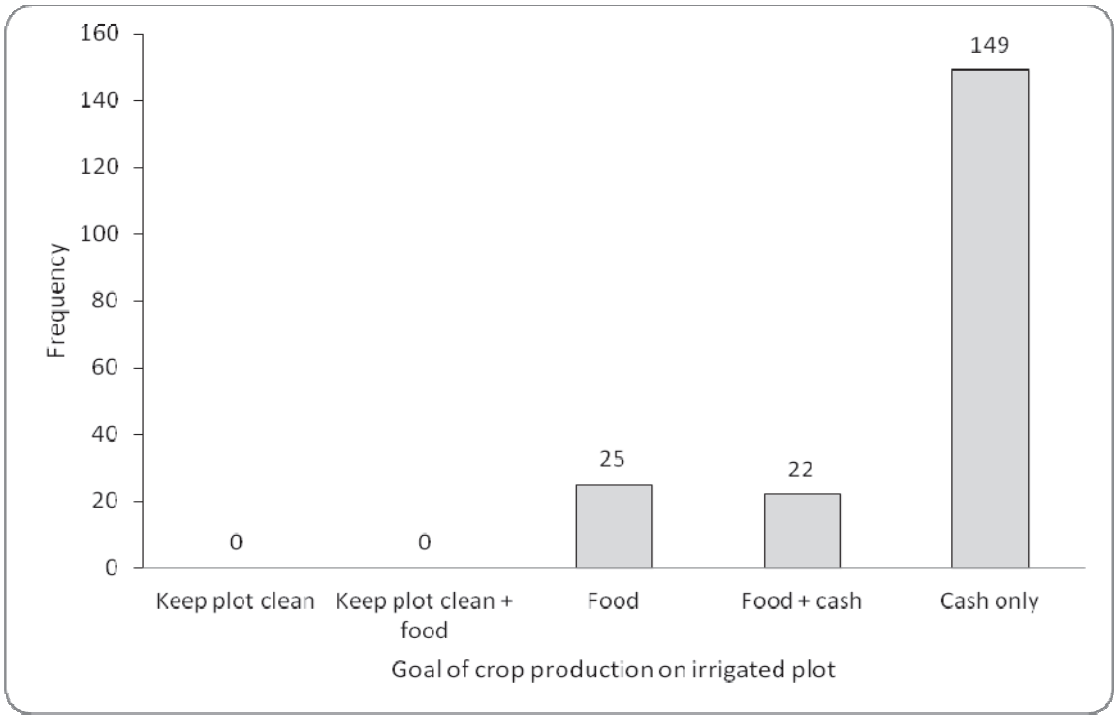

FIGURE 6.3: Frequency distribution of the goals of crop production on irrigation plots among scheme farmer and independent irrigator households in Thulamela (n=196)

Figure 6.4, which shows the goals of micro-livestock production on residential site, reveals that generating monetary income was the dominant goal amongst households involved in this activity, followed closely by the goal of producing food for own consumption. The frequency distribution of the goals of animal production on rangeland shown in Figure 6.5, suggests that this activity was driven even more by the goal of generating monetary income than the production of micro livestock.

FIGURE 6.4: Frequency distribution of the goals of micro-livestock production on residential sites among the three groups of households in Thulamela (n=41)

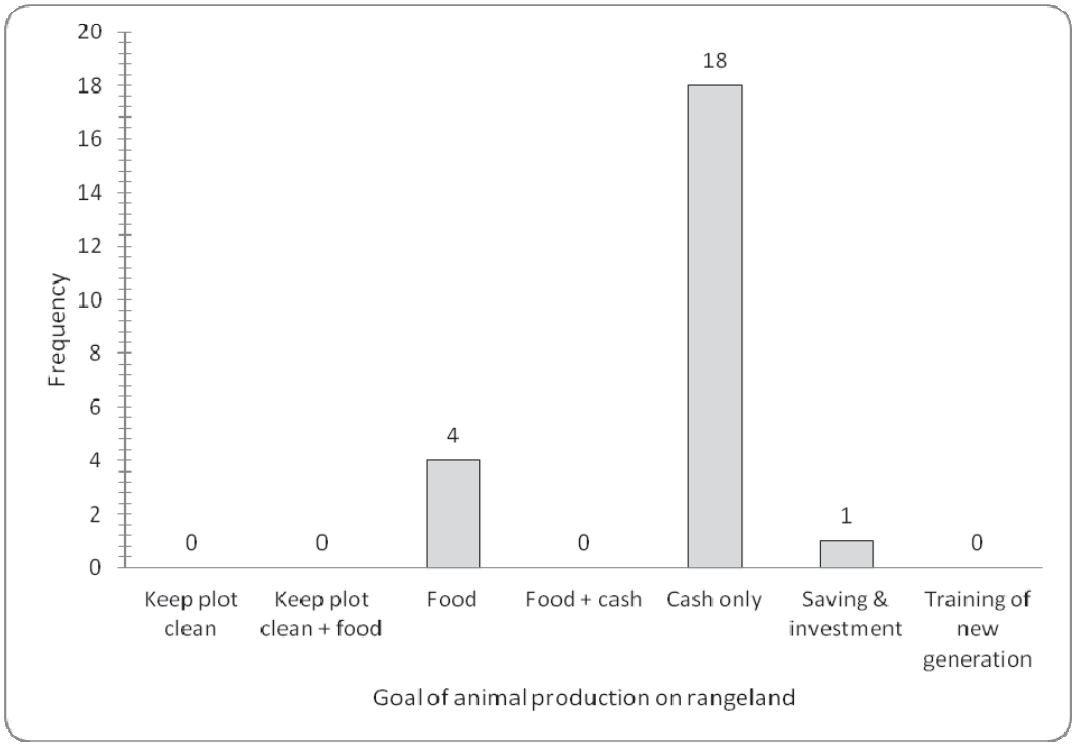

FIGURE 6.5 Frequency distribution of the goals of animal production on rangeland among the three groups of households in Thulamela (n=28)

Group comparisons, which were limited to crop production in home gardens and crop production on irrigation plots, revealed highly significant ($p<0.001$) group effects on the frequency distribution of the goals of these two activities. In the case of crop production in home gardens, the goal of generating cash income was significantly higher among scheme farmers and independent irrigators than among home gardeners. This suggests that the goal of crop production in home gardens could be aligned to the goal of other farm enterprises. A group comparison of the goals of crop production on irrigated plots revealed that the goal of producing food for own consumption was more common among independent irrigators than among scheme farmers. Analysis of sub-group effects within the population of independent irrigators (see Chapter 5) indicated that collectors and diverters were more likely to produce irrigated crops for own consumption than pumpers, whose goal was almost exclusively the generation of monetary income.

Aspirations

The large majority of participants in all three groups had the aspiration to grow their farm enterprise (92%), with 8% aspiring to keep things as they were, and only two aspiring to quit. Again there were differences among the three groups, and these were also highly significant ($p<0.001$). Comparing the aspirations of home gardeners (Figure 6.6) with those of scheme farmers (Figure 6.7) and independent irrigators (Figure 6.8), it is evident that the aspiration to grow was universal among scheme farmers, almost universal amongst independent irrigators, and somewhat less expressed among home gardeners.

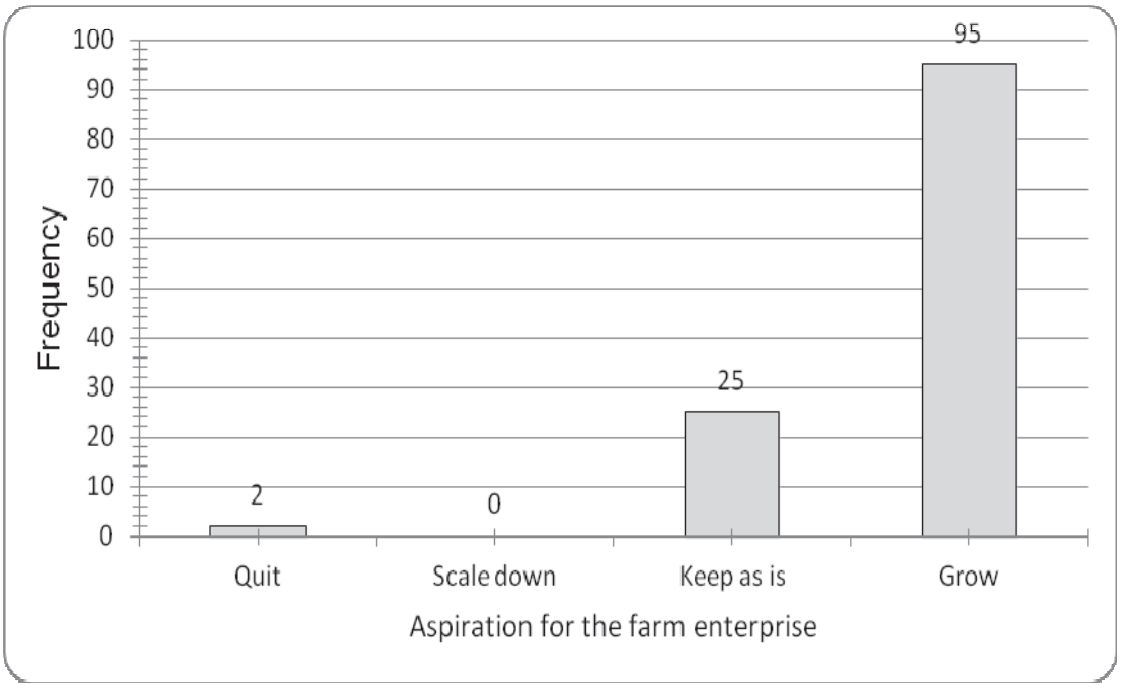

FIGURE 6.6: Frequency distribution of the aspirations of home gardens for their farm enterprise (Thulamela; n=125; 2013)

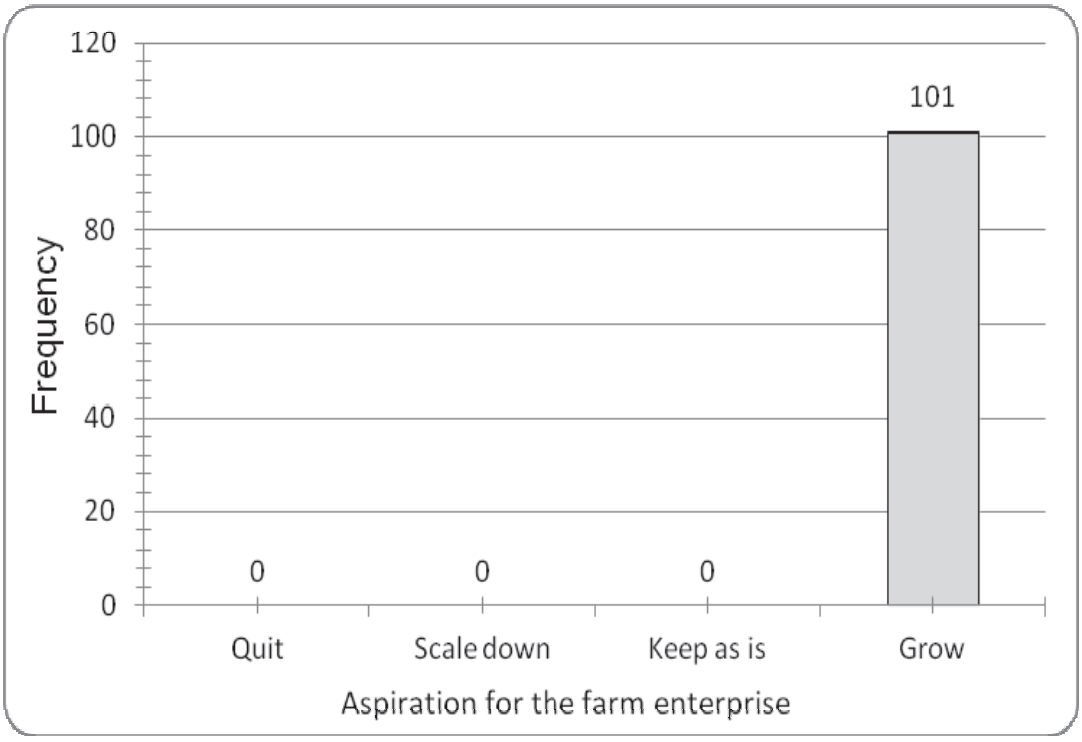

FIGURE 6.7: Frequency distribution of the aspirations of scheme farmers for their farm enterprise (Thulamela; n=101; 2013)

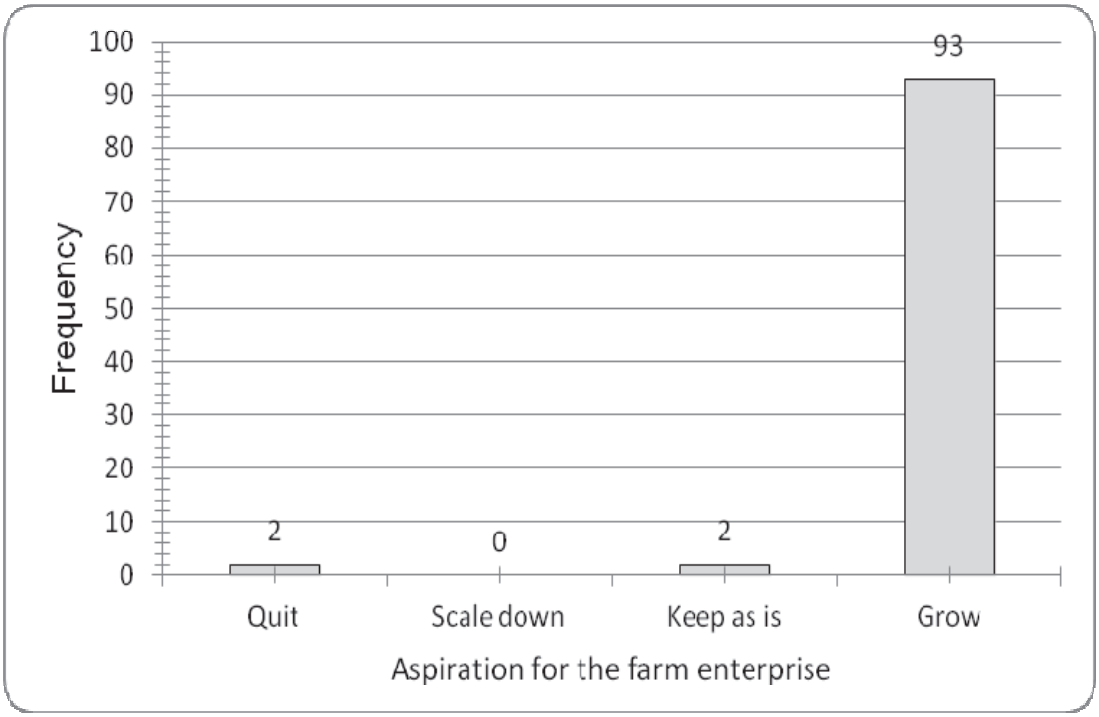

FIGURE 6.8: Frequency distribution of the aspirations of independent irrigators for their farm enterprise(Thulamela; n=98; 2013)

What the survey data failed to expose was the different meanings of 'growth' in the minds of farmers belonging to the three groups. Follow-up interviews with participants revealed that for the most part, the idea of 'growth' among home gardeners was to extend their home garden a little or introduce an irrigated patch, if only there was water, but rarely involved risk or the pursuit of farming on a larger scale but there were a few exceptions. Growth for scheme farmers and independent irrigators, on the other hand, was seen as accessing new and larger markets, particularly the national food produce markets, and as building up their enterprises and acquiring new assets, such as irrigation pipes, borehole pumps, and tractors in order to prepare their own land and earn by providing cultivation services to others, and bakkies to transport their crops to both local and national markets. They saw themselves accessing these new markets by planting crops that were different from those of fellow farmers, or seasonally unavailable elsewhere, and by experimenting with new crops.

6.2.3 Typology of entrepreneurial activity at the Thulamela site

The optimal classification of the cluster analysis of the seven variables described in the introduction to this chapter generated seven classes of households allocating 88% of total variance to between-group variance and 12% to within group variance. Following scrutiny of the group means for the seven classes, labels were allocated to each class. Labelling was done to conjure a picture of the households in each class, which facilitates communication. The labels used were borrowed from the entrepreneurship literature presented in the introduction to this chapter, and also from Eckert & Williams (1995); van der Ploeg (2008) and Cousins (2011). Table 6.2 shows the frequency distribution of the seven classes by type of household, and Table 6.3 the results of the cluster analysis (group means).

TABLE 6.2: Frequency distribution of households by 'class' and type of household (Thulamela; n=324; 2012-13)

Class	Home gardeners	Scheme farmers	Independent irrigators	Total
Rural dwellers	97	52	47	196
Rural survivalist entrepreneurs	26	17	17	60
Entrepreneurial smallholders	1	5	5	11
Petty portfolio entrepreneurs	1	1	6	8
Economic smallholders	0	24	20	44
Portfolio entrepreneurs	0	2	2	4
Small-scale capitalist farmers	0	0	1	1
Total	**125**	**101**	**98**	**324**

Table 6.2 shows that the majority of households (60.5%) were allocated to the class labelled 'rural dwellers'. This class held 78% of the households in the home gardener group but also about half of the scheme farmer and independent irrigator households.

TABLE 6.3: Group means of the variable selected to assess entrepreneurship among home gardeners, scheme farmers and independent irrigators in Thulamela (n=324; 2012-2013)

Class	**Proportion of gross farm income derived from sales** (%)	**Value of farm assets** (Rand)	**Ratio of gross income and total operating expenses**[#]	**Gross farm income** (Rand)	**Gross income other enterprises** (Rand)	**Contribution of 'entrepreneurial activity' to total household income** (%)	**Wealth status***
Rural dwellers	31.8	10 504	3.69 (1.74)	3 481	1 378	11.2	0.86
Rural survivalist entrepreneurs	35.7	27 742	3.94 (1.91)	4 476	23 933	62.8	1.03
Entrepreneurial smallholders	90.1	194 991	4.46 (3.38)	114 267	12 327	59.9	2.94
Petty portfolio entrepreneurs	69.8	146 025	1.51 (1.31)	31 521	64 585	66.6	2.23
Economic smallholders	84.4	53 333	17.90 (2.49)	33 265	1 676	44.2	1.85
Portfolio entrepreneurs	89.1	107 875	1.63 (1.32)	64 149	173 900	85.3	3.26
Small-scale capitalist farmers	95.1	356 800	1.61 (1.61)	325 800	40 000	82.7	34.46
Overall mean	**43.5**	**31 393**	**5.60**	**13 908**	**9776**	**29.4**	**1.26**

* Ratio of per capita household income and the upper-bound poverty line for 2012/13 valued at R12 830 per person per annum

[#] Values in brackets are the median values

From Table 6.3 it can be seen rural dweller households had the lowest degree of commercialisation of farming, the lowest farm asset value, the lowest agricultural income, and the lowest income from other entrepreneurial activity. On average, entrepreneurial activity, including gross farm income, contributed only 11.2% to total household income. The latter was below the upper-bound poverty line of R12 830 per person per annum.

The second class, labelled 'rural survivalist entrepreneurs', also had small farm incomes and their farming also had a low level of commercialisation. However, they derived a large proportion of their income from rural business activity other than farming. They were labelled 'survivalist', because their average household income was close to the upper-bound poverty line and would be well below this line were it not for the income derived from their enterprises, suggesting that 'necessity' was probably the motivation for them doing business. This class was second largest and contained 21% of the home gardener households, and about 17% each of the two groups of irrigator households.

The third class of households, labelled entrepreneurial farmers, was a small group. It contained just one home gardener and five each of the two types of irrigators. Of all seven classes, they had the second highest level of commercialisation in farming (>90% of gross income was derived from sales), and the second highest gross farm incomes. On average, their farm enterprises have the second highest ratio of gross income to total operating expenses, and the highest when the median value is considered. This indicates that their enterprises are 'profitable'. Entrepreneurial farmers derived a large proportion of their household income from entrepreneurial activity (60%) despite relatively low incomes from entrepreneurial activity other than farming, which justifies both the 'farmer' and the 'entrepreneurial' label.

The fourth class of households was also small, containing 8 households only, with independent irrigator households as most represented (6 of the 8). They were labelled petty portfolio entrepreneurs. The 'petty' was added to signify that without business income their household income would be below the poverty line. The label 'portfolio entrepreneur' signifies their involvement in both the business of farming (70% of gross income realised as sales) and other rural enterprises.

The fifth class of households was the third largest and contained about 20% of the two types of irrigator households but none of the home gardener households. They stood out from the pack by their exceptionally high ratio of gross income and total operating expenses, suggesting very limited use of purchased resources in their farming system, despite a relatively high degree of commercialisation. It needs pointing out that the extremely high mean ratio of gross income to total operating expenses of 17.9 is somewhat misleading, as it was brought about by one or two outlier values, one of them as high as 635. This particular independent irrigator generated most of his gross farm income from livestock production, whilst spending next to nothing on this enterprise. For this reason, the median value of 2.49 is a much better representation of the average ratio of gross income to total operating expenses achieved by this class of farmers.

The sixth class of households labelled 'portfolio entrepreneurs' resembled the petty portfolio entrepreneurs but had higher household incomes, suggesting that 'opportunity' was more likely to have been the motivation for engaging in 'business' than among petty portfolio entrepreneurs. This

class contained only four households, two each from the scheme farmer and the independent irrigator groups.

The seventh class of households contained only one household, which was part of the independent irrigator group. This household stood out by its exceptionally high household income and the very high contribution of farming to that income, as well as a very high degree of commercialisation and a very high farm asset value. Clearly, this household was exceptional, and since its characteristics resembled those of the small-scale capitalist farmers described by Cousins (2011) it was labelled accordingly.

6.3 Greater Tzaneen

6.3.1 Personal attributes of farmers

The selected personality traits associated with entrepreneurship for the three groups of farmers in Greater Tzaneen are shown in Table 6.4. The table also provides information on the perception of household heads of the extent to which their farm enterprises were innovative.

TABLE 6.4: Psychological traits associated with entrepreneurship and perception on own innovation among home gardeners, scheme irrigators and independent irrigators in Greater Tzaneen (2013)

Indicators	Home gardeners (n=47)	Scheme irrigators (n=21)	Independent irrigators (n=29)
Psychological traits			
Need for achievement (%)	56	82	87
Locus of control (%)	69	65	66
Risk-taking propensity (%)	66	69	75
Degree of uniqueness of:			
Object of farming (%)	4	25	39
Farming practices (%)	13	24	41
Farming inputs (%)	34	24	34
Farming equipment (%)	9	19	19
Produce markets (%)	5	25	49

The need for achievement was generally high when compared to the other two psychological traits. The proportion of households with a need for achievement was lowest among home gardeners, compared to scheme irrigators and independent irrigators. Locus of control was similar for all household types, with an average of 67%. Risk-taking propensity was highest among independent irrigators (75%) and lowest among home gardeners (66%). In general, households in all three populations had high scores for the selected psychological traits.

The perceptions households had of the degree of uniqueness in their farm enterprises were much higher for independent irrigators across the different aspects of the farm enterprise. The highest score for independent irrigators was for the aspect of produce markets (49%). The perception of home gardeners on the degree of uniqueness regarding farming inputs was significantly higher (34%) than their perception of other aspects of uniqueness. This result is positively associated with the findings of prevalent use of retained seed and limited use of purchased inputs in the home gardens.

6.3.2 Goals and aspirations of farmers

Goals

Similar to households in Thulamela, the three populations in Greater Tzaneen practised a total of five different farming enterprises, namely;

1. crop production in home gardens
2. crop production on dryland plots
3. crop production on irrigated land;
4. micro-livestock production on residential sites(poultry and pigs); and
5. small- and large livestock production on commonage (cattle and goats).

The frequency distribution of the goals of crop production in home gardens among the three groups of households in Greater Tzaneen combined, shown in Figure 6.9, demonstrates that the overriding goal for the production of crops in home gardens was to produce food. A negligible number of households had cash-oriented goals for crop production in home gardens.

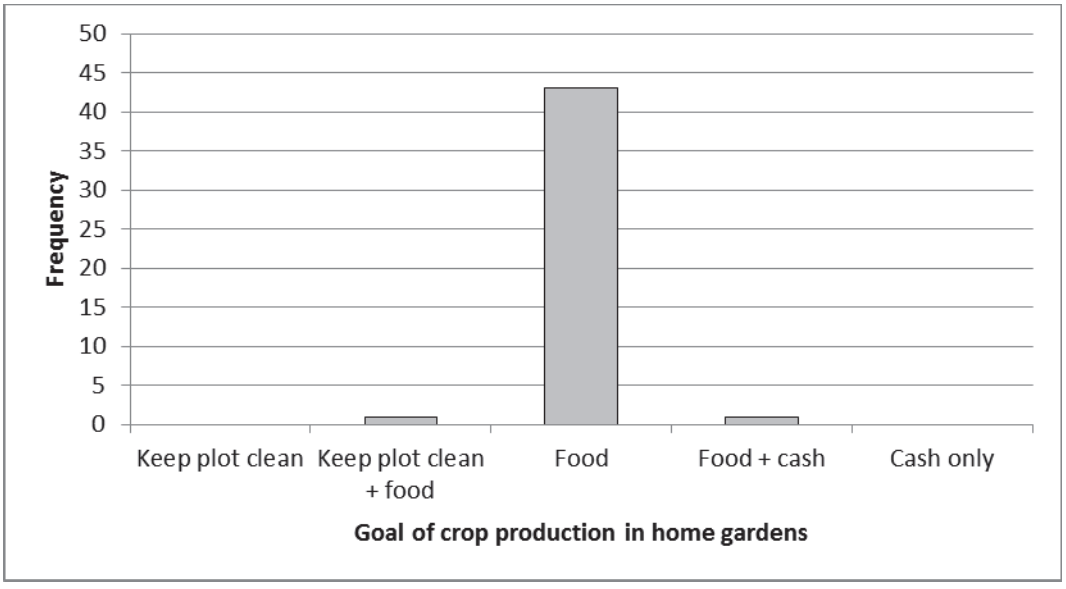

FIGURE 6.9: Frequency distribution of the goals of crop production in home gardens among the three groups of households in Greater Tzaneen (n=45; 2013)

Figure 6.10 shows the frequency distribution of the goals of crop production on dryland plots. Rain-fed agriculture was practised by 13 of the 97 households that were surveyed. Results show that crop

production on dryland plots was practised for production of food for home consumption, and also for income generation. Food production was the more dominant goal.

Figure 6.11 presents the frequency distribution of the goals of crop production on irrigation plots. The majority of irrigation farming participants in Greater Tzaneen had the goal of generating monetary income. Results indicate that irrigated farming was market-oriented. The home gardener households were not part of this analysis because they did not practise irrigated farming during the study period.

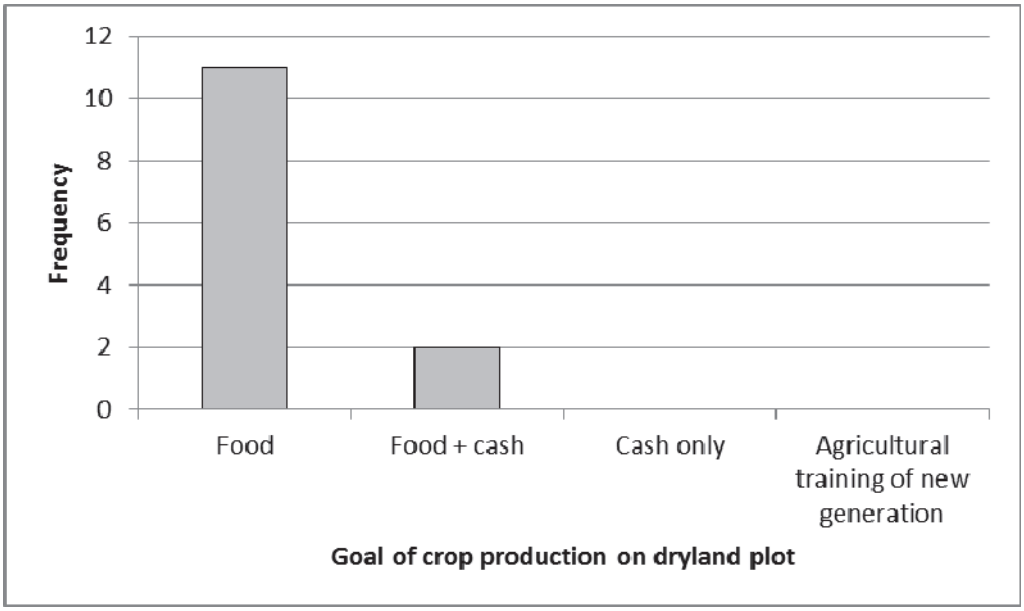

FIGURE 6.10: Frequency distribution of the goals of crop production on dryland plots among the three groups of households in Greater Tzaneen (n=13; 2013)

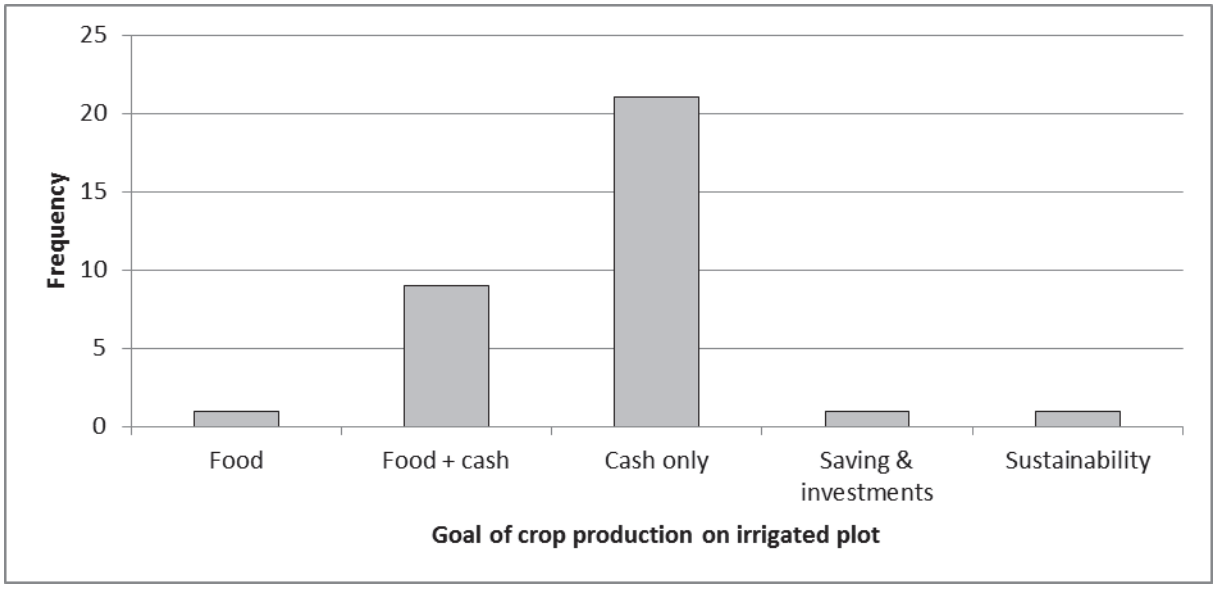

FIGURE 6.11: Frequency distribution of the goals of crop production on irrigation plots among scheme and independent irrigator households in Greater Tzaneen (n=33; 2013)

Figure 6.12 shows the goals of livestock production on the residential site. The most predominant goal of keeping livestock on the residential site in Greater Tzaneen was food production. Generation of cash income was also part of the goal, although less important as reflected by the frequency distribution.

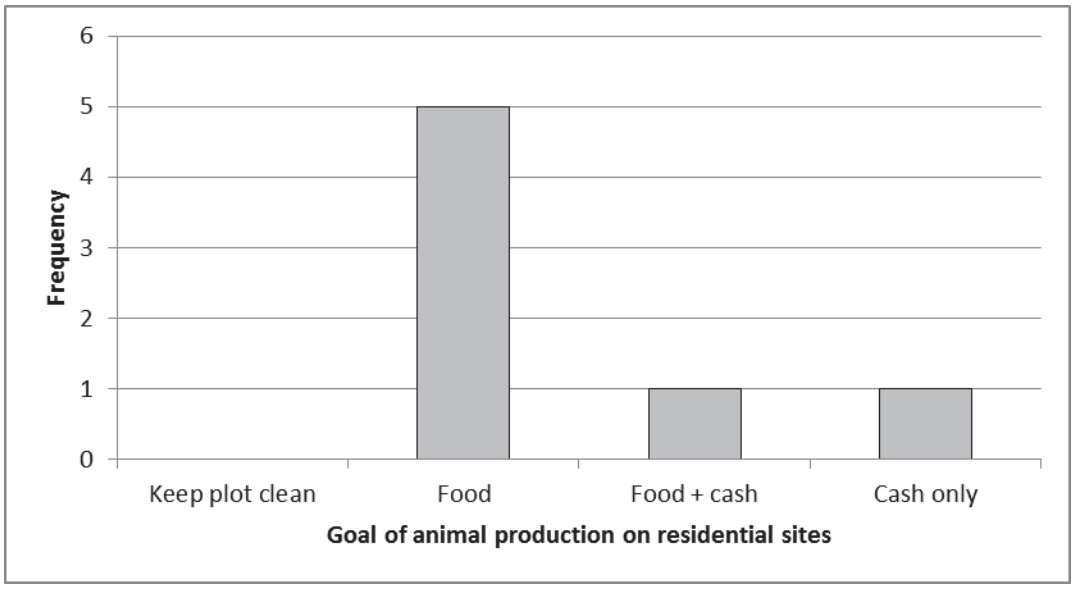

FIGURE 6.12: Frequency distribution of the goals of micro-livestock production on residential sites among the three groups of households in Greater Tzaneen (n=7; 2013)

The frequency distribution of the goals of animal production on rangeland (Figure 6.13) indicates that households in Greater Tzaneen aim for both cash income generation and food production equally. The frequency distribution of goals of animal production on both residential site and rangeland show that food production dominates livestock production goals in the study area.

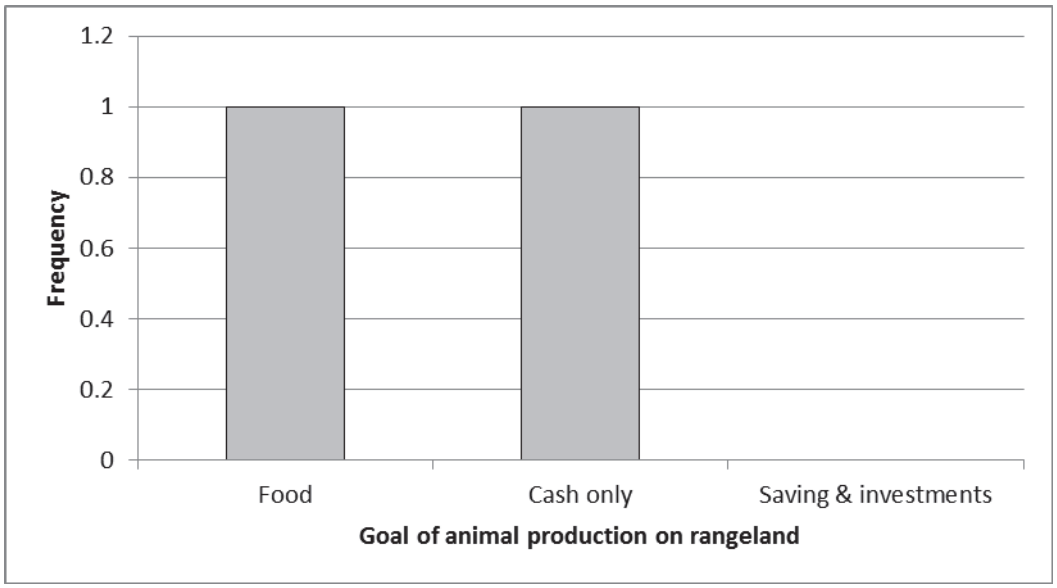

FIGURE 6.13 Frequency distribution of the goals of animal production on rangeland among the three groups of households in Greater Tzaneen (n=2; 2013)

Aspirations

Figure 6.14 presents the frequency distribution of the aspirations of home gardens for their enterprise in Greater Tzaneen.

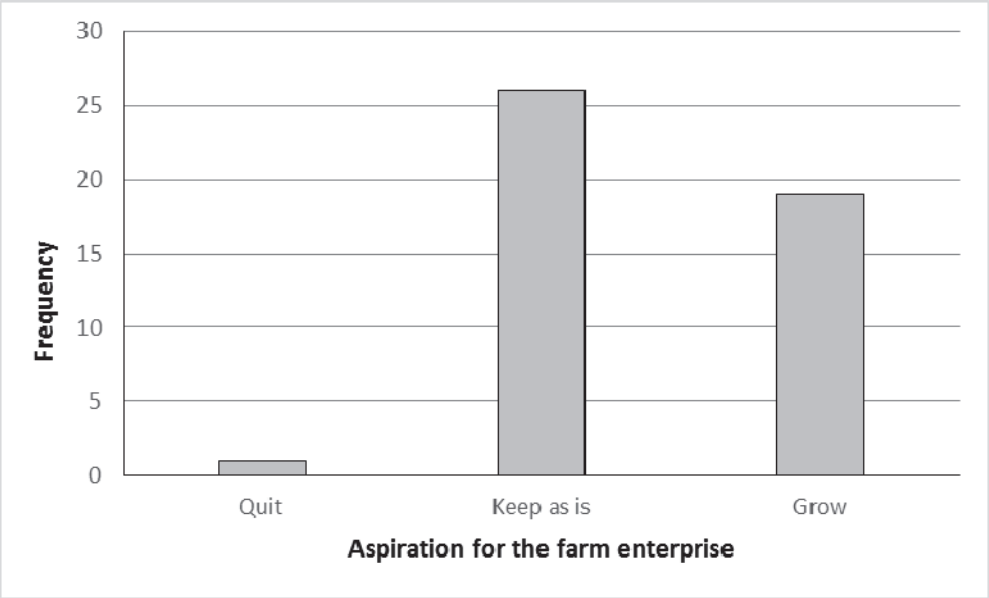

FIGURE 6.14: Frequency distribution of the aspirations of home gardens for their farm enterprise (Greater Tzaneen; n=46; 2013)

A significant proportion of households cultivating home gardens among the three groups of farming households had the aspiration to keep their farming enterprises as they were (57%), with 41% aspiring to grow their farming enterprises. About 2% of the households were aspiring to quit home garden farming. Comparing the aspirations of farmers on home gardens with those of irrigation scheme farmers (Figure 6.15) and independent irrigators (Figure 6.16), it is evident that the aspiration to grow the farm enterprise was more pronounced among scheme and independent irrigators compared to home gardeners. Households gave various meanings to 'growing' an enterprise as was explored through qualitative research. Noteworthy is that none of the independent irrigators had the aspiration to quit farming.

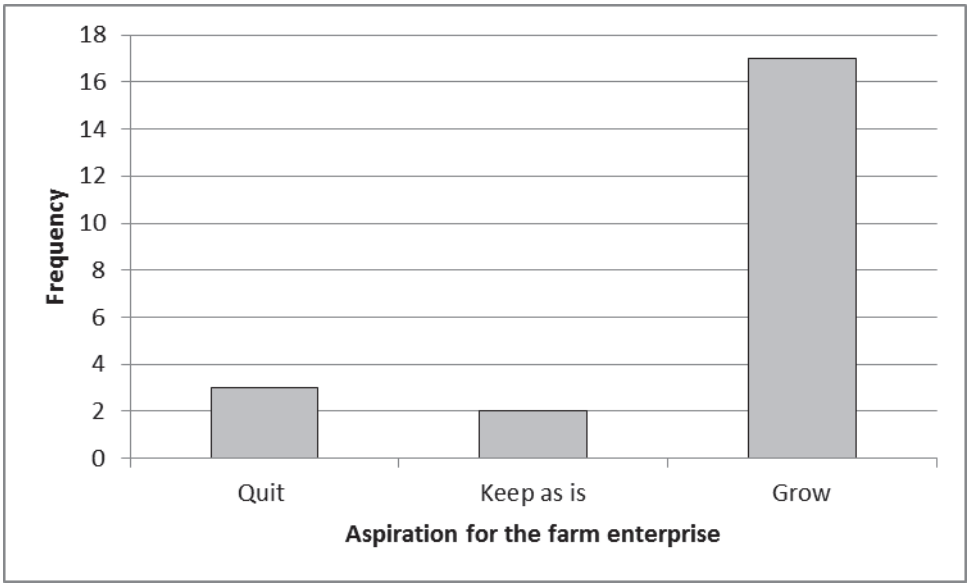

FIGURE 6.15: Frequency distribution of the aspirations of scheme farmers for their farm enterprise (Greater Tzaneen; n=22; 2013)

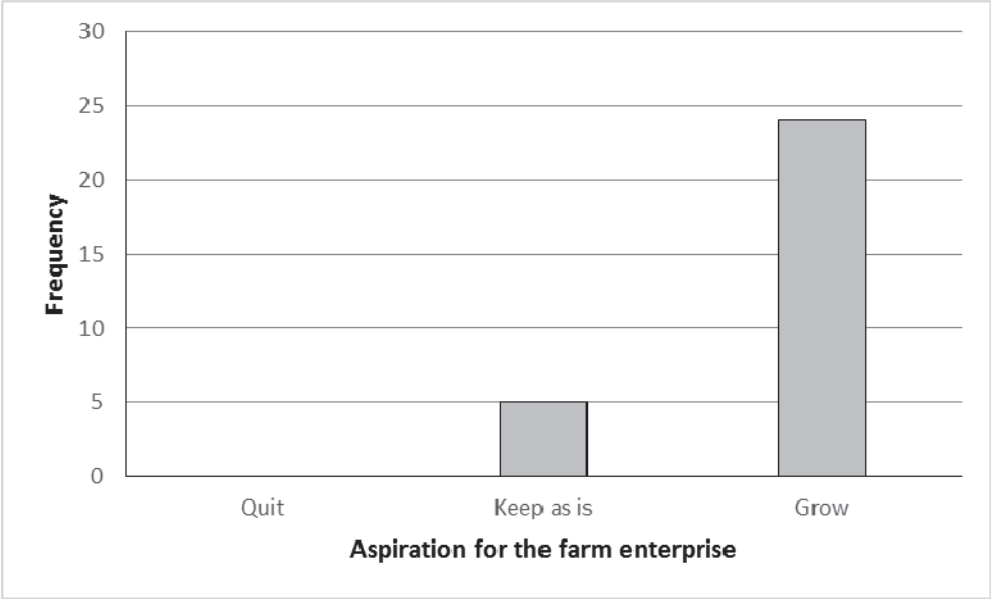

FIGURE 6.16: Frequency distribution of the aspirations of independent irrigators for their farm enterprise(Greater Tzaneen; n=29; 2013)

6.3.3 Typology of entrepreneurial activity at the Greater Tzaneen site

Cluster analysis of the Greater Tzaneen households yielded three classes of households as shown in Table 6.5. About 71% of total variance was allocated to between-groups variance. Consistent with entrepreneurship literature and an analysis of the group means for the key variables, labels were allocated to each class. Table 6.5 shows the frequency distribution of the three classes by type of household. The first cluster was labelled 'rural dwellers' as all the home gardeners in the sample were allocated to it. The second cluster comprised of scheme irrigators (38%) and independent

irrigators (62%) and was labelled 'subsistence irrigators'. The third cluster consisted of fairly similar proportions of both scheme irrigators (42%) and independent irrigators (58%).

TABLE 6.5: Frequency distribution of households by 'class' and type of household (Greater Tzaneen; n=90; 2012-13)

Class	Home gardeners	Scheme farmers	Independent irrigators	Total
Rural dwellers	46	0	0	46
Subsistence irrigators	0	5	8	13
Entrepreneurial smallholders	0	13	18	31
Total	**46**	**18**	**26**	**90**

Table 6.6 presents results of the analysis of group means. These results show that farming by rural dwellers was entirely for subsistence purposes. The value of farm assets was slightly lower than that of the other two classes of households, but their farming systems were slightly more efficient (higher return on purchased inputs). On average, rural dwellers had the lowest agricultural income, and the lowest income from non-farm entrepreneurial activities of the three classes of households. The average wealth status value of this group equalled unity. This indicates that their incomes were close to the upper-bound poverty line of R12 830 per person per annum.

The subsistence irrigator class of households consisted entirely of scheme and independent irrigators. The subsistence orientation of their farms was evident from their very limited engagement in produce markets (degree of commercialisation of 8.1%) but their income from farming was substantially higher than that of the rural dwellers. They also had higher incomes from non-farm entrepreneurial activity than home gardeners but the combined contribution of agriculture and non-farm entrepreneurial activity to their total household incomes was limited (11.2%). Their household incomes were above the poverty line, and would remain there without the income generated from farming and other entrepreneurial activity. This suggests that their livelihoods were largely derived outside the rural economy.

The third class of households, labelled entrepreneurial farmers was smaller than the rural dweller class but larger than the subsistence irrigators class. The most prominent characteristics of entrepreneurial farmers were the high degree of commercialisation (94%) and the high gross farm income (R53 218). Income derived from other entrepreneurial activities was low, yet still higher than that of rural dwellers. Entrepreneurial farmers also had a slightly higher average value of farm assets than the other two groups. Farming for markets was very important for the livelihood outcome of entrepreneurial farmer households, contributing nearly half of their total household income (44.4%). Whilst their average household income was more than double the poverty line, without income from farming it would have been very close to the poverty line.

TABLE 6.6: Group means of the variable selected to assess entrepreneurship among home gardeners, scheme farmers and independent irrigators in Greater Tzaneen (n=90; 2012-2013)

Class	**Proportion of gross farm income derived from sales** (%)	**Value of farm assets** (Rand)	**Ratio of gross income and total operating expenses**	**Gross farm income** (Rand)	**Gross income other enterprises** (Rand)	**Contribution of 'entrepreneurial activity' to total household income** (%)	**Wealth status***
Rural dwellers	0.0	32 732	4.18	1 454	4 153	13.8	1.00
Rural survivalist entrepreneurs	8.1	38 914	4.09	5 210	8 092	11.2	1.95
Entrepreneurial smallholders	94.0	39 726	3.05	53 218	6 177	44.4	2.22
Overall mean	**33.5**	**37 220**	**4.02**	**19 826**	**5 419**	**24.0**	**1.56**

* Ratio of per capita household income and the upper-bound poverty line for 2012/13 valued at R12 830 per person per annum

6.4 Summary and conclusion

The enquiry into entrepreneurship among households at the two sites produced interesting results. Farmers in the three household groups were assessed in terms of three psychological traits that have been associated with entrepreneurship, namely 'need for achievement', 'locus of control' and 'risk-taking propensity'. Generally, very limited differences were observed between the three household groups at the two sites in terms of psychological traits, and comparatively differences between sites were more considerable, with Thulamela households scoring higher than those in Greater Tzaneen. Perceived uniqueness of the farm enterprise, which was used as an indicator of perceived innovation, yielded the opposite results, with farmers in Tzaneen scoring much higher than their Thulamela counter parts. If meaning had to be attached to these major site differences it would be found in the domain of values, i.e. the differences in value attached to 'work and leisure, responsibility, and success' displayed by groups at the two sites. The Thulamela group's high scores in the three psychological traits conform to the qualitative data collected from selected cases. The group wants to be perceived, socially/traditionally/culturally, as a farming community dedicated to hard work and as a disciplined and determined unit that values labour and frowns upon displays of laziness, particularly in the domain of agriculture as a way of provisioning food. Their low scores for uniqueness of their farm enterprise reflect the tendency to downplay any features that suggests individualism. In this way, downplaying of uniqueness (innovation) expresses the avoidance of being the object of community talk of overachievement and "making oneself better".

The aspiration of the large majority of farmers was to grow their farm enterprise, irrespective of the group they belonged to or the study site. However, a subsequent enquiry into the meaning of 'growth' among members of the three household groups revealed that their aspirations differed considerably. Where home gardeners aspired to expand garden production or start irrigating a small patch so as to raise their food production, irrigators aspired to grow their 'farming businesses' and expressed this as wishing to expand their operation (additional land under cultivation), to acquire additional farm assets and to access new markets. There was evidence of associations between type of farming activity and the goal being pursued. Of importance to the project was that the primary goal of home gardening at both sites was to obtain food for home consumption. By contrast, the primary goal of irrigated cropping on scheme plots and independently irrigated plots was to generate monetary income by marketing what was being produced.

The results of the cluster analysis, which made use of seven variables, all of which signified different aspects of entrepreneurship, yielded useful household categories, seven at Thulamela and three at Greater Tzaneen. At both sites, the majority of households demonstrated low to very low levels of entrepreneurship based on the indicators used. There were also a minority of households who appeared to be engaged in entrepreneurial activity that appeared to be motivated by opportunity. At both sites, the largest number of such households were found in the cluster labelled entrepreneurial smallholders. This label reflected that these households were primarily engaged in 'the business of farming' In Thulamela three more household categories represented what looked like entrepreneurs motivated by opportunity. The first two were labelled petty portfolio entrepreneurs and portfolio entrepreneurs. Both of these categories were involved in multiple

enterprises, usually including market-oriented farming. The last category, labelled small-scale capitalist farmers, only had a single representative and stood out for very high entrepreneurship indicator values. Of importance also was the finding that irrigated farming was associated with raised levels of entrepreneurship, but the overlap between irrigated farming and entrepreneurship motivated by opportunity was far from complete.

The findings presented in this chapter lead to the conclusion that rural entrepreneurship, which included the production of crops and livestock for markets and also any other local business activity, made a significant contribution to the livelihoods of between 30% (Greater Tzaneen) and 40% (Thulamela) of the samples of households that participated in the study. In households where entrepreneurship was significant for livelihood outcomes, necessity appeared to be the motivating factor for most, but there was also a minority that appeared to be motivated by opportunity. This pattern resembles that described for the informal business sector found in the cities of South Africa, where also only about one out of ten informal enterprises was motivated by opportunity and the rest by necessity.

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Chapter 7 Livelihood, Agriculture and Entrepreneurship: Cases from Thulamela

7.1 Introduction

In this chapter the livelihood and farming activities of eight households in Thulamela and three households in Greater Tzaneen are described. The purpose of this chapter is to provide rich pictures of how households in the study areas have constructed their livelihoods with specific reference to the role of farming in these livelihoods, as well as the presence or absence of entrepreneurship.

The cases are representations of the classes of households that were identified by the cluster analysis described in Chapter 6. In this analysis, variables considered to be indicators of entrepreneurship were used to group households. For Thulamela, each of the seven classes or clusters is represented by a single case, except for the rural dwellers, which are represented by two cases. For Greater Tzaneen each case represents a cluster.

The sources of information used to compile the descriptions included the survey, which covered the period 1 July 2012 to 30 June 2013, the life histories of the farmer in the household, and subsequent interviews with the farmer conducted during 2014 and 2015 and for Thulamela. These follow-up interviews were held to discuss the progress people had made in pursuit of their goals and aspirations. The life histories provided insight on the ways in which farmers obtained access to the various assets they used in their farm operations and how these assets were mobilised to set up their farm enterprises.

7.2 Thulamela cases

7.2.1 Ntusheni, the rural dweller

In 2013, the household of Nthuseni had six members, consisting of herself, her three children and two grandchildren. No one in Nthuseni's household had completed high school and all three children were unemployed. In 2012/13, the household income consisted almost entirely of social grants, which combined amounted to R25 560. To the income derived from claiming against the state was added a very small gross income of R185 from the production of crops and the rearing of scavenger chickens in the home garden. This brought the total to R25 745, or R4 291 per person, which was only R142 above the food poverty line of R4 149, and less than half of the upper-bound poverty line of R12 830.

Characterising elements of the livelihood and farming of Nthuseni's household were:

- Almost complete dependence on social grants by a three-generation household;
- Low household income
- Very little economic activity;
- Farming is limited to home gardening and is entirely for home consumption;

Nthuseni, who is an 84 year old woman, identified herself as the 'farmer' in her household. In 2012/13, Nthuseni planted 1 023 m^2 of her 3 000 m^2 residential site to a mixed crop of maize, cowpeas and pumpkins, harvesting produce to the value of R545, which was consumed entirely by the household. To produce the crops she purchased inputs to the value of R378, made up of R250 for the cultivation of the garden by tractor, R35 on fertiliser and R95 on seed. This provided her with a net operating income of R193 and a net cash operating income of -R378 for the crop enterprise. In addition, she reared scavenger chickens. On July 1 2012 she had 13 chickens valued at R60 each. Over the next year she consumed four and six died, leaving her with three chickens on 30 June 2013. She did not purchase any inputs for her chicken enterprise. Accordingly, she realised a negative gross income (gross loss) of -R360, due to the death of six animals. Combined, her two enterprises resulted in a gross income of R185, a net operating income of -R193 (loss) and a net cash operating of -R978 (loss) summarised in Table 7.1.

TABLE 7.1: Farm income statement of Nthuseni for the period 2012/13

Farm income statement	**All enterprises**
Gross farm income (R)	R185.00
Total farm operating expenses (R)	R360.00
Gross cash receipts (R)	R0.00
Gross in-kind receipts	R785.00
Net operating income (R)	-R193.00
Net cash operating income (R)	-R978.00

In 2013, Nthuseni indicated that she wanted to grow her farming. In June 2015, she was asked how much progress, if any, had been made towards that growth. The interview took place in the presence of her two daughters and one grandchild. One of the daughters enquired why it was not her that was being interviewed because she was also a "farmer", pointing at a patch in the garden that was planted to Chinese cabbage, which she claimed to be her doing. Since 2012/13, the area planted to crops in the home garden had been reduced. Nthuseni still grew maize but had given up on the cowpeas. Neither mother nor daughter expressed a desire to cultivate the entire home garden. The daughter spoke of searching for employment.

Nthuseni and her daughter cited the scarcity of water as factor that prevented growth in their farm enterprise. Yet, a communal tap is located next to her gate. When this was pointed out to them, they responded that tap water in Manamani village was only available late in the evenings and that the family did not have the money to invest in a borehole. Neither Nthuseni nor her daughter had

ever sought access to land for farming, nor had they ever actively attempted to sell any of the crops they had produced in their home garden.

In terms of her psychological attributes associated with entrepreneurship, Nthuseni scored 100% for need for achievement (the sample mean was 99%), 80% for locus of control (the sample mean was 80%) and 100% for risk-taking propensity (the sample mean was 99%). She scored low when it came to 'uniqueness' of her home gardening enterprise, i.e. 0% for object of farming, 0% for farming system, 0% for farming equipment, 0% for farm inputs, and 0% for produce markets.

7.2.2 Tshililo, the rural dweller

Tshililo is a 34 year old home gardener who resides in Manamani. In 2013, his household had eight members, consisting of his parents, his two, older, siblings, his sister's three children and himself. In Tshililo's household, no members had completed high school and neither his siblings nor his parents were employed. In 2012/13, the total income of the household amounted to R23 340 or R2 918 per person. This was R1 213 below the food poverty line. The household income was obtained from remittances (R8 400), two child grants (R6 980), the making and selling of goods (R7 200) and small-scale farming (R780). Tshililo was responsible for the latter two economic activities.

Tshililo is the son of the village's Vhamsanda and his second wife. His father, the Vhamsanda, passed away in 2014. Tshililo was identified as the farmer in the household but insisted that his family worked collectively in the farm enterprises of the household. Growing up, Tshililo struggled in school, eventually dropping out in 2002 when in Grade 11. After quitting school, Tshililo became involved in various activities. He began planting his home garden to vegetables, which he sold in the neighbouring village of Dzwerani, and assisted his mother with her beer brewing business. He later took over the brewing business from his sickly mother. He brews during the week and sells over the weekend. When the village's water shortage began affecting the growth of his irrigated vegetables, Tshililo decided to look into livestock production. Using income from brewing he purchased Venda chickens and two pigs (1 male and 1 female) from the petty portfolio entrepreneur, Gumani, who taught him how to rear these animals.

In 2012/13, Tshililo's farming consisted of the production of crops, pigs and scavenger chickens. On the whole, he made a loss. He planted 2 948 m^2 of his 4 550 m^2 residential site to a mixed crop of maize, Swiss chard and Chinese cabbage, harvesting produce to the value of R800, which was consumed entirely by the household. To produce these crops he purchased inputs to the value of R780, made up of R500 for the cultivation of the garden by tractor and R280 on seed. This provided him with a net operating income of R20 and a net cash operating income of -R780 for the crop enterprise. In addition, he reared pigs and scavenger chickens. On July 1 2012 he had 14 pigs and 13 chickens valued at R500 and R30 each, respectively. Of his pigs, he sold five, consumed one and three died. He consumed eight chickens, sold six and six died. There were additions to his chickens through reproduction, and on 30 June 2013 he had seventeen in hand. Tshililo purchased inputs to the value of R110 for his piggery and, combined, his livestock enterprise resulted in a gross income of -R20 and a net operating income of -R130 (loss) summarised in Table 7.2.

TABLE 7.2: Farm income statement of Tshililo for the period 2012/13

Farm income statement	**All enterprises**
Gross farm income (R)	R 780.00
Total farm operating expenses (R)	R 890.00
Gross cash receipts (R)	R 3,680.00
Gross in-kind receipts	R 1,540.00
Net operating income (R)	-R110.00
Net cash operating income (R)	R 370.00

Characterising elements of the livelihood and farming of Tshililo's household were:

- Very low household income;
- Limited economic activity by the household as a whole;
- One person runs several enterprises with the goal of venturing into irrigated farming;
- Use of contemporary platforms to market the various enterprises;
- Farm enterprises were less profitable than the other rural enterprises..

Tshililo made up for the losses in his farm enterprise with the profits of his other enterprises generating a profit of R2 400 from brewing and R4 800 from his brick-making operation. He runs this brick-making business on land situated next to Manamani dam. His uncle had applied for this land with the intention of using it for irrigated farming but had given up on that idea, because the water in the dam was too contaminated for food production purposes. He subsequently gave Tshililo permission to use the land to set up a brick yard. Tshililo sells his bricks at R1 each. He employs clever strategies to market his goods, advertising his bricks on his Facebook page and on homemade wooden and corrugated iron billboards, which he nails to poles and trees along Manamani roads. He explained that with his focus on brick making, livestock production and beer brewing, his crop production was only for home consumption. In 2015, Tshilio was expanding his brick making business (Figure 7.1) and was ready to purchase more pigs for which he was designing a "nicer" shelter.

FIGURE 7.1: Tshililo's brickmaking enterprise on his uncle's plot located next to Manamani Dam

Tshililo has been saving as much as he can afford towards the cost of sinking a borehole and installing a pump on his 1 ha dryland plot. As the son of the Vhamsanda, Tshililo had obtained access to this plot through his father, free of charge. In 2015, the cost of sinking a borehole and installing a pump was about R30 000. Tshililo believed that 'growth' in the manner that he was progressing, was very slow. He was adamant that if he was given the opportunity to relocate to a place where irrigated farm land was available, he would accept the offer.

Assessment of Tshililo's psychological attributes in relation to entrepreneurship showed that he scored 67% for need for achievement (the sample mean was 99%), 75% for locus of control (the sample mean was 80%) and 100% for risk-taking propensity (the sample mean was 99%). When it came to 'uniqueness' of his farm enterprise , he scored 0% for object of farming, 0% for farming system, 0% for farming equipment, 0% for farm inputs, and 0% for produce markets.

7.2.3 Takalani, the rural survivalist entrepreneur

In 2013, Takalani's household had eleven members, consisting of him and his wife, his two sons and three daughters, his daughter-in-law and three grandchildren. In his household, Takalani is the farmer but his wife assists him on the farm. The cluster analysis (Chapter 6) placed Takalani in the category labelled 'rural survivalist entrepreneurs'. In the year 2012/13, the total income of Takalani's household amounted to R58 325 or R5 302 per member, which was R1 153 above the food poverty line but less than half of the upper-bound poverty line of R12 830. The major part of this household income R33 600 had been derived from the brewing and selling of beer and the building of a hut for someone in the village. Other sources of income were claims against the state (R10 440) and farming

(R9 389). Takalani has four adult children but all were unemployed. His two sons, who are brick layers, helped him with the construction of the hut. His youngest daughter was in Grade 6 and all of his grandchildren attended the local crèche.

Characterising elements of the livelihood and farming of Takalani's household were:

- Self-employment keeps the household out of desperate poverty;
- Farming is the primary household activity in terms of labour but income is low;
- Adult children do not contribute to farm labour despite being unemployed;
- Purchased inputs for crop production are kept to a minimum, even for cash crops;
- The labour-based farming system includes the collection of irrigation water;
- Low investment in farm assets;
- Heavy reliance on local marketing of farm produce.

Takalani was born in 1955 in Khubvi Village and he is 61 years old. His father was a migrant worker, based in Johannesburg, with all of his three wives and fourteen children residing in his Khubvi homestead. Takalani began his schooling in 1965 but quit after completing Form 2 (Standard 7) in 1972, because providing for a seventeen-member household made continued schooling financially impossible. Growing up, Takalani did not practise any form of farming and, when he quit school, he found various piece jobs. He preferred working as a bricklayer, building houses. In 1979, Takalani left Venda and began his training in the South African military, returning in 1982 where he was employed in the, then, Venda Defence Force (VDF). In 1989, when the VDF was incorporated into the South African Defence Force, Takalani returned to Khubvi and was allowed to transfer to the South African Police Service, where he worked until 2005. He left the SAPS to focus solely on his farming because he felt that he was too old to continue to serve as a police man.
Takalani started farming in 1990, whilst still employed as a soldier. He approached a friend who had a plot on Khubvi Irrigation Scheme and asked to rent one strip from him. His friend refused to lease him this portion of land but pointed him to vacant land outside the scheme. The plot was in close proximity to the river and adjacent to a coffee plantation. To get access to that land, Takalani approached his Vhamsanda and was charged R500 for it. Takalani does not have an official PTO for this land. He was given a hand written slip by the Vhamsanda that stated that he had paid R500 for its use. He stated that he learnt farming from fellow farmers.

To irrigate his plot, Thakalani collects water from the river and carries it in buckets to his plot, placing him in the collector category of independent irrigators (see Chapter 5). In 2012/13, Takalani planted 12 000 m^2 to maize for grain. He cultivate by hand and did not apply fertilisers. He lacked the labour to check weed growth and did not irrigate the plants. He also planted 5 000 m^2 to tomatoes, 5000 m^2 to white cabbage, 5000 m^2 to onions and 5 000 m^2 to Chinese cabbage. For these crops he hired a tractor service to cultivate the soil and invested in fertilisers to the value of R1000 for each crop, and R180 per crop in plant protectants. He hired a casual worker to do a single weeding operation paying the worker R180 per crop. On his residential plot, Takalani planted 146 m^2 to maize. Takalani had no means of transportation and relied on traders to collect and transport vegetables from his plot. The bulk of his crops were sold to street traders, bakkie traders and to the local community. His white cabbages were purchased by a single trader, who collected the harvest

all at once. What he did not sell to traders, he took home and sold door-to-door to his neighbours. Thakalani's field maize was a disaster. He only harvested 100 kg of grain, worth R376, which was consumed by the household (Figure 7.2).

FIGURE 7.2: Thakalani's poor maize planting which harvested only 100 kg of grain from a 1 ha plot

He fared better with his other crops, generating a gross income of R1 550 from tomatoes, R5 450 from white cabbages, R925 from the Chinese cabbage, and R900 from onions. He harvested R188 worth of grain from his home garden (Table 7.3).

TABLE 7.3: Farm income statement of Takalani for the period 2012/13

Farm income statement	**All enterprises**
Gross farm income (R)	R9,389.00
Total farm operating expenses (R)	R7,840.00
Gross cash receipts (R)	R7,025.00
Gross in-kind receipts	R2,364.00
Net operating income (R)	R1,549.00
Net cash operating income (R)	-R815

Takalani's children have little interest in farming. As a result, labour is in short supply. His wife assists him, and when the work is too much for the both of them to handle he employs one or two workers

on a casual basis. In 2013, Takalani stated that he was saving for an irrigation pump. In 2014, when asked on progress, he answered that he had used his savings for the renovation of his three outside dwellings and for the foundation of his new home, which he did himself. He also reported that the crops he had planted on his independent plot had been completely destroyed:

> *There is fencing [around my plot], the problem is that, as human beings, we do not love each other, the fence was cut at the top and at the bottom to create an opening for the cattle to enter my plot and graze. They ate everything.*

He explained that he knew the owner of the cattle and reported the matter to the police. The police instructed him to first approach his Vhakoma (Vhamsanda) so that the matter could be resolved within the community. Takalani believed this process to be expensive because of the fee paid to meet with Vhakoma and the additional fee paid for the sitting of his council. He also believed that this process benefits those who are very generous in their gifts to Vhakoma. He stated that after Vhakoma hears the charge/complaint, he sends marshals to inspect the damage for which he decides on an appropriate fine/compensation. Takalani's case had not yet been resolved because the owner of the cattle had yet to attend a council meeting, citing work commitments. Further, Takalani complained that all independent irrigators in Khubvi had been called to a meeting with Vhakoma and his council, where they were informed of a new annual rental fee R254 for the use of their independent plots.

Despite these setbacks, Takalani was working on accessing new markets. He explained that the Khubvi extension officer had approached a number of independent irrigators, advising them to form a committee that would work on the Fetlalatlala Project. This project would pay the farming committee to grow stipulated crops. However, when the committee had been established, the extension officer informed them that the project had been awarded to a neighbouring community. Takalani stated that this news did not lead to the dissolution of the committee. Instead they had decided to continue to work together to apply for school feeding scheme tenders and when approaching market agents.

Assessment of Takalani's psychological attributes in relation to entrepreneurship showed that he scored 90% for need for achievement (the sample mean was 99%), 90% for locus of control (the sample mean was 80%) and 100% for risk-taking propensity (the sample mean was 99%). When it came to 'uniqueness' of his farm enterprise , he scored 0% for object of farming, 0% for farming system, 0% for farming equipment, 0% for farm inputs, and 0% for produce markets.

7.2.4 Mashudu, the entrepreneurial smallholder

In 2013, the household of Mashudu had nine members, consisting of him and his wife, five of his six children, and two grandchildren. Only one of his six children, a social worker, had left the parental home. Two of his children aged 29 and 25 were unemployed, and three were still at school. Mashudu is the farmer in the household. His wife is a primary school teacher. The cluster analysis (Chapter 6) placed Mashudu in the 'entrepreneurial farmer' category. For 2012/13, the household

income was R327 630, to which farming contributed R91 550 (27%), and his wife's salary R156 000 (48%). The social worker daughter remitted R61 200 during 2012/13, and the household received R8 880 in grant money. An additional R18 000 was generated through construction work.

Characterising elements of the livelihood and farming of Mashudu's household were:

- Substantial regular income provides the financial platform to invest in farming and take risks;
- Ongoing experimentation with new crops and new markets,
- High levels of purchased inputs on irrigated land;
- Considerable investment in farm equipment.

Mashudu is 64-year old and was born in Mukumbane. In 1957, at the age of six, he moved to Itsani when his father was allocated a plot on the Dzindi Irrigation Scheme. Growing up, he and his siblings assisted his farther on the Scheme plot and also on an additional 3 ha on the fringes of the scheme, which his father has applied for. Land of the fringes of the Scheme is referred to as "wasteland". When the scheme was planned, this land was considered unsuitable for irrigation, because the soil was too shallow or the slope too steep (Murray, 1951). Such land was part of the land allocated to the Scheme community but it was designated for extensive grazing purposes. However, proximity of the main canal or discharge from concrete furrows that convey water from the main canal to the plots, present opportunities to irrigate parts of this 'waste land', and some people, Mashudu's father being one, applied for and obtained 'official' permission to cultivate a parcel of this 'wasteland'.

Mashudu went to school and completed Grade 10 (Standard 8) for which he received his Junior Certificate. He also obtained a certificate in "carpentry and cabinet making". As was common among young men of his generation, he migrated to the city and for five years he worked as a carpenter for Robert Construction in Johannesburg. At the end of 1981, Robert Construction was relocating to Namibia. Not wanting to move that far away from home Mashudu resigned and returned to Dzindi, where he established his own construction company. During the nineteen-eighties, he regularly applied for and obtained government tenders to build and install kitchen cabinets in hostels completing such projects as far as Krugersdorp and Soweto. He was also awarded a tender by the Department of Education to renovate and restore schools in the, then, Venda Homeland.

In 1988, Mashudu applied for land in Tshisaulu. His idea was to establish a tropical fruit orchard. He had observed that good money could be made from the sale of mangoes and litchis. He explained his idea to the Dzindi Extension Officer, who gave him permission to look for vacant land[1]. When Mashudu found vacant land in Mukumbane, where he was born, he approached the local *Mumsanda* (headman) and paid R220 for the land. Following this payment the Mumsanda should have sent him to the Mukumbane Tribal Council to legitimise his user rights and obtain a PTO certificate, but this did not happen. When Mashudu started clearing the land, people from the Council approached Mumsanda and informed him that Mashudu was clearing tribal land without the

[1] NOTE: Requesting permission from the government representative at Dzindi is significant, because one of the conditions of holding land on Dzindi Irrigation Scheme was that all other land holdings had to be rescinded. Seeking to acquire land to establish an orchard, Mashudu probably knew that he was compromising his eligibility for an irrigation plot at Dzindi.

permission of the Council. To protect his position, Mumsanda pretended to have no knowledge of Mashudu's activities and instructed him to vacate the land. Afterwards, in 1990, when things had settled down, Mumsanda pointed Mashudu to another piece of vacant land. Mashudu now knew how to proceed the proper way. First, he sought permission from the Mukumbane Tribal Council, then from the Department of Agriculture, and finally from the Sibasa Magistrate, who provided him with a PTO certificate at the end of 1991. Mashudu employed two Mozambicans to establish and maintain the orchard, planting 500 mango trees and 35 litchi trees from 1992 to 1994. Water for irrigation was collected by bucket from the stream that ran below his orchard. Around 2000, when the trees started to produce, the market for mangoes had become so oversupplied that there was no longer any money to be made, which prompted Mashudu to clear the orchard and use the cleared portions for the production of dryland maize. This is an interim use because his ultimate goal for the land is to establish a macadamia orchard but first he first has to purchase another a pump to extract water from the river below the orchard for the irrigation of the trees.

In 1997, Mashudu inherited both his father's 1.28 ha scheme plot and the 3 ha of wasteland. His father left both to him, because amongst his sons, he considered Mashudu to be the 'most dedicated to farming'. The scheme plot has 21 strips, each with a gross area of 612 m^2. To avoid friction between him and his two brothers, who also live around the Scheme, Mashudu offered each brother 5 strips on the scheme plot, leaving him with 11 strips, with a total gross area of 6 732 m^2.He kept the 30 000 m^2 wasteland plot, because his siblings were not interested in sharing the cost of purchasing an irrigation pump.

In 2014, Mashudu bought the irrigation pump and pipes, which he now uses to irrigate his 3 ha of 'wasteland'. Before acquiring the pump he diverted water leaking from the canal to the 'wasteland' to irrigate (Figure 7.3). He considers his bakkie as an essential asset for his farm enterprise. It enables him to access markets which farmers such means of transportation cannot. For example local supermarkets expect farmers to harvest, wash and deliver produce to the store.

FIGURE 7.3: Water leaking from the main canal diverted to Mashudu's 'wasteland' plot

Among Dzindi scheme farmers, Mashudu is among those who are most successful, financially. His 2012/13 farm enterprise income statement (Table 7.4) shows that he achieved an exceptionally high net operating income from his farming activities.

TABLE 7.4: Farm income statement of Mashudu for the period 2012/13

Farm income statement	**All enterprises**
Gross farm income (R)	R91,550.00
Total farm operating expenses (R)	R38,253.48
Gross cash receipts (R)	R77,150.00
Gross in-kind receipts	R14,400.00
Net operating income (R)	R53,296.52
Net cash operating income (R)	R38,896.52

People at Dzindi regularly gossip about Mashudu's farming. A few years ago he planted a substantial portion of his scheme plot to garlic. Not only was he was the first farmer on the Scheme to do so, he planted multiple strips to this 'new' crop. The whole farmer community was talking about it. He harvested 2 tons, dried and packaged the lot and shipped it in 5 kg bags to the Johannesburg Fresh Produce Market. At the time, garlic retailed for R35 per kg at Fruit and Veg City, known to be one of the cheaper fresh produce chain stores in South Africa. Conservatively he expected a payment of R20 000 but when all costs had been deducted, Mashudu received a cheque for R350.00. The dismal

failure of his venture was the talk of Dzindi for a long time. Yet, he did not give up experimenting with new crops and distant markets.

During the 2012/13 season, Mashudu planted 2 477 m^2 of his wasteland plot to Habanero chilli peppers and 2 477 m^2 to Jalapino chilli peppers. Both crops were delivered to the National Fresh Produce Market in Johannesburg, which required delivery to a transportation enterprise in Levhuvhu, a task he accomplished using his bakkie. Once the cost of re-packaging, refrigerating and transportation were deducted, Mashudu received R45 per consignment of 3 kg peppers. The sale of Habanero peppers generated gross cash income of R30 000 and that of Jalapino peppers R9 000. In addition, Mashudu planted 7 strips of his scheme plot to maize, 4 to white cabbage (see picture), 1 to Swiss chard and 2 to nightshade (muxe). In his orchard he planted 1.5 ha to dryland maize. Of the maize Mashudu produced on his scheme plot, he sold 3000 cobs as green maize at R2 per cob, generating a R6000 cash income. He harvested the remaining cobs as grain and delivered it to NTK using his bakkie for storage and future consumption. The grain harvest was 640 kg with a retail value of R1 800. From his 2 strips of Nightshade (muxe), he generated R6 000 in cash, selling to street traders. From the Swiss chard he generated a cash income of R 4250, selling to Pick ‘n Pay, delivering the produce using his bakkie He sold his white cabbage (Figure 7.4) to a person who had a feeding-scheme tender, delivering the cabbages to this client using his bakkie. The cabbage sales generated a gross cash income of R28 500.

FIGURE 7.4: Mashudu irrigating white cabbages on his scheme plot

In 2014, Mashudu continued to deliver Habanero to Levhuvhu for the National Fresh Produce Market in Pretoria, adding green beans to the crops he supplied to this market. He packaged the

green beans himself in small rectangular boxes, and was very satisfied with the profits he made. Following his 2014 success, he decided to continue supplying the national produce markets and also began growing okra to add to the range of crops he produced and sold. However, the 2015 venture was a financial disaster. For delivery of 200 boxes of green beans, which he packed on the farm, he received a total of R2 360, which did not even begin to compensate him for the money he spent on hired labour for harvesting and packaging and the boxes which cost R5 00 each, let alone the other operating expenses incurred. He also burnt his fingers on the ochra venture. He delivered 50 crates of ochra for transportation to the National Fresh Produce Market but received no payment for this consignment. Disillusioned he opened his ochra plots to members of his community to harvest what they wanted for free. The rest of the crop went to seed. As a result of this serious financial setback, Mashudu turned his focus back to selling crops, primarily white cabbage, on local markets, which he considered less risky. He also expressed an interest in growing potatoes, and planted a strip to this crop in June 2016.

Assessment of Mashudu's psychological attributes in relation to entrepreneurship showed that he scored 100% for need for achievement (the sample mean was 99%), 75% for locus of control (the sample mean was 80%) and 100% for risk-taking propensity (the sample mean was 99%). When it came to 'uniqueness' of his farm enterprise , he scored 0% for object of farming, 0% for farming system, 0% for farming equipment, 0% for farm inputs, and 0% for produce markets. All of these scores were well below the average. In other words, Mashudu presented himself as the guy next door, the man who does exactly the same as his fellow farmers on the Scheme. Nothing could be further from the truth.

7.2.5 Gumani, the petty portfolio entrepreneur

In 2013, Gumani's household had eight members that consisted of her, her two sons, her two daughters and her three grandchildren. Three of Gumani's children, both of her daughters and her youngest son, were unemployed. Gumani's eldest son was as a hawker in Thohoyandou. No adult members of Gumani's household had completed high school. Two of her grandchildren were attending crèche and the third was in his Grade 2 year. Gumani is the farmer in the household. Her children assist her, occasionally, on the farm. The cluster analysis placed Gumani in the 'petty portfolio entrepreneur' category. She combined farming on an independently irrigated plot with the rearing of pigs and operating a Spaza shop from her home. Her 2012/13 household income amounted to R133 820 or R16 728 per person. This was R3 898 more than the upper-bound poverty line. The main part of the household income (R84 000) was generated by the spaza shop, to which were added R42 860 from farming and R6 960 in child grants. Gumani does the farming and oversees the spaza shop but one of her daughters does the day-to-day running of the shop.

Characterising elements of the livelihood and farming of Gumani's household were:

- Highly entrepreneurial outlook;
- Business, including farming, contributed 95% to household income;
- Commercial farming involved both crop and livestock production;
- Progressive development of the irrigation enterprise;

- Experimentation with markets;
- Considerable investment in farm equipment.

Gumani is a 56 year old Itsani independent irrigator who was born in Manamani. Gumani dropped out of school in her Standard 5 (Grade 7) year in 1975. In 1983, she obtained employment at the South African Knitting Co. in Shayandima, where she worked until she was retrenched in 1990. Within a week after her retrenchment, she purchased knitting machines to continue with her knitting. She also purchased cold storage fridges so that she could sell meat and beer and in 1995, was able to open and operate both a shebeen and a spaza shop from her home. In this year, she also decided to purchase 'Venda' chickens, which she would sell to her shebeen clientele, also allowing her clients to purchase on credit. Gumani observed that most of her clients cleared their debts on days when state grants were being paid. She saw the opportunity to increase her sales by setting up a stand at state grant pay points. The jump in sales and profits resulting from this initiative combined with an investment in pig production enabled Gumani to purchase a bakkie. Her aim was to become mobile so that she could reach a greater number pension/grant pay points at which to sell her wares.

In 2003, Gumani stopped her knitting enterprise, because of her poor eyesight and decided to grow vegetables on her residential stand. She grew potatoes, green beans and groundnuts, which she also sold to her shebeen and spaza shop clientele. Her clients and other members of the Itsani community encouraged her to look for proper farm land, where she would be able to produce crops on a larger scale. An Itsani man who held a sizeable piece of wasteland below the Dzindi Irrigation Scheme offered her the use of part of his field. She learnt to farm on a field scale from her late husband and from a few Dzindi plot holders.When she was confident with her farming ability, she asked her husband to approach the local headman and apply for 4 ha of 'wasteland', which was located in close proximity to the plot she had been farming on. She stated:

> *In 2010, I had a dream of a plot near the small river. I [then] woke my husband up, early in the morning, and told that he should approach the Vhamsanda for a plot to farm on. He went to the Vhamsanda in Tshisaulu, Makumbane and paid a fee. Vhamsanda sent one of his servants to view the land that we wanted and we were allowed to take it, it is 4 ha. I do not have a PTO but I have a letter from the Mukumbani Tribal Council.*

To irrigate her plot, Gumani uses a petrol-powered irrigation pump. She uses this pump to extract water from the Dzindi River and convey it to her plot (Figure 7.5). Daily she transports the pump to her plot using a wheelbarrow to ensure that it not stolen.

During the 2012/13 season Gumani only used a small part of her plot. She planted 551 m^2 of her wasteland plot to green maize, 551 m^2 to white cabbage, 551 m^2 to onion and 1 102 m^2 to nightshade (muxe). Gumani sold her produce to local consumers and street traders but she applied for and obtained a certificate (license) to supply to the Thohoyandou Spar.

FIGURE 7.5: Gumani's pump and herbicide sprayer

From her green maize, Gumani generated a gross income of R700 from the green maize, R2 400 from the white cabbages, R1 200 from the onions and R2 880 from the nightshade, a total gross income of R7 180, of which R6 180 was in cash. Her operating expenses amounted to R 7 429, which mean that the independently irrigated plot enterprise made a net operating loss of -R248. Her pig and broiler were much more profitable, generating a total gross income of R35 680, whilst total operating expenses were limited to R10 825, leaving her with a net operating income of R24 855. The gross income for all enterprises combined was R42 860, and the net operating income R24 607. She spent R1 092.50 on seed and seedlings, R1 476 on fertilisers and employed casual labour to assist her with the planting and harvesting of the nightshade, which cost her R450. Her irrigation plot generated a gross income of R7 180. The farm income statement is shown in Table 7.5.

TABLE 7.5: Farm income statement of Gumani for the period 2012/13

Farm income statement	**All enterprises**
Gross farm income (R)	R42 860.00
Total farm operating expenses (R)	R18 253.00
Gross cash receipts (R)	R45 410.00
Gross in-kind receipts	R1,150.00
Net operating income (R)	R24 607.00
Net cash operating income (R)	R26 505.00

In 2014, Gumani had planted garlic. To prepare for this new crop she had joined a garlic farmers' organization. This organization had taught her how to successfully produce the crop. She had also planted sugar cane and had tried to access new markets through Levubu. She had used her bakkie to deliver 2000 sugar cane stalks[2] to Levubu, for which she received a payment of R800 but was charged R1300 in agent costs, clearly a loss-making venture. She realised that she knew very little about these 'distant markets' but had approached Dzindi plot holders to teach her about them. She added that the blow of her sugar cane losses was somewhat cushioned by finding three clients for her onion and garlic. She met these new clients when delivering her sugar cane to Levubu. She said that she would continue to search for bigger and better markets.

Assessment of Gumani's psychological attributes in relation to entrepreneurship showed that she scored 100% for need for achievement (the sample mean was 99%), 80% for locus of control (the sample mean was 80%) and 100% for risk-taking propensity (the sample mean was 99%). When it came to 'uniqueness' of her farm enterprise , she scored 0% for object of farming, 0% for farming system, 0% for farming equipment, 0% for farm inputs, and 0% for produce markets. These very low uniqueness scores failed to reveal her continuous search for new and better things.

7.2.6 Aluwani, the economic smallholder

In 2013, the household of Aluwani had eleven members, consisting of him and his two wives and his seven children. All his children were at home and, of the eight children, six remained in school and his two eldest sons were both unemployed. Aluwani is an independent irrigator in Manamani and was the farmer in the household. Both of his wives work on his farm and his older children also assist. In 2012/2013, Aluwani's household derived its income from farming (R65 500), the tractor business (R42 477), and social grants (17 400). Total household income was R125 377, or R11 398 per person, R1 432 below the upper-bound poverty line.

Aluwani was born in 1965 in Manamane. Growing up, he sold firewood that he had collected and in the summer, he collected manure in preparation to plant. In 1980, he joined his father in Johannesburg where he hoped to find employment that would give him the earnings to purchase a plot. He returned to Venda in 1983, where he worked for Toyota until he found work with Fashion World and became the company's driver when ownership changed hands. Though his employers took care of him, he still had "the nagging feeling to return" to farming.

Before purchasing his own farming land, Aluwani rented from Dzindi scheme plot holders but rental proved dissatisfactory because without a formal rental contract, the plot holder would return in time for crop harvesting and chase him away. He purchased his first 5 ha plot in Manamane, by asking for a R3 000 loan from his employer, telling him that his younger brother wished to attend university. He bought another 4 ha of land to add to his 5 ha, and to earn the R26 000that he needed for this additional land, he sold one of his beasts and started making clay bricks on a section of his 5 ha plot.

[2] Sugar cane is used as a sweet by members of the ZCC churches, who are discouraged from eating processed food, including store-bought sweets.

Within six months, he had earned R76 000, which he used to pay for his new plot and to repay the R3000 loan he had taken out to buy the 5 ha plot. With remainder of his earnings, he purchased a tractor. In 2006, he left his work as a driver to take up full-time farming.

Characterising elements of the livelihood and farming of Aluwani's household were:

- Farming is the main source of household income, primarily in the form of food for home consumption;
- The family provides most of the farm labour, keeping operating expenses low;
- Ongoing experimentation with new crops and new markets;
- Expansionist outlook.

Aluwani uses his 40 000 m^2 plot to grow his irrigated crops. To irrigate his land, he pumps water from a river and applies it to the crops by means of furrow irrigation. Aluwani employs casual workers during peak labour situations (planting, weeding, harvesting) and he predominantly assisted by his wives on his land. In the July 2012-June 2013 cropping year, Aluwani planted 995 m^2 to Spinach and 3 560 m^2 to white cabbage. He sold his spinach to local consumers and generated a R4 900 cash income. He sold the bulk of his white cabbage to a client who had a feeding scheme tender with local schools. The rest was sold to bakkie traders. From his white cabbage, Aluwani generated R20 000 cash income. On his 50 000 m^2 dryland plot, Aluwani planted 30 000 m^2 to maize. He did not sell any grain and the entire harvest was set aside for home consumption. Aluwani's farm income statement is summarised in Table 7.6.

TABLE 7.6: Farm income statement of Aluwani for the period 2012/13

Farm income statement	**All enterprises**
Gross farm income (R)	R 65,500.00
Total farm operating expenses (R)	R 24,265.00
Gross cash receipts (R)	R 24,900.00
Gross in-kind receipts	R 40,600.00
Net operating income (R)	R 37,900.00
Net cash operating income (R)	-R 2,660.00

In August 2014, Aluwani was selling onions, Swiss chard and Chinese cabbage to the Thohoyandou Pick 'n' Pay and Spar, which he transported and delivered to the supermarkets using his own old bakkie. He stated that this market had too many local farmers competing with each other and that he was investigating ways to supply the national produce markets with limited risk. He explained that during the second half of 2013, he had transported no less than 60 boxes of baby marrow a week, to an agent at City Deep, where his produce would be re-packaged, refrigerated and transported to a national produce market. After a five-month wait, he received a cheque of R500 from the agent. Later, he received three payments of R1600, R1700 and R1200 and was told that the bulk of the money generated from the sale of his baby marrow was used to pay the costs incurred for transportation.

7.2.7 Phathutshelo, the portfolio entrepreneur

Phathutshelo is 48-year. His father was one of Dzindi's most prominent and successful farmers. As recent as 2011, he was named 'Dzindi Farmer of the Year' (Figure 7.6). He retired completely from farming a few years ago.

FIGURE 7.6: Phathuthselo's father named 'Dzindi farmer of the year' in 2011

In 2013, the household of Phathutshelo had nine members, consisting of him and his wife, his five children, and two of his sisters. All his children were at home, attending school. His two sisters, both of whom were in their twenties, had completed their high school education. Phathutshelo is a Dzindi plot holder and was identified as the farmer in the household but it needs pointing out that his wife is heavily involved in irrigated production, and that the children also assist. Phathutshelo's household generates most of its income from farming and from a tractor business. In 2012/13 the tractor business generated a gross income of R218 000, farming R103 500 and R13 920 was obtained as state grants. Total household income was R335 420, or R37 260 per person, more or less three times the upper-bound poverty line.

Characterising elements of the livelihood and farming of Phathutshelo's household were:

- Husband and wife effectively divide tasks, she farms, he takes care of the tractor business;
- Skilfully seeking a comparative advantage over fellow farmers on the scheme,
- Quality is paramount in both farming and the tractor business;
- Conscious decision to focus on local markets;
- High levels of purchased inputs on irrigated land;
- High levels of Investment in farm equipment.

Phathutshelo began school in 1975 but struggled throughout his schooling career, completing Grade 7 (Standard 5) in 1987. He eventually dropped out of high school in his Grade 10 (Standard 8) year

without obtaining his Junior Certificate. Growing up, he worked on his father's irrigation plot and helped him with his other enterprises as well. From his dad he learnt to cultivate irrigation land using draught animals. Once proficient in this task, he started to use his father's animals and equipment to cultivate land for fellow farmers. This he did to earn money for himself. At first, his family used as draught animals but when his father acquired cattle, he used the donkeys solely for his 'transportation and delivery business'. This business involved making grocery purchases for Dzindi residents in Thohoyandou and delivering these to their homes and transportation of farming equipment from homesteads to plots and produce from plots to homesteads. Phathutshelo used cattle to cultivate until he purchased his first (second-hand) tractor in 2003. He added a second tractor in 2009 and enlisted his younger brother to work with him in the tractor business (Figure 7.7).

FIGURE 7.7: Phathutshelo's two tractors, one with a ridger attached and the other with a disk plough

When still at school, his father granted Phathutshelo the use of a single strip on his plot on which he could plant for his own account. Good performance over the years was rewarded by additional strips. A few years ago, when the father retires, Phathutshelo was given the entire irrigation scheme plot but only retains 13 strips (9 126 m^2). The remaining 6 strips (4 212 m^2) were distributed amongst his siblings. In 2012/13, he increased his area of cultivation on the scheme with an additional 12 strips (8 424 m^2). He acquired the temporary use of this land from two plot holders by providing them with his tractor service free of charge in exchange for the use of their land.

In the 2012/13 cropping year, he planted 13 strips to maize, 14 to white cabbage, 3 to Swiss chard, 7 to muxe and 3 to butternut. The latter crop was 'new'. Of the maize Phathutshelo produced on his strips, he sold 6 500 cobs as green maize at R3 per cob to street traders and directly to consumers, generating R 19 500 cash income. Phathutshelo set aside 200 cobs for home consumption, but mainly used these as gifts. He harvested the remaining cobs as grain and, using his bakkie, delivered it to NTK for storage and future consumption. He harvested 400 kg of grain with a retail value of R1 500. Phathutshelo sold 5 625 heads of his white cabbage to street traders and bakkie traders at R8 per cabbage, generating R45 000 cash income. From his 7 strips of nightshade (muxe), he generated R20 000 in cash and R8 000 in cash from his 3 strips of Swiss chard, selling to bakkie traders and to the Thohoyandou Spar and Pick 'n' Pay, delivering the produce using his bakkie. Phathutshelo did not generate a cash income from his 3 strips of butternut, because the crop wilted before harvest and could not be sold, a rare failure. Phathutshelo and his wife are assisted by one permanent farm worker. During peak labour times (planting, weeding, harvesting), they rely on his sons and daughter to work on the farm. Casual workers are also employed during such times. Phathutshelo invests heavily in the purchase of fertilisers. For example, in 2012/13 he spent R10 773.00 on fertilisers. He keeps land preparation costs low by using his own tractors. His farm income statement is shown in Table 7.7.

TABLE 7.7: Farm income statement of Phathutshelo for the period 2012/13

Farm income statement	**All enterprises**
Gross farm income (R)	R 103,500.00
Total farm operating expenses (R)	R 37,053.00
Gross cash receipts (R)	R 93,100.00
Gross in-kind receipts	R 2,400.00
Net operating income (R)	R 66,447.00
Net cash operating income (R)	R 40,047.00

Phathutshelo has also been investing in cattle and the value of his livestock on 30 June 2013, amounted to R56 000.00 (Figure 7.8).

FIGURE 7.8: Part of Phathutshelo's cattle herd in July 2015

Phathutshelo's farming and tractor business often feature in the talk of the Scheme. At Dzindi, there are six tractor service providers but Dzindi residents "swear by" Phathutshelo's service, even though they often complain that they have to wait. Plot holders say that they have to wait, because Phathutshelo always makes sure that he prepares his own land first, so that his crop is planted before that of his fellow farmers, providing him with an advantage over them. Yet they prefer waiting instead of hiring someone else, because they know the cultivation will be done perfectly. Another reason why other farmers stick with him is that provides the service on credit. Phathutshelo put it this way:

> *There are many people that I help. If you go out and ask them, "who do you mostly employ to plough for you?", they will respond "Phathutshelo". I help them nicely when I plough for them, even [when] I plough on credit, I don't harass them. That person will decide whether or not to pay [me]. They must remember that this is not the end of the farming cycle. Next year, they will need to plough again [and] if they did not pay they will look for another tractor driver who will not be like me*".

In 2014, Phathutshelo stopped supplying local supermarkets. Instead, he focused completely on selling to consumers and bakkie traders who transport produce themselves. He stated that transporting and delivering crops to local supermarkets and distant consumers was too costly. While he did not insist that the operating expenses of supplying to local supermarkets were a hindrance, he did state that obtaining a license to supply supermarkets was problematic. He was convinced that upon inspection of his site and the source of water he used (the canal water is

polluted) he would not be issued with such a license. So far, he had not been affected negatively by this decision. He boasted that he even had a consumer who travelled all the way from Polokwane to purchase his Swiss chard. In August 2014, Phathutshelo was preparing land to plant white cabbage for harvest in February 2015. He had also entered an arrangement with people who had a feeding scheme tender providing meals to schools. He maintained that in order to run a successful enterprise, the farmer must observe his or her fellow farmers' practices and/or activities stating, "you must look around and see what it is that they are planting and when they plant" so that you can "plant your crops early or plant a different crop altogether".

How he has achieved success and his, sometimes, aggressive nature have also been topics of gossip at Dzindi. During the 2015/2016 drought, Phathutshelo made a killing from his cabbage, selling at R16 per head and not a single head was left standing on his land. For once the smallholders who had fresh produce were price makers instead of price takers. The community assigned his windfall to him having "a bakkie and a boy". During the drought, there was little water entering the canal and plot holders were allocated specific times during which they could draw water. Whilst plot holders usually all agree when restrictions are proposed, back on their plots there are several who will attempt to get hold of extra water by breaking the emergency rules. This is achieved, for example, by blocking the flow of water in the canal, giving them more but reducing the flow to the lands located below the blockage. Farming at the tail-end of the canal, Phathutshelo employed a young labourer to patrol the canal during his irrigation times to ensure that there were no "blockages" and if there were, "he got into his bakkie and drove" to the source of the blockage to 'sort out the offender'.

Assessment of Phathutshelo's psychological attributes in relation to entrepreneurship showed that he scored 100% for need for achievement (the sample mean was 99%), 100% for locus of control (the sample mean was 80%) and 100% for risk-taking propensity (the sample mean was 99%). When it came to 'uniqueness' of his farm enterprise , he scored 0% for object of farming, 0% for farming system, 0% for farming equipment, 0% for farm inputs, and 0% for produce markets. All of these scores were well below the average. In other words, Phathutshelo presented himself as scheme farmer who does exactly the same as his fellow farmers on the Scheme, thus providing a false presentation of himself.

7.2.8 Tendani, the small-scale capitalist farmer

In 2013, Tendani was the only member of his household who occupied the homestead. Of his three sons, two were employed in Johannesburg and his youngest son was attending university in Johannesburg. Tendani can be regarded as the most successful farmer in the Thulamela sample, at least from a financial perspective. His 2012/13 farm enterprise statement shows a gross income of R325 800 and a net operating income of R123 400. The negative net cash operating income was the result of heavy investments in cattle.

Characteristic of Tendani and his farm enterprise are:

- Specialisation in tomatoes,
- High levels of purchased inputs on irrigated land;
- Investment in farm equipment;
- Diversification of farm enterprise

Tendani is a 51 year old independent irrigator in Khubvi Village. He was born into a successful farming and business family that placed value towards receiving a good education and obtaining a tertiary qualification. Tendani is a 51 year old independent irrigator in Khubvi Village. He is the third son of a successful farmer and business man who placed great value towards receiving a good education and obtaining a tertiary qualification. Growing up, Tendani earned pocket money by working on his father's plot. He stated that it was when working for his father that he learnt to operate the tractor, precise land preparation and how to manage a farming enterprise and money. He stated:

> *[My father] used to put things straight… he told us "don't work towards standing in front of a till* [working in a shop]*, he used to tell us that "that thing of working in front of a till does not last forever and you'll be left broke, without money".* [If you need money for something], *he would say' "make a plan by ploughing two or three stands, then use the cash you have earned to fill up the tractor tank and plough my farm, you can keep the change".*

Tendani obtained a certificate in steel engineering and, in 1987, he began working for a welding company but soon left this employment when he discovered that his earnings were less than the pocket money received from his father. He returned home to work with his older brother in one of his father's shops and soon realised that he was not well suited for that type of employment. He left his brother to manage the shop and returned to farming for his father which included transporting and delivering his father's produce to distant markets, such as Namibia, and taking care of his cattle.

Whilst Tendani was away on a delivery, members of their village accused his father of having 'zombies' and set his farm alight, destroying close to 6000 of his avocado trees. With his father's farm burnt down, Tendani moved to Nwanedi where he rented a 5 ha plot on which he could do his own farming. It was in this period that he began planting tomatoes. Whilst working as a driver for TigerBrand, the company presented him with tomato seedlings and offered him a contract to plant his 5 ha to the seedlings. TigerBrand paid Tendani R105 000 for the harvested tomatoes and, with those earnings, he returned to Khubvi and began preparing a portion of land on his father's 22 ha farm on which he could continue to grow tomatoes (Figure 7.9).

Later, Tendani inherited his father's land, and in 2012/13, he had planted 6 ha to tomatoes under drip irrigation. He spent R18 000.00 on land preparation, using his own tractor and invested heavily in the purchase of fertilisers (R69 000.00) and seedlings (R78 000.00) To irrigate his land, he pumps water from the river that borders his farm and a drip system is used to apply it to his tomatoes.

Tendani built his own fertigation system and at each diversion off the main line he had inserted a filter, which he had constructed using empty gas bottles (Figure 7.9), to remove coarse particles present in the water which could cause the blocking of emitters.

FIGURE 7.9: Filters made from old gas bottles clean the water and protect drippers against blockages

During peak labour situations (planting, weeding, harvesting), Tendani employs 3 casual workers to assist him on his farm. Tendani sells his tomatoes to local consumers and to local supermarkets. He also sells to people who process tomatoes in Durban. In 2012/2013, he generated R240 000.00 in cash sales, selling a crate of tomatoes for R90 or a 5 litre bucket for R5. His farm income statement is shown in Table 7.8.

TABLE 7.8: Farm income statement of Tendani for the period 2012/13

Farm income statement	**All enterprises**
Gross farm income (R)	R 325,800.00
Total farm operating expenses (R)	R 202,400.00
Gross cash receipts (R)	R 265,000.00
Gross in-kind receipts	R 15,800.00
Net operating income (R)	R 123,400.00
Net cash operating income (R)	-R 17,400.00

Producing tomatoes requires great care and is expensive. Applying fertilisers, water and plant pest control measures must be done at the correct time to avoid a disaster. Tendani was of the opinion that he was on top of the tomato game (Figure 7.10), and explained that his main worry was to make sure that things were done correctly and on time.

FIGURE 7.10: Workers spraying tomatoes on Tendani's farm

Whilst focussing on tomato production Tendani was investing profits in cattle. On 30 June 2013, his cattle herd, which he kept on someone else's land, was valued at R 305 000.00. Tendani explained that he intended to double the area planted to tomatoes every year until the full 22 ha was in production (Figure 7.11). This meant using much of his profits to purchase additional irrigation equipment (dripper system). When he purchased his pump he had made sure that it was powerful enough to irrigate 22 ha. Tendani reckoned that when he had reached the stage where he was producing tomatoes on 22 ha he would gross in excess of R1 million per year. He continued by explaining that when he realised that goal, he would shift away from cash crops to cattle ranching, because he felt that farming with crops was very stressful. His idea was to purchase a large farm elsewhere to keep the cattle and produce lucerne on his irrigation farm in support of the cattle business. He was aiming at a herd of between 300 and 500 animals.

In 2014 Tendani and his three sons had registered a company (Pty). All the income from farming was being deposited into the company's account, which was also used to purchase inputs. The company paid Tendani R6000 per month for his living costs. His banker son did the books, and all three

deposited their bonus money into the farm account to purchase cattle. Tendani explained that his sons were heavily involved in his enterprise and that much of the research into livestock production was being conducted by his youngest son.

FIGURE 7.11: Tendani breaking new land to expand his tomato farm

In 2015, Tendani experienced a serious setback. A disease hit his tomatoes resulting in major losses. Despite seeking information on how to control the disease and spraying various recommended chemicals, the crop could not be saved. Tendani ploughed in the tomatoes, and planted cabbages instead. He hoped that planting crops other than tomatoes would suppress the disease and that after a year or two he would once more be able to produce tomatoes profitably on his farm.

7.3 Greater Tzaneen cases

7.3.1 Gracious, the rural dweller

Born in Polokwane in 1949, Gracious is a widow who practises rain-fed home gardening. She relocated to Rhulani to join her husband and his family in 1969 when she got married. Gracious says, "I studied up to standard 1 only, because at that time our parents were not educated and they did not believe in educating a girl child. The prevailing belief was that a girl child should be prepared for a descent marriage not employment. After getting married, Gracious lived with her in-laws from 1969 to 1990. During this period her husband was working as a civil servant. In 1990, she moved out of the parental home and established her own residential plot. The process of applying for the land was done by herself with the assistance of her husband. The residential plot was registered in Gracious's name, and not that of her husband as is usual practice. Her husband's brothers and sisters asked the *induna* to allocate the land to Gracious, because they had observed that her husband was no longer taking care of her and her children. She states that, "My husband had many wives and I was the first. He started neglecting me, and channelled all his efforts to support the young wives". Because of the lack of support, Gracious looked for, and found a job in Tzaneen, where she worked in a hair salon. Her husband passed on in 2000.

When asked about how she started home gardening, Gracious has this to say, "when I got here I started farming in the yard and continued to do this up to now. In the olden days, I was strong and healthy but I chose to farm around the yard only because I did not have time for farming at scale, like in arable fields. I was always busy working".

She left work because of ill health (stroke). Now she has the time to do farming but her health is bad and age is catching up with her. She is now living on an old-age grant which she supplements with small harvests from her home garden. Her garden is rainfed, hence she plants it only once a year during rainy season. She is not connected to the irrigation water from which many villagers are getting water to their yards. She plants maize, groundnuts, cowpeas and leafy vegetables in the garden. Her harvests do not cover her household's food needs. Her farm income statement is shown in Table 7.9.

When asked about her aspirations in life she says, "I do not have aspirations about my life anymore. I have been seriously sick for a very long time. For this reason, I stopped aspiring for any material achievements except of course that I live longer". With regards to her farming aspirations, Gracious says, "I do not aspire to grow my farming, because I do not have energy any more". She lives with three grandchildren of which oldest is about twelve years. The grandchildren are going to school and are not helping in the garden. However, she still thinks farming is very important because it helps people to get cheap food through own production.

TABLE 7.9: Farm income statement of Gracious for the period 2012/13

Farm income statement	All enterprises
Gross farm income (R)	R 805.00
Total farm operating expenses	R 2 790.00
Gross cash receipts (R)	R 0.00
Gross in-kind receipts	R 1 015.00
Net operating income (R)	-R 1 985.00
Net cash operating income (R)	-R 3 700.00

An assessment of Gracious's psychological attributes in relation to entrepreneurship showed that she scored 25% for need for achievement (the sample mean was 56%), 75% for locus of control (the sample mean was 69%) and 38% for risk-taking propensity (the sample mean was 66%). With regards to 'uniqueness' of her farm enterprise , she scored 0% for object of farming, 0% for farming system, 0% for farming equipment, 100% for farm inputs, and 0% for produce markets. All of these scores were well below the average, save for farm inputs.

7.3.2 Juju (retired Principal): The subsistence irrigator

Juju is an independent irrigator who holds a PhD degree in Special Education. He was born in 1952 at Letaba village, where he grew up with his parents and grandparents. During his childhood, Juju's family was practising dryland subsistence farming growing mainly traditional crops that included maize, beans, pumpkins, peanuts, cowpeas and sorghum. The produce was often enough to cover family food needs throughout the year. The land was big enough and during those days rains were good and reliable. They stored the harvested grain in granaries. Some maize cobs, sorghum, beans and pumpkins that were saved as seed for the following season would be hung in the kitchen in the direction of smoke. The smoke prevented the seeds from being damaged by grain weevils.

Juju started attending primary school in 1963, but could not attend on Wednesdays, because that was when he would be taking cattle to a local dipping tank. From standard 4 to 6 he studied Agriculture as a subject. At his school, every pupil was allocated a vegetable bed in the school garden. They were taught how to plant, weed and harvest crops. Agriculture was divided into two parts; theory and practical. They did their practical lessons in the vegetable beds and each pupil was assessed on the basis of the performance of their beds. Juju used to obtain pass marks in Agriculture, but he was not the best performer and the subject was not his favourite. Although he did not like the subject much he used to feel proud of his performance when harvesting times came. The subject teacher would ask them to sell some produce and allow them to take home the remainder. His parents praised him a lot each time he brought vegetables home from school. This made him feel happy and encouraged him to keep on doing better in the subject. He passed Agriculture at Standard 6, but discontinued it because he did not consider it a preferred career option/route. He loved biology and music. He studied music at College and taught it for 30 years at high schools.

Juju spent most of his teaching career at special schools for pupils with disabilities. When he was promoted to principal at a special school, he introduced practical subjects including agriculture. Juju says, “when I married, my immediate family did not practise farming. I was a teacher and my wife was a nurse”.

It is mobility within his teaching career that brought Juju to farming. He was transferred by the Department of Education from the school he was teaching at to Letaba School for the Handicapped in 1982. At this school he taught deaf pupils. The school placed much emphasis on practical subjects and agriculture was one of its favourites. He was later appointed to be teacher of agriculture. His pupils produced for the school and also for the market. During this time Juju was working closely with Mabuza, the first extension officer in the Nkuna community of Greater Tzaneen. For 6 years Mabuza would advise Juju on various farming techniques. The National Department of Agriculture assessed Juju’s school in 1985. They were happy with Juju’s performance and asked the extension officer to find land for Juju to farm. The extension officer identified a 6 ha plot and recommended that the chief give it to Juju. Juju got a PTO certificate for the land and started farming in 1986.

Juju started clearing the land with the help of his son. This was hard labour. He then saved money to hire labour for erection of a fence. In 1988, he hired a tractor for land preparation and bought a water pump. He started producing on 2.5 ha on which he planted green peppers and peas. He paid for the operating costs from his salary. After farming and selling for 4 years, he bought a bakkie for R30 000 using money he had earned from the farm. Juju explains his success-story by saying, “I was lucky to have hardworking workers from Mozambique. When I established the farm, my main objective was to make it my retirement business and help my community by creating employment and offering them a place to buy fresh produce in close proximity. I am achieving these objectives”. He runs a small-scale mill on the farm where people can process their maize grain into meal. The farm income statement is shown in Table 7.10.

TABLE 7.10: Farm income statement of Juju for the period 2012/13

Farm income statement of Juju for the period 2012/13	**All enterprises**
Gross farm income (R)	R22 170.00
Total farm operating expenses	R147 624.00
Gross cash receipts (R)	R25 670.00
Gross in-kind receipts	R15 300.00
Net operating income (R)	-R125 454.00
Net cash operating income (R)	-R134 554.00

An assessment of Juju’s psychological attributes in relation to entrepreneurship showed that he scored 100% for need for achievement (the sample mean was 87%), 75% for locus of control (the sample mean was 66%) and 63% for risk-taking propensity (the sample mean was 75%). When it came to ‘uniqueness’ of his farm enterprise , he scored 33% for object of farming, 100% for farming system, 0% for farming equipment, 66% for farm inputs, and 100% for produce markets. All of these scores were higher than the sample averages. Sometimes he uses money from his pension fund to cover farming costs when sales at the farm are at a low. He treats this money as a loan which the

farm will pay back when it makes its own money. Using money earned from the farm, Juju bought a R350 000 house for his son and sunk a borehole for irrigation at a cost of R25 000. He resigned from work in 2012 and used some of his pension money to buy cattle, which he is rearing on the farm. He uses cattle manure to supplement fertilisers on his cropped land. Juju also runs poultry on the farm from which he gets chicken manure. He crops all the land every year and aspires to achieve two crops per year on the full farm in order to satisfy the local market needs at all times. Juju is satisfied with the size of his land, and does not aspire to add more

7.3.3 Edmond, the entrepreneurial smallholder

Edmond is an independent irrigator who lives and farms in Nkowankowa. He was born at the now Berlin Farm area in 1954. By then the place was a normal rural village called Rigorigo. Around 1960 all residents of Rigorigo village were evicted by the apartheid government and the area was turned into a government-owned sisal farm. When Gazankulu was declared a self-governing homeland in the 1980s, the place was turned into a pack house deport for citrus crops around Litsetele.

Edmond studied up to Standard 6 (Grade 8) and Agriculture was one of his subjects. When he left school in 1973, he worked on white-owned farms around Litsetele till 1978. During that period he got experience and skills in irrigation water and plant management. He then left to work in Johannesburg in an Indian owned-retail shop where he sold clothing. He resigned from this job just after 3 months. Edmond explains the reason of his resignation as follows:

> *The clothing that we were selling in the shop was selling so quickly that the shop owner was forced to restock every two days. This opened my eyes. I saw that one can live on, and make money from selling goods. After 3 months, I resigned and told my employer that I wanted to go and start my own business. I knew I could do it because I had been saving money throughout my working days. I used to take my money (wages) to a bank before using it. After leaving this job, I never worked for any one until now.*

He left Johannesburg and went back home with the aim of starting his own business. His father gave him an old truck to use. He began by buying empty oil drums and sold them at a higher price. After that he started stocking and selling treated gum poles. He used the money he earned from all this to open a café' in Giyani, which he ran for 10 years. But apart from running the café' Edmond was farming on a 2 morgen (1.5 ha) plot which he shared with his two brothers. He sank a borehole for the plot to get irrigation water. After closing the café' he started buying and selling building materials that included air-vents, windowsills and lintels. He later closed the business and moved on to full-time farming.

He acquired 10 ha of farmland in 1989 by applying to the local chief and was issued with a PTO certificate. Edmond says, "when I closed my hardware business, I was planning to get into farming. Farming had always been in my plans". He started by digging a borehole for irrigation water. He goes on to say, "the establishment phase of this farm was very difficult, but I already had massive

experience in running businesses so I did not lose hope, because I knew where things would end up at". He used money from his retail businesses to erect fencing, sink the borehole, buy tractors and other farming equipment, as well as starting inputs. His challenges are that he does not have enough water. He has one borehole that is serving the whole 10 ha plot. He often suffers water shortages. He also complained that he does not have enough money to buy inputs at planting time, especially fertilisers and pesticides. His farm income statement is shown in Table 7.11.

Until 2014, Edmond was a member of Technoserve's group of SMMEs incubation programme. Technoserve is an NGO that assists Small, Micro and Medium Enterprises to grow through its incubation programme which include assisting its members to access loans and markets. In addition, under the programme members are offered a number of skills development programmes such as business and financial management training. He quit the programme because of a misunderstanding between him and Technoserve around how the NGO used to handle his marketing. He now markets his produce directly by himself, and is happy with how the market is responding, but still acknowledges that Technoserve significantly helped to grow his entrepreneurial skills through work-shopping and mentoring. "But the challenge is that I cannot grow enough crops to enter into supply contracts with big buyers", Edmond says.

TABLE 7.11: Farm income statement of Edmond for the period 2012/13

Farm income statement of Edmond for the period 2012/13	**All enterprises**
Gross farm income (R)	R 24 100.00
Total farm operating expenses	R 22 186.00
Gross cash receipts (R)	R 26 600.00
Gross in-kind receipts	R 2 920.00
Net operating income (R)	R 1 914.00
Net cash operating income (R)	-R 4 606.00

An assessment of Edmond's psychological attributes in relation to entrepreneurship showed that he scored 92% for need for achievement (the sample mean was 87%), 88% for locus of control (the sample mean was 66%) and 75% for risk-taking propensity (the sample mean was 75%). When it came to 'uniqueness' of his farm enterprise , he scored 100% for object of farming, 100% for farming system, 0% for farming equipment, 100% for farm inputs, and 100% for produce markets. All of these scores were well above the sample averages.

Edmond is planning to grow his farming by starting to grow special and high value crops that include green pepper, cucumbers and sweet corn, as well as getting into greenhouse farming. He says, "to achieve this, I need to start implementing my vision; that is to invest heavily in farming through among other things paying my labourers well. Happy workers are often very productive". He does not believe that it can be too late in life. "How can you say it is too late when you do not know when you will die?" He is a reputable car mechanic. He runs the farming business simultaneously with the car repairs business. He explained that he cross subsidises one business' financial needs by earnings from the other.

7.4 Livelihoods, agriculture and entrepreneurship: emerging themes

7.4.1 Households, people and relationships of production and consumption

Households consist of people who relate to each other. When looking at households from a livelihood perspective, relationships of production and consumption are central. Relationships of consumption refer to the use of resources, such as food and money, by members of the household. Relationships of production are concerned with the contribution household members make towards generating resources for consumption or investment. Since intra-household relationships of production and consumption received limited attention in the Greater Tzaneen cases, the analysis of these relationships was mainly concerned with the Thulamela cases.

Labour is an important factor in a number of rural economic activities, such as farming, brick making, trading and milling to name but a few. Labour can be sourced from within the household or outside of it, in which case it usually has to be paid for. Hiring labour is only financially viable when there is a positive return (profit) on the expenditure on labour. Labour drawn from within the household differs from hired labour in that it does not necessarily have to be paid for. Payment for family labour is typically in the form of a share in the consumption of the resources that were produced through the labour process.

The three rural dweller households, i.e. the two in Thulamela and one in Greater Tzaneen, have in common that relationships among household members are mostly centred around consumption, and appear to lack relationship of production. Besides a little home gardening, the households of Nthuseni (7.2.1) and Gracious (7.3.1) are not involved in productive activities. Household income is nearly completely derived from state transfers. In the households of Nthuseni, three generations are staying together under the same roof. The adult daughters of Nthuseni remain at home probably because they lack the means to live independently. Staying together and pooling their child grants and Nthuseni's old age pension grant provides them with a very basic standard of living. To an extent this basic standard of living appears to be adequate, because there is very little mobilisation of the labour available within the household in search of a 'better life'. The household of Gracious is made up of the old and the (very) young and both generations survive of the old-age pension grant of Gracious. The adult generation is absent, not only physically, but seemingly also financially, as no resources appear to be flowing from where they are to Gracious' household. Also in this household the standard of living is 'very basic'. Analysing chronic poverty in South Africa, Aliber (2003) identified several categories among the 'chronically poor'. Relevant categories for the current context were the 'rural poor', 'female-headed households', and 'the elderly'. The households of Nthuseni and Gracious are intersects of these three categories. Paraphrasing Aliber (2003), both are 'rural granny households', which are considered to be poverty traps (Adato, Carter & May, 2006). In such households, it is typically the old generation that keeps the household afloat, through their old-age pension grants. The middle generation shares in the consumption but appears to be sitting around (or is absent as in 7.3.1). The middle generation is not without aspirations, but appears to be devoid of a realistic vision and strategy to pursue these aspirations. In addition, the middle generation often has children, resulting in a three-generation household. Having children enable the

middle generation to make small contributions to household income, by claiming child support grants, but children also increase consumptive demand. Since the value of child support grants is small, the outcome is more likely to be the deepening of poverty rather than escape from poverty. As the children grow up, low household income is likely to limit their options for education, thus reducing their opportunities for employment. Accordingly, the conditions for the reproduction of poverty remain in place.

Income support is one of the ways in which to combat social exclusion associated with poverty. Babajanian and Hagen-Zanker (2012), who investigated the dimensions and drivers of social exclusion in the global South and the various ways in which this problem could be addressed, considered social pensions to be a suitable intervention to address the drivers of income exclusion for the elderly. These pensions provide a source of income to individuals who cannot rely on the labour market for an income that will support their basic needs. They also stated that conditional grants, such as the child support grant that applies in South Africa, made a positive contribution toward preventing social exclusion of poor children. However, they were adamant that income support did not address the drivers of the social exclusion of able-bodied working-age adults, whose income earning capacity is undermined by lack of jobs or skills, rather than physical ability. To address long-term income exclusion, they suggested that participation in social protection activities and livelihood support activities could enable poor and vulnerable people to strengthen their assets and invest in agricultural inputs, which, in turn, could enhance their productive capacity and increase their income. Looking at these recommendations against the background of the Nthuseni household, one is left wondering.

The household of Tshililo (7.2.2) is a variation on the relational theme described for the two 'granny households'. In this three-generation household of eight members, Tshililo was the only person of five adults who was engaged in productive activities. In 2013, at the time of the survey, two of the eight household members represented the old generation, but they did not yet receive an old-age pension. Tshililo's father, who was the headman of Manamani village, was the head of household, but Tshililo was identified as the farmer. Village headmen are known to receive money and goods in return for their services (see cases 7.2.3, 7.2.4, 7.2.5), but such income is irregular. The father passed away in 2014, an event that transformed the household into a 'granny household'. Tshililo's mother, who was the second wife of the headman, used to earn income from brewing, but ill health made her to stop this activity. Tshililo, his older brother and his sister represented the middle generation. In 2013, brother and sister were 'sitting around'. The three remaining members of the household were the children of the sister. Take Tshililo away, and this household resembles that of Nthuseni. Tshililo had aspirations, and a goal and strategy to pursue his aspirations, but considering the circumstances at home, he realised that it would take a long time to before he could attain his goal of sinking a borehole, buying a pump and starting his own irrigation farm.

In the households of Takalani (7.2.3) and Mashudu (7.2.4) relationships of production and consumption are also skewed. There were 11 members in Takalani's three-generation household. He and his wife, who represented the old generation, were the only two members who worked on the farm. They had to hire labour during peak times despite six members of the household belonging to

the middle generation. The two male members of this middle generation considered themselves to be 'brick layers' but most of the time they were without work. Yet, Takalani and his wife appeared unable to claim their labour. This is unexpected because the entire middle generation including the two sons, claimed their share of consumption. Mashudu's three-generation household, which consisted of nine members, was not poor but once again, it was the old generation, consisting of Mashudu and his spouse, which generated most of the income. One important difference was that one of their daughters, who was an employed professional, remitted to her parental household, raising its income substantially. However, as with the other four households referred to earlier, unemployed members of the middle generation were 'sitting around'. They did not help Mashudu on the farm. Consequently, he had to hire both full-time and part-time workers to satisfy his labour requirements. The 'sitting around' of the young generation in farm households is not new. Ten years ago, Mohamed (2006) documented similar cases at the Dzindi Irrigation Scheme. The apparent failure of parents to claim labour from their unemployed children on the farm does not apply to all households. For example, in the household of Aluwani (7.2.6), the unemployed children know and accept that they have to work on the land when there is a need for them to do so. This also applies to the household of Phathutshelo (7.2.7), where all children, irrespective of age, are required to contribute their labour when asked to do so. Moreover, Pathutshelo's son has recently decided to leave high school and join his father and mother on the farm, He is being treated by his parents the same way as Phathutshelo was by his father. He has been given a strip to farm for his own account, whilst assisting his mother and father on the rest of the holding. In the household of Gumani (7.2.5), the unemployed children do not work on the plot, but they do help by running the spaza shop when the mother is in the field.

The Thulamela cases suggest that the ability of parents to claim farm labour from their children contributes to profitability and livelihood outcomes of the farming household and vice versa. For this reason, the inability of some parents to secure labour from their unemployed children who rely on them for most of their consumption needs must be seen as a social constraint to sustainable agrarian livelihoods. This social constraint is not limited to the area in which the current study was done. Hull (2014) described the same phenomenon in rural KwaZulu-Natal, where she found that young people, who were members of rural households, focused their attention on individual social and economic pursuits rather than on the reproduction of their parental home. She pointed out that this phenomenon explained the apparent paradox in rural areas of extremely high unemployment levels coexisting with the lack of labour in farming. Hull (2014) argued that it was, therefore, erroneous to view rural households as cohesive productive units, and pointed out that this had implications for rural economic development.

7.4.2 Youth and agriculture

The Thulamela household case studies suggest that young unemployed people often reject farming as a livelihood option, even when farming is the most obvious livelihood option available to them and joining their parents on the farm would most likely improve the livelihood outcomes of their social units. ILO (2010) explained that a lack of decent work, if experienced as an early age, threatens to compromise a person's future employment prospects and often leads to unsuitable labour behaviour patterns that last a lifetime. It tends to lead to a sense of uselessness and idleness, and can lead to participation in crime and violence and cause mental health problems and the taking of drugs. There is, therefore, an important agrarian question on youth and agriculture and the reproduction of the family farm. This not just a South African question. White (2012) argued that the youth in the developing world share a disinterest in taking up small-scale farming as a livelihood strategy. He identified several factors that could have contributed to this trend. These included:

- 'the de-skilling of rural youth;
- the downgrading of farming and rural life;
- the chronic neglect of small scale agriculture and rural infrastructure; and
- the problems young people increasingly have when they do want to become farmers of getting access to land while still young.'

These factors have been at work for many years in South Africa. For example, in the Eastern Cape, Van Averbeke (1999) identified crime, problems with access to land by those wanting to farm, ageing infrastructure, and the loss of agri'CULTURE' as key priorities for agricultural development. The latter factor referred to evidence of rapid erosion of 'farm-related indigenous knowledge', which is typically transferred from one generation to another, and is the synthesis of decades, if not centuries of local experimentation. Mohamed (2006) reported that plot holders at Dzindi Irrigation acquired farm knowledge Scheme mainly through two processes, namely, intergenerational transfer, and farmer-to-farmer transfer. The role of extension-driven knowledge transfer at this Scheme, occurred mainly during the period after scheme settlement, when the extension officer taught plot holders how to irrigate (Manyelo *et al*., 2015). Evidence of intergenerational transfer and farmer-to-farmer knowledge transfer at work was also contained in several of the Thulamela case studies, such as Tshililo (7.2.2), who learnt about pig production from Gumani (7.2.5). Gumani had learnt about irrigated crop production from 'fellow farmers', as did Takalani (7.2.3). Mashudu (7.2.4), Phathutshelo (7.2.7), and Tendani (7.2.8) learnt farming from their fathers. Inter-generational knowledge transfer processes are dependent on the reproduction of the family farm, and some of the cases suggest that this reproduction is not guaranteed. Farmer-to-farmer knowledge transfer, which is locality based, is dependent on farming being continued. Whilst this did not present a problem in the two study areas, elsewhere in South Africa the process of de-agrarianisation has progressed to such an extent that the 'farm knowledge' that is retained is but a shadow of what existed before.

Rigg (2006) argued that the disinterest of South African rural people in farming had advanced to the extent that farming should no longer be the focus of development policy. Instead, he recommended

shifting the policy focus on provisioning rural people with skills that would enable them to 'escape' the rural areas and find gainful employment in the cities. There are indeed rural areas in South Africa where the link between rural and agrarian has been weakened so severely that land-based activities make only very small contributions to the livelihoods of the majority of rural households (Hebinck & Van Averbeke, 2013). However, there are regional and local differences, as is evident from the current study. The other concern with the proposition of Rigg (2006) is that urban employment is not available either. This was already pointed out by Rogerson (1996) 20 years ago, when he drew attention to the 'migration' of poverty from rural to urban areas. Growing urban poverty has been the result of South Africa's city economies being unable to absorb their growing populations. Brooks *et al*. (2013) predicted that the scenario where large numbers of rural people leave their small farms to take up jobs in factories, would probably not play out in Africa. They pointed out that the manufacturing of goods was now largely located in Asia and was unlikely to shift to Africa. Other sectors of the economy, such as the service sector, would also not be able to absorb the full cohorts of new people entering the labour force in Africa's rural areas (Brooks *et al*., 2010). Consequently, enabling young people to enter farming for a living will have to remain at the centre of rural development thinking. This draws attention to the urgent need to address the factors that have been and continue to drive young people away from farming.

7.4.3 Age, gender and land

Access to land is a necessary condition for people to take up farming as a livelihood option. The case studies provide evidence that accessing (irrigation) land is not easy, especially for young people and young women in particular. The cases show that some farmers inherited access to land (7.2.4, 7.2.7, 7.2.8). Others gained access to land by applying to the tribal leadership (7.2.3, 7.2.4, 7.2.5, 7.3.2, 7.3.3). There were also a case of a farmers purchasing land (7.2.6) and a case of a farmer renting land from others on the Dzindi Irrigation Scheme (7.2.7). Generally, the pattern of accessing (irrigation) land resembled that described by Proctor and Lucchesi (2012), who investigated where the next generation of African farmers would obtain land from. They found that just over half (52%) would inherit land from their parents, 16% would access land not previously cultivated, 9% would rent or borrow land, and 12 % would buy land. Indications were land at the Greater Tzaneen site was more freely available than in Thulamela, where farmers were moving onto marginal land to expand their irrigation enterprises (see for example 7.2.4).

Important from an age perspective is that when access to land is through inheritance, a young person would have to wait a long time before he can obtain access. In the past, when irrigator sons went to work in the city and then returned home when middle-aged (Mohamed, 2006), taking over the farm was less problematic than at present, because the migrancy phase in the life cycle of rural men has been severely interrupted due to the lack of jobs in the cities (see also Hull, 2014). In addition, evidence from Dzindi indicates that inheritance of land is associated with farm size reduction. At the Dzindi Irrigation Scheme the average plot size has been declining at the rate of 1% per year over the past ten years due to the splitting up of plots following the death or retirement from farming of the plot holder. This process leaves new generations of farmers with smaller

holdings than their parents (see cases 7.2.4 and 7.2.7 for evidence of the process of farm size reduction at Dzindi).

If getting access to land is difficult for young men, it is even more difficult for women, particularly young women. The plight of women irrigators in Africa has been pointed out by several researchers, including Zwarteveen (1997), Chancellor (1997) and van Koppen (2002). In Chapter 4, the under-representation (Thulamela) or virtual absence (Greater Tzaneen) of women among irrigation farmers was highlighted but no information was collected on the reason for their absence. Noteworthy was that in Thulamela, women irrigators all gained access to land through one or other intervention that involved men, be it the death of their spouse or his intervention with tribal authorities on her behalf, as in the case of Gumani (7.2.5)

7.4.4 Profitability of irrigation

Measured as gross income, farming contributed significantly to the total income of the households of irrigators. However, how profitable was irrigated farming? One of the cases in Thulamela (7.2.3) and two in Greater Tzaneen (7.3.2 and 7.3.3) show that gross incomes tell only part of the story. Profitability as expressed by net operating income is sometimes small or even completely absent. In 2012-13 in Thulamela, 17% of scheme farmers recorded gross whole-farm incomes that were less than their operating expenses, whilst among independent irrigators the same s applied to about one in three farmers (31%). Profitable irrigation is dependent on the value of production (gross income) and on the costs incurred to realise this value. The case studies demonstrated some the strategies farmers use to ensure that value of production exceeds the costs of its production. Some farmers focus on raising the value of production, by optimising agronomic factors and marketing (7.2.4, 7.2.7, 7.2.8), whilst others focus on minimizing costs (7.2.6). The cases indicated that across the various irrigation enterprises, employment of family labour instead of hired labour was one of the main ways in which operating expenses could be minimised. This is in line with the findings of Van Averbeke & Mohamed (2006) at the Dzindi Irrigation Scheme and Ncube (2014) at the New Forest Irrigation Scheme in Mpumalanga.

7.4.5 Entrepreneurship and local agrarian economies

The economic development of South Africa's rural areas is dependent on the creation of rural employment. Whilst subject to debate, and perhaps dependent on locality, it would appear that farming remains the most likely locomotive of this process. At present, South Africa's macro-economic policy is aligned to the free-market economy. State-owned farm enterprises, which once existed during the homeland era, have been completely dismantled. This leaves the development of local rural economies to private enterprise.

The information gained at the two study sites demonstrates that (irrigated) farming can play an important role in the economic development of South Africa's rural areas. Farming, particularly market-oriented farming, and enterprises that are linked backwardly (e.g. tractor services) or forwardly to farming (e.g. small-scale milling and the informal trade of produce) to market-oriented

farm enterprises were shown to contribute significantly to the incomes of households engaged in these business activities. Whilst several rural households were able to accumulate wealth by engaging in rural business activity, others were less successful. However, even for them, engagement in (survivalist) enterprises enabled them to escape poverty.

7.5 Conclusions

In this chapter, various themes covered by the study were brought together through a selection of 11 household case descriptions. From these cases it was evident that (irrigated) farming and related enterprises have the potential to improve the livelihoods of rural people in a substantial way. It was also shown that family labour was an important success factor in profitable (irrigated) farming, but that farmers could not necessarily claim such labour. Several cases indicated that unemployed children of farmers were not necessarily prepared to assist on the farm, even though this would almost certainly improve profitability by cutting the cost of hired labour. The reproduction of the family farm, was, therefore not universal, on the contrary. Youth and farming deserves more attention. A number of factors contributing to the growing disinterest of young people in farming were identified. These factors were in line with those at play globally. Access to (irrigated) land at a young enough age, especially for women, was one of the factors that stood out at the Thulamela study site.

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Chapter 8 Smallholder Irrigation Development Pathways

8.1 Introduction

The intention of the research is to understand how farmers have expanded their irrigated food production enterprises over time, and where this has resulted in an improvement in livelihoods outcomes. The observed pattern of change is then considered to be a desirable *development trajectory or pathway*. By critical observation of these de-facto pathways, it is proposed that *future strategies* to replicate these personal farming successes can then be formulated. The motivation inherent in the pathways is the desire to establish and grow irrigation enterprises to increase food security, profitability and employment opportunities. Chapter 8 of the report describes and analyses the development pathways or trajectories that have been followed by selected farming households. Case histories were used to obtain an understanding of pathways and related obstacles blocking progress. An analysis of obstacles then led to an interactive and participative development of strategies to address these and facilitate more effective irrigation development. The analysis of identified obstacles through participative discussion with farmers, led to proposed strategies which are presented in Chapter 9.

8.1.1 Understanding trajectories and pathways

The concepts of 'trajectories', 'pathways' and 'strategies' are not commonly defined, and at times are used with different meanings or even interchangeably in the literature. The concept of 'pathways' seems most commonly used to describe the observed change in patterns in livelihoods and strategies typically linked with a conscious decision in expectation of improved outcomes.

While de Haan & Zoomers (2005) argue a case for intellectual rigour in the differentiation of the concepts of 'pathways' and 'trajectories', with the former relating to the coordination process among a collective of actors and the latter to the individual domain, this differentiation is not made here. The unit of analysis is the farming household and this variously comprises individuals as well as family groups undertaking farming. Thus the terms 'pathways' and 'trajectories' are used interchangeably and are characterized by the common historical element of observed changes in livelihoods strategies of the household which take place over variable timelines. The definition of Pender *et. al* (1999) is useful and applies here:

A development pathway represents a common pattern of change in resource management, associated with a common set of causal and conditioning factors…The causes and consequences of such pathways are likely [to be] different and the opportunities and constraints affecting natural resource management decisions likely [to] differ across development pathways…Across and within development pathways there may be differences in agriculture and natural resource management strategies at both household and collective levels (Pender, Scherr and Duron, 1999).

Where 'pathways' have a retrospective characteristic and result from habit, iterative experiences or experiment, conscious or sub-conscious, 'strategies' are characterised by their deliberative and conscious nature, with the intention of achieving a better future livelihood. 'Strategies' are therefore deemed to be distinct from 'pathways' or 'trajectories' (used interchangeably in this work), with a 'strategy' being the preferred set of actions going forward, established after a conscious and rational weighing up of experiences and preferences to attain a preset goal (de Bruijn & van Dijk, 2003 **in** de Haan & Zoomers, 2005).

8.1.2 A framework for pathways

A description of the methods and materials used in the field to obtain the case descriptions is set out in detail in Chapter 3. In summary, a set of themes for case study interviews was established on the basis of the literature review. These themes were guided by the study focus on entrepreneurship, with an emphasis on growth of the farming enterprise in the form of expansion and intensification, and with particular interest where production is for markets. The case histories targeted the three populations of interest (home-gardeners, scheme irrigators and independent irrigators) and were used to 'map' their historical development along various irrigation pathways, both expansion and intensification. Expansion means farming a larger area using the same field production methods. Intensification means producing more on the same area of land. This is done by increasing inputs, changing farming methods to more sophisticated approaches (better cultivars, field methods, efficient irrigation technology, better crop protection, etc.) to achieve increased yields.

A framework for presenting and analysing the pathways was based on preliminary results of the fieldwork that was done in Thulamela and Greater Tzaneen. Fieldwork indicated the existence of 12 possible irrigation development pathways, which are depicted as arrows in Figure 8.1.

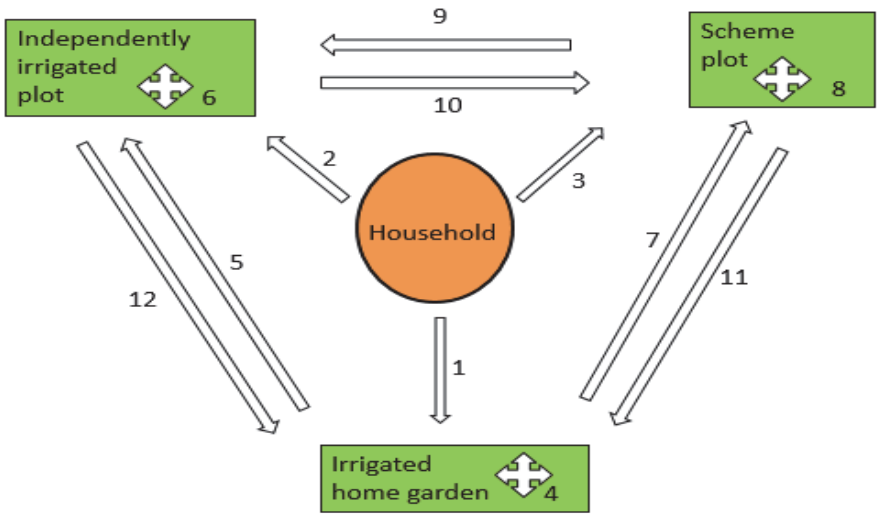

FIGURE 8.1: Development Pathways (Trajectories) Framework

Evidence was obtained of introducing irrigation in home gardens, and of the expansion of scheme-based farms and independently irrigated enterprises. Evidence was also found of up-scaling irrigated

production from home gardening to scheme-based farming, from home gardening to the establishment of independently irrigated farming, and from scheme-based farming to independently irrigated farming. The information that was collected indicated that all of the irrigation development pathways required farmers to overcome particular obstacles. These barriers encountered by farmers are addressed later in the chapter. At Thulamela, some of the theoretically possible trajectories between the three populations of study were found to be less relevant or not evident at all. At Greater Tzaneen however, there were cases that reflected most of the possible pathways of growth between the three populations. The discussion is therefore focussed on the most relevant trajectories that were documented at the two sites.

After the cases were categorized, a matrix in the form of an excel spread sheet was created in order to reduce the data. One part of this matrix contained a range of attributes and characteristics that described the type of farmer, based on the South African smallholder farmer typology developed by Cousins (2014) and adapted by Manderson (2015), which is reproduced in Table 8.1. All cases were classified in accordance with the current status of the farmer.

TABLE 8.1: Typology of smallholders in South Africa (Cousins, 2014 & Manderson, 2015)

Attribute	**Smallholder categories and codes**			
	Subsistence-oriented smallholders (**SH Code 1**)	Market-oriented smallholders in loose value chains (**SH Code 2**)	Market-oriented smallholders in tight value chains (**SH Code 3**)	Small-scale capitalist farmers (**SH Code 4**)
Objective of production	Household consumption	Household consumption + cash income	Cash income + some home consumption	Profit
Proportion of marketed output	None or insignificant	50% or >	75% or >	100%
Contribution to household income	Reduces expenditure	Variable – from small to significant	Significant	Very significant
Labour	Family	Family + some hired	Family + significant numbers hired	Hired
Mechanisation	Very low	Low	Medium to high	High
Capital intensity	Very low	Low	Medium to high	High
Access to finance	Absent	Some	Significant	Very significant
Households in SA	2-2.5 million	200-250 000	?	?

The second part of the matrix contained information which captured how for each case the farmer had accessed the five capital assets listed in the Ellis (2000) framework, namely, *natural* (land and water), *physical* (irrigation infrastructure, means of land preparation, etc.), *financial*, *human* and *social*.

In the matrix this information was captured using four descriptors for each capital, namely:

- access (the steps taken to access the capital asset, such as land and water);
- obstacle (the obstacle/s, if any, associated with each step taken to access the capital assets);
- severity of the obstacle; and
- solution/explanation (the way in which the obstacle was overcome or in some cases not overcome, meaning that the obstacle remains a hurdle to development).

The information on human and social capital pertaining to the cases was interpreted from information obtained in the life histories and data captured in the general livelihood questionnaires.

8.2 Irrigation pathways at the Thulamela site

The life histories were categorised in accordance with the trajectories followed, as shown in Figure 8.1, and the cases were analysed with the objective of identifying how participants had experienced the trajectory followed.

8.2.1 Results in relation to Trajectory 1 – Household to home gardener

The results are presented using the logic of the trajectories shown in Figure 8.1. Cases are briefly narrated (illustrated) to provide a picture of how participants experienced these trajectories. Where a particular trajectory occurred in different settings, the cases are subdivided in order to capture local specificities. Some of these local specificities are elaborated on to give additional background and meaning to the cases. Each trajectory starts with a summary table which presents some background information to the cases, namely the trajectory or trajectories the participant was involved with, with the numbers used being explained in Figure 8.1, and the code describing the type of smallholder the case refers to (SH Code as explained in Table 8.1).

Trajectory 1: Irrigated Home Gardening

Case	Trajectory path/s				SH Code
MHG 1	1				1
MHG 2	1				2
IHG 1	3	1	4		2
THG 1	3	1	4		2

MHG 1: Manamani Home Gardener

MHG 1 is an 81-year-old Manamani home gardener who moved to the village from HaMaduni upon marriage. She and her granddaughter irrigate a small area of their garden and the crops grown in that portion of land are harvested for home consumption. MHG 1 and her family have never applied for scheme land and have never sold crops produced.

MHG 2: Manamani Home Gardener

MHG 2 is a Manamani home gardener who has access to an independent dry-land plot for which he wants to purchase a pump. MHG 1 worked as a tailor for many years in Johannesburg and Pretoria before becoming ill and returning to Venda. In Manamani he continues to produce clothes but his clientele has dropped significantly and he has joined his siblings in working on their father's dry-land plot. The crops that he grows in his home garden are mostly for home consumption and sales are made only when he is approached by his neighbours.

IHG 1: Itsani Home Gardener

IHG 1 is an Itsani home gardener from Tshisaulu. At school, IHG 1 took gardening as a subject and stated that he excelled in this subject. He was raised by a single mother and took it upon himself to grow Chinese cabbage and other winter vegetables for home consumption. IHG 1 attended Technikon SA in Florida, Johannesburg for one year before returning home, unable to finance his education. He moved to Itsani in 1998 and applied for a residential stand from the local Mumsanda and has found various forms of employment upon his return to Venda.

IHG 1 has tried to rent land from Dzindi plot holders, who have refused his offers on a number of occasions. He sells his home garden produce to neighbours, passers-by and *bakkie* traders.

THG 1: Tshivhuyuni Home Gardener

THG 1 is a Tshivhuyuni home gardener who was allocated one bed on her parents-in-law's "wasteland" plot on Dzindi Irrigation Scheme upon her marriage in 1992. In 1993, THG 1 and her husband moved to their own residential stand after applying for one from their Mumsanda in 1992. Their plot cost them R 2000 and it is located above land that borders a small but perennial river. The couple sought permission from Mumsanda to clear the land bordering the river and to plant on it. THG 1 uses both her home garden and this additional land to grow tomatoes, Chinese cabbage, spinach, carrots and green maize. With her savings from her husband's salary, she was able to purchase a generator and drip pipes to irrigate her additional land.

THG 1 sells her produce to her neighbours and hawkers and supplies to the local crèche. THG 1 also sells her produce door-to-door and wants to obtain additional land so that she can produce enough to sell to supermarkets. She plans to save for a *bakkie* in order to deliver her produce to distant markets.

8.2.2 Results in relation to Trajectory 3 – Household to Mphaila irrigation scheme plot

Background on Mphaila land and water institutional rules

Land access and control: At present, the process of transferring a plot starts in the family of the deceased plot holder. For all practical purposes it is the family who decides who the new registered plot holder will be. Once negotiations on this matter have been concluded, the family meets with the Scheme Committee. The Committee will verify the identity document of the deceased and that of the proposed new plot holder and will insist on the presence of at least three family members of the deceased to confirm that the family has indeed agreed that the plot should be transferred to the proposed new plot holder. When these conditions are met, the Committee records the name of the proposed new plot holder. Then the Committee writes a letter in which it recommends that the applicant becomes the new plot holder. Once the Committee has made its recommendation, the applicant fills out the application form issued in terms of Proclamation No. R.5 of 1963 in the presence of the extension officer, who also writes a letter of recommendation. The applicant then proceeds to the Tribal Authority, which also issues a letter of recommendation. From there the applicant proceeds to the Makhado Municipality, where the full dossier is handed over to an official, who then issues the Permission to Occupy certificate.

Rules of transfer (rentals/leasing): Some land exchanges between these farmers were formalised and some of them were not formalised. Formalised arrangements mainly pertained to those farmers who had debts on their plots and some provision was made in the scheme constitution to address this. If a farmer leased a plot and found that there was a debt to be settled, he/she had to pay half the amount and was then allowed to continue to irrigate conditional on settlement of the outstanding debt within six months, with a proportional monthly contribution. A lessee had to complete a lease form, guided by a local agricultural technician. All in all, land exchanges at Mphaila were based on either: payment for land preparation services by the lessee; sharecropping; lump sum cash payments; or monthly cash payments.

Rules of water authorizations (GA/license): Access to pumped water is restricted to payment to payment of monthly self-contributions. They are allowed to irrigation from Monday until Friday.

Case	Trajectory path/s				SH Code
MIS F1	3				1
MIS F2	2	3	8		2
MIS F3	3	8			2
MIS F4	3	8			2
MIS F5	3				1
MIS F6	3	8			2
MIS F7	3				2
MIS F8	3	8			2

MIS = Mphaila Irrigation Scheme

MIS F1: Mphaila Scheme Plot Holder

MIS F1 is both a plot holder and a lessor at Mphaila Irrigation Scheme. He is also a secretary of Mphaila Irrigation Scheme. He obtained his plot through a land transfer which happened after the death of his father. However, along the way he started to struggle to utilise his plot because of financial problems and this situation made his plot to acquire lot of debt as he could not even make payments for monthly self-contribution. Before he decided to rent out his plot it had already accumulated a total debt of R 1000; this gave him a bad image as he was a member of the scheme committee. One day when he was working in the extension office, a person came looking to lease land at Mphaila. He did not hesitate to tell the person that he was willing to rent out, but he laid out conditions, one of which was that the lessee must pay all the dues of the plot before he could lease it for a period of 3 years. As the lessee did not have a problem with the arrangement, the extension officer took out a lease agreement form, which was filled in the same day. Since the initiation of the lease agreement, he has never had a problem with lessee and he also said that this surprised him because he was not related to the lessee. The lessor indicated that the debts that his plot had already accumulated were better compared to other plot holders in the scheme, who sometimes accumulated debts of over R 2000 before their plots were leased out.

The lessor indicated that rental agreements which are captured formally are more reliable than informal ones because when contracts were signed, a copy of the contract remained with the extension officer and the local chief. He said that there were others who were still unwilling to formalise their rental agreements and they were the sources of conflict in the scheme. Several cases of evictions were reported to the extension officer because of informal lease agreements. Some were leasing informally in return for annual cash payments, which was against the constitution of the scheme and thus another source of conflict.

He identified the formal leasing system as a positive development for Mphaila, especially for plot holders who struggled financially to make use of their plots. He pointed out that holding a plot without farming was of no benefit to the scheme. He advised plot holders who were not able to make use of their plots due to financial problem to lease them out.

MIS F2: Mphaila Scheme Plot Lessee

MIS F2 is a lessee of two plots on the Mphaila Irrigation Scheme. He accessed these plots in 2011 but does not have a formal rental renting contract for them. Before he began renting on the irrigation scheme, MIS F2 was an independent irrigator on 5 hectares of land, of which he used less than half a hectare. He abandoned his independent plot because he paid R 1300 per month for electricity to use it. MIS F2 has stated that the move to Mphaila was a good choice for him because on the scheme, electrical payments are done collectively. He is a market-oriented smallholder farmer and owns a *bakkie*.

He was not aware of the formalised rental system at Mphaila and was only informed of this after he had agreed his lease for the two plots. He was also not happy with taking over fees amounting to R 1100 from the plot holders in addition to his rental fees. He listed theft of farm equipment, such as his sprinklers, as a problem because of the cost to replace them. He has noted that rules associated

with renting on the scheme are inadequate and suggested the revision of the scheme constitution to cater more for renting and lessees.

Since the commencement of the lease contract he has not encountered a problem with his lessors. However, he pointed out the poor scheme fencing and inaccessibility of roads within the scheme as some of the major obstacles that require attention.

MIS F3: Mphaila Scheme Plot Lessee

MIS F3 is a lessee of two plots at Mphaila Irrigation Scheme. He is a market-oriented smallholder farmer who owns a private car. Before he leased, the holder of the 2 plots was struggling to pay the debts of the plots and the monthly self-contribution. He said that by coming to the scheme he has put the plot holder in an advantageous position because he no longer has the burden of debts or worries of payments. He said that he leased in conjunction with another lessee. However, he is not new to the land-leasing market. He started leasing land in an irrigation scheme before he moved to Mphaila, acquiring his first leasing experience at Rabali Irrigation Scheme. His lease agreement was captured informally, and as per agreement he was told to pay the total dues of the plot, which amounted to a total of R 2300, before he was allowed to lease. On top of that he was told to continue with monthly self-contributions of R 200 per plot, neither of which he was happy about. He indicated that he generally has a good relationship with the current plot holder, who is happy that monthly self-contributions are being paid.

He identified leasing as a positive development as Mphaila Irrigation Scheme is occupied by plot holders who are mostly pensioners who cannot even afford land preparation service and monthly self-contributions. Although Mphaila plot holders possess PTO certificates, they are not the ones who work on those plots. He pointed out that these financial constrains are a motive behind the sale of plots, which is already overriding in the scheme. He himself is interested in buying out plots.

He cited informal lease agreements as resulting from a lack of information, because most people did not know about the formal arrangements that were supposed to apply until they leased plots, especially people who came from other villages. He himself was willing to formalise his lease agreement. He identified great uncertainty with informal lease agreements because they are not recognized by the scheme officials.

MIS F4: Mphaila Scheme Plot Holder

MIS F4 is a chairperson, a plot holder and a lessee at Mphaila Irrigation Scheme. He is also a market-oriented smallholder farmer who owns a *bakkie (*1 ton pickup truck). He came to Mphaila in 2005 and at that time all of the plots on the scheme had already been allocated to people. However, that same year he managed to purchase two plots. He bought the first plot for R 13 000 and he was using it for the production of sweet potatoes. A second plot was sold to him for R 10 000 and he was using it for maize production. After he acquired ownership of these two plot, he was still hungry for more land. He later occupied a third plot through informal leasing in return for payment of the monthly self-contribution. When he first approached the plot holder, the entirety of his land was not used and had even developed bushes; however, it carried no debts as the owner kept on paying for it

even though it was not in use. He had a positive relationship with the plot holder and he had been a lessee on that plot ever since.

He identified eviction of lessees from their rented plots as largely caused by informal lease agreements and jealousy by plot holders. He advised people wanting to lease plots to do it formally. He also complained about the total he had to pay every month for monthly self-contributions, for labourers and for land preparation services.

MIS F5: Mphaila Scheme Plot Lessee

MIS F5 is a lessee of half of a plot at Mphaila Irrigation Scheme. He was accepted to lease because he was a relative to the holder of the plot. He mostly practiced farming his own household until he decided to find a scheme plot in 2008 through renting in return for payment of monthly self-contribution and he had already spent more than 3 years in the plot. His worry was that he leased a plot without formalised secure rights, however, he has managed to maintain a good relationship with the plot holder.

He identified renting as a good development for Mphaila but he emphasized that it had to be formalised. He advised plot holders who were no longer capable of using their plots as a result of financial constrains to lease them out as it would relieve them from worries of making payments every month.

MIS F6: Mphaila Scheme Plot Holder and a Lessee

MIS F6 is a plot holder, a lessor and a lessee at Mphaila Irrigation Scheme. She became a holder of 2 plots in 1990 when Scheme plots were first handed to the people of Mphaila. She permanently sold one of her plots in return for a total cash imbursement of R 10 000; this happened when she needed money to take her child to driving school. In 2010, she gained access to an entire plot in Mphaila through informal leasing. The arrangement was that she would pay the monthly self-contribution on behalf of the plot holder. She pointed out that she will continue leasing until the plot holder tells her to stop. She said that she leased because the plot holder was unable to utilise his plot. She had already concluded negotiations to jointly lease another plot with another lessee in 2012. She indicated that they were allowed to lease because the owner was unable to use it. In 2011, she gave one person a chance to informally lease a portion of the other plot that she had rights to. Despite that the fact that agreements were not secure (due to their informal nature) she was not interested to have the lease arrangement formalised, and was determined to stay with the lessee as long as he wanted to continue. She said that the lessee helped her because he contributed monthly, though the amount was variable based on what he could afford.

MIS F7: Mphaila Scheme Plot Lessee

MIS F7 is a lessee at Mphaila Irrigation Scheme. Her lease agreement started at the beginning October 2011 and was contracted to end in October 2014. By 15 October 2011 her plot had already been cultivated and she was waiting for seedlings to be ready before they were transplanted into the field. Before leasing she went directly to the extension officer of Mphaila, where she introduced herself and stated the reason for her visit. The extension officer then used his record book to

identify one plot holder who was unable to utilise his own land, and she was told to go and speak with him. She then went to consult with the plot holder, who fortunately had no problem with the arrangement, so she returned to the extension officer with the plot holder to fill a lease agreement form for three years with an assistant of the extension officer. After capturing their details, the extension officer signed the lease agreement form and kept a copy, and he sent both of them to the local chief, who also did similar thing. However, she was not happy with the arrangement of only three years and she was also not happy with the amount of land she got, as she needed more than one plot. She indicated that at least she was being assured that there would be no threat of eviction since the rental contract was captured formally.

MIS F8: Mphaila Scheme Plot Holder and Former Lessee

MIS F8 is a plot holder and a former lessee at Mphaila Irrigation Scheme. She became a holder of 2 plots in 1990 when Scheme plots were first handed to the people of Mphaila. In 2010, she jointly and formally rented a plot in Mphaila Irrigation Scheme. As part of the agreement reached with the plot holder, the two lessees were liable to pay the total dues on the plot, which was R 700, and also continue with the monthly self-contribution of R 100. Unfortunately, she ended up paying the R 700 alone. In 2011, as she was getting ready for farming, the other lessee went to the extension office to pay the full monthly self-contribution, which they had shared payment of each month since the inception of leasing. This resulted in a very serious conflict, because when she went to the extension office to pay her share of R 50 she was told that the plot had already been paid for. The matter was brought to the scheme leadership, but unfortunately they ruled her out. When she told the plot holder about the situation, the plot holder told her that he found this it very disgusting.

In 2011, she signed a 3-year lease contract in return for monthly self-contributions and share-cropping, and this time she leased the whole plot alone. Fortunately, the lessor decided to sell the entire plot to her for R 6000.

8.2.3 Results in relation to Trajectory 3 – Household to Dzindi Irrigation Scheme plot

Background on Dzindi land and water institutional rules

Rules of land access and control: At present, the process of transferring a plot starts in the family of the deceased plot holder. For all practical purposes it is the family who decides on who the new registered plot holder will be. Once negotiations on this matter have been concluded, the family meets with the Scheme Committee, which sits every Tuesday morning. The Committee will verify the identity document of the deceased and that of the proposed new plot holder and will insist on the presence of at least three family members of the deceased to confirm that the family has indeed agreed that the plot should be transferred to the proposed new plot holder. When these conditions are met, the Committee records the name of the proposed new plot holder. Then the Committee writes a letter in which it recommends that the applicant becomes the new plot holder. Once the Committee has made its recommendation, the applicant fills out the application form issued in terms of the Proclamation No. R.5 of 1963 in the presence of the extension officer, who also writes a letter of recommendation. The applicant then proceeds to the Tribal Authority, which also issues a

letter of recommendation. From there the applicant proceeds to the Thulamela Municipality, where the full dossier is handed over to an official, who then issues the Permission to Occupy certificate (Plate 4.4), but not before checking whether the applicant owes the Municipality any money. If the applicant is in good standing, the certificate is handed over. If not, all debt to the Municipality must first be settled before the certificate is issued.

Rules of transfer (rentals/leasing): When research at Dzindi started in 2003, land exchange in the form of renting was said to be non-existent at the scheme, and field observations showed that renting land was definitely not common; if it occurred it was done clandestinely, because scheme leadership forbade it (Van Averbeke, 2008). The idea to allow plot holders to rent out land was introduced and talked about in several general meetings with plot holders, and implemented by renting land from one of the plot holders in Block 2, when water in Block 1 was not available due to a faulty valve and the research plot (Plot 1) could not be used. Since then, land exchange has become quite common at Dzindi, but was not formalised. Different arrangements that applied to the exchange of land with others were encountered. Some made some land available in lieu of payment for land preparation services. Other rented out parts of their plots for cash. There were also arrangements that were based purely on friendship and trust.

Rules of water authorizations (GA/license): Plot holders at Dzindi accessed water from the canal without any form of payment. However, they were guided by an irrigation timetable.

Case	**Trajectory path/s**				**SH Code**
DIS F1	3	8	1		3
DIS F2	2	10	8		3
DIS F3	3	8	1		3
DIS F4	3	8			2
DIS F5	3	8			2
DIS F6	3	8			2
DIS F7	3				1
Case	**Trajectory path/s**				**SH Code**
DIS F8	3				
DIS F9	3				1
DIS F10	3				1
DIS F11	3				1

DIS = Dzindi Irrigation Scheme

DIS 1: Dzindi Scheme Plot Holder

DIS 1 is a Dzindi irrigation scheme plot holder from Maungani village who has a scheme plot in Block 1 in the area referred to as the “wasteland”. He applied for and was allocated a scheme plot in the 1960s after the removal of the Shangaan community. Before 2003, when he focused solely on farming, he worked as a migrant labourer. His first job was on a tobacco farm in Brits where he earned R 150 a month. He later moved to a farm at Hartbeespoort Dam where he planted tomatoes,

onion and flowers. He worked at Hartbeespoort Dam for 5 years before moving to a company that specialized in swimming pools and tennis courts, where he remained until his retirement.

On his scheme plot and home garden he grows cabbages, and states that the soil on his wasteland plot is suitable for tomatoes, potatoes, green beans, beetroot and carrots. He sells his produce to street and *bakkie* traders and supermarkets, and has sent green beans to the fresh produce market.

DIS 2: Dzindi Scheme Plot Holder

DIS 2 is a Dzindi irrigation scheme plot holder from Makumbane who moved to Dzindi in 1957 after his father was allocated a scheme plot. Together with his siblings, he assisted on the scheme plot, as well as on the 3 ha his father applied for on the fringes of the scheme, an area referred to as "wasteland".

He has a certificate in carpentry and cabinet making, and worked as a carpenter in Johannesburg for six years before returning to Dzindi and establishing his own construction company.

He acquired his own 5 ha orchard in Makumbane in 1980 on which, until recently, he was only allowed to plant fruit trees. In 1997, he inherited both his father's scheme plot on Block 4 and his wasteland plot. On the scheme plot, he retains 11 beds after having to subdivide it amongst his siblings. He has not had to subdivide the wasteland plot because his siblings were not interested in sharing the cost of purchasing an irrigation pump. He has focussed solely on farming since 1997 and sells his produce to the local community, street and *bakkie* traders and supermarkets, and also sends to the national market.

DIS 3: Dzindi Scheme Plot Holder and Lessee

DIS 3 was born in 1968 to a successful Dzindi scheme farmer. DIS 3 was assigned one of his father's scheme plots, but has not registered as a plot holder because of the cost of doing so. This scheme plot was subdivided between DIS 3 and his three brothers, but as a market-oriented farmer who owns a *bakkie* and a tractor, he wanted to extend his land holding. In exchange for free land preparation, he was able to obtain additional beds amounting to 3 ha from various scheme plot holders.

DIS 3 identified sharing water on plots which he "rents" as a source of contention, and quit the use of one plot because of water problems. He added that renting a plot where one pays in cash creates problems because plot holders became "greedy" and lessees make little profit.

Growing up, he worked on his father's plot but his ambition was to become a carpenter. He started planting on his father's plot in the early 1990s and after good crops he was rewarded with an additional bed. He now has 13 beds on his father's plot. He has a tractor service, which he started in the early 1990s, though he still mostly relied on the family's cattle for ploughing. He shared his father's plot with his brothers and as a result he ran out of land.

He stated that land leasing would be a positive development for Dzindi because of the many plots that were lying idle, with plot holders using them mainly in the summer to plant maize.

DIS F4: Dzindi Scheme Plot Holder and Lessee

DIS F4 is both a plot holder and a lessee in Block 1 of Dzindi Irrigation Scheme. He is a market-oriented smallholder farmer who mainly produces vegetables. He shares his registered plot with his four siblings, and has given each one of them three beds. After these subdivisions he ran out of land and had to approach plot holders who were not using their plots in their entirety. He ultimately managed to secure seven beds on two plots in Block 1 of Dzindi Irrigation Scheme. On both of his rented plots, rental agreements were captured informally and were based on cash payments.

The lessee confirmed his opposition to the renting of land, noting the most common objection by far was that lessees refused to move out of the plots after the rental contracts had expired and others went as far trying to change plots ownership. This created conflict which was difficult to resolve because there was no authority to adjudicate on the matter, as contracts were made verbally. Fear of leasing one's plot was also mentioned. Also important was the issue of sharing water with the plot holder – another source of potential conflict when on irrigation day, water allocated to the plot is used entirely by the lessor. One more vital issue which creates conflict is jealousy of lessors. The lessee reported an incident whereby the lessor went to the plot and harvested the lessee's produce close to harvest time, while they were exploring marketing options, without any permission from the lessee.

DIS F5: Dzindi Scheme Plot Holder and Former Lessee

DIS F5 is a scheme plot holder and a former lessee of a portion of a plot in Block 4 of Dzindi Irrigation Scheme. He shares his registered plot with his son and has given him one bed. As a market-oriented farmer he sells his commodities, which are mainly green maize and vegetables, to the hawkers who came directly to his plot, to people in the town of Thohoyandou, and to Tshilidzini Hospital. He sought access to additional land to add to his small plot, but it was difficult for him. He finally managed to secure one additional plot through leasing in return for cash payment, but he was chased away by the lessor. From this negative experience of eviction, he cited untrustworthiness of the lessor. The lessee argued that the plot holder reneged on the rental agreement and chased him out before the end of the contract had been reached. He blamed jealousy as the reason for this behaviour. He also pointed lack of recognition of lease system by officials as the main source of his eviction because there was no authority to adjudicate on the matter, as the contract was captured verbally.

He identified better enforcement of the rules as one condition necessary to make leasing at Dzindi an acceptable practice. He also encouraged other plot owners, who for one or other reason were incapable of farming their plots, to rent them or relinquish them for reallocation.

DIS F6: Dzindi Scheme Plot Holder and Lessee

DIS F6 is both a plot holder and a lessee in Block 1 of Dzindi Irrigation Scheme. He obtained his plot in 1980 and has been a plot holder ever since. He is a market-oriented farmer who farms to support

his family financially through sale of vegetables and maize to the market. He used his surplus produce for home consumption. He needed extra land to expand his holdings but he lacked enough resources. He found it difficult to get access to additional land, but finally managed to lease twelve additional strips on plot number 12 for free, as the holder of that plot was unable to make use of it. He identified a rental market as the only option to eliminate risks of evictions caused by informal rental agreements which lacked recognition by scheme officials.

DIS F7: Dzindi Scheme Plot Holder and Lessee

DIS F7 is both a plot holder and a former lessee in Block 3 of Dzindi Irrigation Scheme. He shares his land with his two children, giving them 7 strips of his plot to share. One of them took 4 strips and the other took 3 strips. As a subsistence-oriented farmer his problem was that he did not have enough land left to farm. He tried to look for additional land and he found it in Block 3, but that was for lease in return for cash payment. Unfortunately, his rental agreement did not last long as his rental contract was terminated before the leasing term ended, due to jealousy of the plot holder. The plot holder had since been unable to utilise his plot since the eviction. He also encouraged other plot owners, who for one or other reason were incapable of farming their plots, to lease them to other people.

DIS F7: Dzindi Scheme Plot Lessee

DIS F7 is a lessee in Block 3 of Dzindi Irrigation Scheme. She is a subsistence-oriented smallholder farmer who produces maize and vegetables, and she has been leasing since 2008. She said that she asked the plot holder for the rental use of two strips of his plot to produce maize and vegetables, and permission was granted; she paid nothing in return. She identified leasing as a positive development and the only way in which the landless could gain entry into the scheme.

DIS F8: Dzindi Scheme Plot Former Lessee

DIS F8 is a former lessee in Block 3 of Dzindi Irrigation Scheme. He had leased 3 plots in return for cash, but his farming efforts were not successful as the land was used by others despite the arrangements. In the first plot he was surprised to find the land he leased already being cultivated by one of the plot holder's relatives. On the second plot where he had previously farmed for over a period of three years, he found another lessee farming on his beds at the time of planting. Lastly, on the third plot, where he had been the lessee for a number of years, he was evicted by the children of the lessor shortly after the lessor, who was very old at that time, died.

Based on his negative experiences he believes the most common cause of evictions is that rental agreements lack recognition by scheme officials; the issue of jealousy is another factor. He also lamented the untrustworthiness of plot holders.

DIS F9: Dzindi Scheme Plot Holder

DIS F9 is both a plot holder and a lessor in Block 1 of Dzindi Irrigation Scheme. He obtained his plot in 1964, through land transfer, 8 years after his father's death in 1956. He struggled to obtain the plot because he had to marry first, as this was a prerequisite to obtaining a plot at Dzindi. He farmed his plot with his children and his brother's children; as a result, the land within his plot became

insufficient for him to provide for his family and he thus needed additional land. At the same time, he could not make use of his own plot to its full capacity due to financial problems. His only option was to lease out part of his plot in order to afford farming, so he leased out seven beds in return for free land preparation service.

Generally, he has positive experiences renting out his plot. He indicated that if it wasn't for leasing, his plot would be lying idle. Leasing was also helping him financially, because he depended on a social grant for income and this amount was insufficient to plough his plot. He rented his plot in return for free land preparation service, and has never encountered problems with the lessee. His rental agreement was captured informally because if they had approached the scheme official it would not have been allowed.

DIS F10: Dzindi Scheme Plot Holder

DIS F10 is a plot holder and a former lessor in Block 1 of Dzindi Irrigation Scheme. He has given half of his plot to his sister, and he is willing to farm his half, but water problems remain a major obstacle to growth and the plot was unused. He decided to lease out her half of the plot with her permission; however, she later decided to terminate the rental contract with the lessee because she did not feel secure, citing rumoured ambiguities of the rental system and conflicts over water as the two reasons for her decision. Another example of lessors afraid of losing the plot.

DIS F11: Scheme Plot Holder

DIS F11 is a plot holder in Block 2 of Dzindi Irrigation Scheme. She shares four beds of her plot with her daughter and expressed her desire for additional land. However, she is convinced it will never happen, especially through renting, due to the poor security of the rental system. She identified fear of losing one's plot as the reason for lack of land rentals at Dzindi, and pointed out that she would rather share her plot with her sibling than renting to someone else. She reported several cases of people who went to the extension official in an attempt to claim ownership of their rented plots.

8.2.4 Results in relation to Trajectory 3 – Household to Tshiombo Irrigation Scheme plot

Case	Trajectory path/s				SH Code
TIS 1	2	10			2

TIS F1: Tshiombo Irrigation Scheme Plot Holder

TIS F1 is a Tshiombo irrigation scheme plot holder who, before farming permanently, worked as a panel beater and spray painter in Johannesburg and Thohoyandou. When he returned to Venda, he set up his own panel beating shop in an abandoned building in Thohoyandou and maintained the business until tyre companies started competing with his service and he lost business as a result.

When he started farming in Tshiombo in 2004, he rented 7 beds on an independent irrigator's plot. He had relative success on this plot until 2009, when his perceived success resulted in his lessor

taking away 3 beds and offering him only 4 in the following season. When he told his father of his misfortune he was offered the family's scheme plot, which he took over officially in 2010. TIS F1 has, since 2003, also invested in livestock. His first cow was purchased in 2003 with money earned from his panel beating business, three more were purchased in 2005 after he sold his car, and since 2006 he has been able to increase his number of cows with money made from his crop farming. TIS F1 sells his produce in Thohoyandou to street and *bakkie* traders.

8.2.5 Results for Trajectory 2 – Household to independently irrigated plot

In Khubvi, independent irrigators farm on tribal land, which is land held in trust by the paramount chief, in this case Chief Tshivhase, on behalf of the people. The independent irrigators of Khubvi obtain farming land by approaching their extension officer, who takes them to the headman, where negotiation for land takes place. Some farmers of Khubvi pay an initial fee of R 500, whilst others are exempt. The price for first access to land is R 250 per hectare, and the annual fee is R 250. The headman then escorts the farmer to Makumbane, where their purchase of land is registered. Upon registration, they receive a small booklet which acknowledges their permission to occupy, and in which annual payment is documented. The two Khubvi independent irrigators analysed for this report obtained their land in different ways. One followed "standard" procedure, but also registered use of this land with the municipality. The other stated that he did not follow "standard" procedure, because he inherited his 20 hectares from his father. Inheritance of land, however, is seen to be equivalent to transfer of "ownership" of land so long as it is endorsed by the extension officer first, then the headman and last, the paramount chief through his tribal council.

In Tshiombo, the land on which independent irrigators may acquire "plots" runs parallel to scheme blocks and is held by four Headmen. The land obtained by the independent irrigators falls under the Headmen Mathoho and Nyamande, whose area begins mid-way Block 2, up to and including Block 4. The standard procedure to obtain a plot is that individuals approach the headman on whose land the plot falls, and negotiation for the right to use said land occurs. If the headman agrees to the request, a fee of R 500 is paid to him before he escorts the farmer to Makumbane, where Chief Tshivhase's tribal council meets every Thursday. The tribal council registers the farmer's rental of land and an additional R 500 is paid before the council issues him with a P.T.O. The annual fee to occupy this land is R 235. The R 500 fee is only paid for land exceeding 1 hectare. There are, however, exceptions, to this procedure. If, for example, an individual seeks land smaller than 1 hectare, all negotiation is conducted with the headman, the fee charged varies, and these independents are usually not registered with the tribal council. One independent stated that she paid R 150 for her plot but ensured that she was registered with the tribal council. Another paid the headman R 600 for his plot and although it was not taken to the tribal council for registration, claims that the headman himself issued him with his P.T.O (whereas another farmer paid R 900 for his plot, was taken to the tribal council, but was not issued with a P.T.O.). While payment for land appears to be the norm, the headmen who have registered their own plots with the council are not expected to pay a fee.

Water use by independent irrigators

With the legal separation of land and water, water usage by farmers is now guided by the National Water Act of 1998. However, the independent irrigators operate 'de-facto' outside of legal frameworks pertaining to land and water, and as such, their security and authority on which they can call to enforce their "rights" lies with their headmen and the tribal council. While they may not have legal right to use water within the national regulatory framework, they believe they have rights given the local traditional processes they pursue. The independent irrigators of Tshiombo obtain water by pumping it directly from the Tshiombo River or the dam closest to Block 4, and/or digging pits on their plots. Khubvi independents have also stated that they pump directly from the Khubvi dam.

Manamani Village

Case	Trajectory path/s				SH Code
MII 1	1	4	2	6	3
MII 2	3	2	6		3
MII 3	2	6			2
MII 4	1	2	6		2

MII 1: Manamani Independent Irrigator

MII 3 is a Manamani independent irrigator who was born in Elim and grew up and worked on a farm in Sweetwaters. He moved to Manamane in 1977 on the advice of an aunt, who had heard of the availability of plots in that village. After he obtained a residential plot in Manamane he left his family to work in a furniture factory in Krugersdorp. This work was abandoned once he had saved enough to purchase a choppa bicycle to use for transportation when selling chickens, which he purchased from a poultry farm in Levhubu. When the poultry farmer moved from Levhubu he decided to switch from his chicken sales business to crop production, and in 1981 he approached the local Headman to obtain permission to use the 5 ha of land adjacent to his residential site for farming purposes.

MII 2: Manamani Independent Irrigator

MII 2 is an independent irrigator in Manamani and categorised as SAFL 3. Before he purchased his first independent plot in the village he was employed as a driver at a Thoyandou-based company for 23 years. He always intended to go into farming full-time, and twice rented from Dzindi scheme plot holders, but renting proved dissatisfactory because without a formal rental contract, the plotholder would return in time for crop harvesting and chase him away.

In order to purchase his first 5 ha plot in Manamane, he loaned R 3000 from his employer, telling him that his younger brother wished to attend university. He continued working for his employer, leaving his two wives to work on the plot. In 2006 he left his work as a driver and switched to farming permanently. He added 4 ha of land to his 5 ha, and to earn the R 26 000 needed for this land, he sold one of his beasts and started making clay bricks on a section of his 5 ha plot. Within six months he had earned R76 000 to pay back his loan and to purchase a tractor.

MII 3 & 4: Manamani Independent Irrigators

MII 3 is an independent irrigator in Manamani. He is the younger brother of the village's Vhamsanda and the uncle of MII 4. Growing up, MII 3 enjoyed working on the family's land and took "gardening" as a subject in school. He obtained his Junior Certificate in 1978 and sought employment in Johannesburg where he worked in zone planning until 1997, when he returned home. Whilst living in Johannesburg, his mother looked after his land. His portion of land is close to a dam and the equipment he needed for his farm enterprise was purchased with the money he earned as a migrant labourer. He feels that the dam water is too polluted to use for growing crops, and the generator that he purchased to pump water from the dam is used for the brick-making business that he has started with his nephew, MII 4.

MII 4 joined his uncle on his independent plot and the crops that he produces in his home garden are harvested solely for home consumption. He is the son of the village's *Vhamsanda* and he dropped out of school in his Grade 11 year in 2002. After dropping out of school, he took over his mother's beer brewing business and began selling "Venda" chickens. With the savings made from the profit of these businesses, he purchased pigs from Vignette 12, who also provided knowledge on how to care for and grow his piggery. The money that is made from the sale of his pigs is invested into the brick-making business he runs with his uncle. They advertise their business on his Facebook page and on homemade wooden "boomkrants".

Itsani

Case	Trajectory path/s				SAFL Code
III 1	1	2	6		3

III 1: Itsani Independent Irrigator

III 1 is a home gardener turned independent irrigator in Itsani. She was employed for 7 years by a knitting company in Shayandima before her retrenchment. A week after her retrenchment, she purchased knitting machines to continue with her knitting. She also purchased cold storage fridges so that she could sell meat and beer, and in 1995 was able to open both a *shebeen* and a *spaza* shop. With the money earned from these businesses, she purchased a *bakkie* so that she could sell at pension/grant pay points.

Her farming enterprise began on her residential site in Itsani. The crops she produced in her home garden were sold to her *shebeen* and *spaza* shop clientele, as were the chickens and pigs obtained from the poultry house and piggery. Her clients and community encouraged her to obtain a plot and she was offered 1 ha to use by a member of her community. She later approached the local headman to acquire 4 ha of land not far from the plot on which she was already farming.

Khubvi Village

Case	Trajectory path/s				SH Code
KII 1	2	6			2
KII 2	2	6			3

KII 1: Khubvi Independent Irrigator

KII 1 is an independent irrigator in Khubvi village who has been farming full-time since 2005. Before obtaining his independent plot, he worked as a bricklayer until he joined the army in 1979. For 26 years he worked in various defence force organisations as well as the South African police force. He decided to farm because he felt that he was too old to continue to serve for the police. He obtained his plot by approaching the local headman, and was allocated one adjacent to a coffee plantation. He learnt farming techniques from fellow farmers, because as a child his family did not practice farming. He supplies to the local market and *bakkie* traders and is working on getting a contract with local school feeding schemes.

KII 2: Tshiombo Independent Irrigator

KII 2 is an independent irrigator who was born into a successful farming and business family. His father wanted all of his children to be educated, so he obtained a certificate in steel engineering. He began working for a welding company but found that his earnings were less than the pocket money received from his father. He decided to work in one of his father's shops before he began working on his father's plots. He later worked for Delport and TigerBrand, delivering tomatoes. Whilst working as a driver, he rented 2 ha of land, on which he grew tomatoes. He sold his tomatoes to TigerBrand and received R 105 000; with those earnings, he returned to Khubvi and began preparing land on his father's 22 ha, on which he could continue to grow tomatoes. His aim is plant tomatoes on his entire 22 ha and to use the earnings to aid his livestock farm, which he will then focus on solely.

Tshiombo Village

Case	Trajectory path/s				SH Code
TII 1	3	9			2
TII 2	3	9	6		2
TII 3	2				2

TII 1: Tshiombo Independent Irrigator

TII 2 is both a plot holder on Tshiombo irrigation scheme and an independent irrigator. He inherited his scheme plot in the same year that he assumed his father's position as *Vhamsanda* (Headman). He grew up farming with his siblings and when the irrigation scheme was established, his father applied for a plot. He later obtained 3 ha of land on the fringes of the scheme, known as the 'wetlands', but whilst he is a scheme plot holder, the plot is shared amongst members of the family, leaving him with little space on which to farm. His produce is sold to local traders, who also bring him new clients. He intends to expand his land holding, not for farming purposes but as an asset for his family.

TII 2: Tshiombo Independent Irrigator

TII 2 is an independent irrigator in Tshiombo. He first applied for and was allocated a plot on Tshiombo irrigation scheme's Block 4 in 1972. In 1998, he acquired 4 ha on the fringes of the scheme, an area referred to as the "wetlands," because his plot no longer obtained water from the scheme's canal. Finance for his independent plot was obtained from sales of crops, savings from his

wife's *spaza* shop and from his earnings as a priest. He supplies to the local market and is working on accessing the national fresh produce market through his cooperative.

TII 3: Tshiombo Independent Irrigator (Mugeri)

TII 3 is a Tshiombo independent irrigator from Tshifudi, north of Venda. When he was 9 years old, his father passed away and he sought employment on farms in Levhubu. After six months, he left Levhubu and sought employment in Johannesburg. Up until 1991, when he learnt of the availability of land in Tshiombo's "wetlands", he alternated between farming in the village in which he was born and seeking work in Johannesburg. He obtained his 4.7 ha of land in the wetlands in 1991 and obtained his farming knowledge by attending a number of workshops held in the local headman's homestead. He has burnt his fingers trying to access the national fresh produce market but believes that by joining a cooperative, his future dealings with this market will be more successful.

8.2.6 Synthesis of the findings in Thulamela

The findings in relation to the various possible trajectories people have used to establish or grow irrigation enterprises are interpreted from the perspective of important obstacles which people encountered. This synthesis of the findings is presented in Table 8.3, which indicates the trajectory number (explained in Figure 8.1), the locality, the important obstacles and the severity of each (the codes used are elaborated in Table 8.2, followed by a brief explanation of the obstacle).

TABLE 8.2: Categorisation of the severity of the obstacles associated with irrigation development and growth trajectories

Severity of Obstacle				
1	**2**	**3**	**4**	**5**
none	**minor**	**moderate**	**major**	**critical**

TABLE 8.3: Important obstacles experienced by participants in Thulamela who established or grew irrigation enterprises

Trajectory	Location	Obstacle	Severity of Obstacle	Explanatory notes
1	Manamani	Access to water	4	Those who wish to irrigate their gardens find it difficult to access water due to the water limitations in their settlements.
1	Itsani	Theft	2-3	Theft of flowers in home gardens, and fear of theft of crops in future.
3	Mphaila	Monthly water and electricity fees	3-4	Both plot holders and lessees find these fees excessive and struggle to make payments.
		Informal rental agreements	4	Concern over the validity of verbal arrangements when formal arrangements may be accessed (see MIS F1, MIS F2).
		Access to roads from the scheme	4	A lack of access to roads makes transportation of produce difficult and limits access to markets (see MIS F2).
		Theft of equipment	4	The financial burden of continually replacing stolen equipment is a disincentive.
	Dzindi	Access to water	4-5	Plots in Blocks 1 and 2 access very little water (see DIS F1 and DIS F3).
		Social 'institutional' obstacle of subdividing the plot	4-5	This obstacle restricts the area on which the plot holder may farm, and, depending on the location of the assigned beds, the plot holder may be denied access to water (see DIS F2, DIS F3 and DIS F4 for examples).
		Informal leasing of scheme plots	3-4	Obstacles include being chased away from rented land just before harvest, being assigned beds/strips that are located on a section of the plot where it is easy for the plot holders to prevent access to water, and plot holders harvesting the lessee's crops (see DIS F3, DIS F5, DIS F8 and MII 2).
		Accessing additional land	3	No written contracts are permitted, being an outsider increases chances of refusal, and perceived success decreases potential access (see IHG 1).

Trajectory	Location	Obstacle	Severity of Obstacle	Explanatory notes
1, 2, 3, 9, 10		Tribal leadership	3-5	The local tribal authority expects payment for every transaction they facilitate. The local tribal authority accepts payment from the highest "bidder" and a farmer who had been previously been assigned a piece of land may have to repeat certain steps of access, including payment of associated fee. Many steps have to be taken within the tribal authority chain, and all steps have a fee attached (see farmer illustrations).
		Accessing the local market	1	There is relative ease in accessing this market.
		Supplying to supermarkets	3-4	One may have to attain a certificate from the Department of Health to supply to a supermarket. Supermarkets do not offer suppliers a formal contract, all costs before delivery are incurred by the farmer, and it is the supermarkets that decide on the pricing of the produce (see IS and II for examples).
		Middle men (agents) when accessing national fresh produce markets	3-5	Farmers work through agents to send their produce to the national markets. The chain followed for produce to reach these markets is unclear and farmers have reported large financial losses (see DIS 2, MII 2 and TII 3).
		Access to finance for natural and physical capitals	2-3	It is impossible to access loans or any form of financing from banking institutions. Financing is accessed through employment, self-employment, savings, reinvestments and cross-investments (see all farmer illustrations).
		Accessing farming knowledge	1-2	Knowledge is obtained from parents and family, fellow farmers, and/or extension officers
		Obtaining hired labour	1-2	Labour is hired only when necessary and affordable (see farmer SAFL codes).

8.3 Irrigation pathways at the Greater Tzaneen site

8.3.1 Approach

This section of the report covers the case study histories of irrigators in the Greater Tzaneen Local Municipality. A total of 38 farmers were interviewed from the three population groups of interest: irrigation scheme farmers, independent irrigators and home-gardeners.

The approach to describing pathways in Greater Tzaneen by use of case histories is a little different from Thulamela, where, because there are multiple villages and schemes, all of the vignettes were grouped by village or scheme and the relevant analysis of pathways was then tabulated. At Greater Tzaneen, only one irrigation scheme and one village were the focus of the research. The cases were thus grouped on the basis of the 12 irrigation development trajectories that were observed in the field, and were then analysed using Ellis's version of the DFID Sustainable Livelihoods Framework (Ellis, 2000). The analysis similarly concludes with obstacles, leading into Chapter 8, where obstacles are further explored and solutions developed.

8.3.2 Results

Trajectory 1: Start with home gardening

Home gardens mostly provide households with their closest and most easily accessible arable lands as they are situated within the boundary of the homestead. This reality is emphasised at Rhulani village, where residential plots were methodically laid out by officials[1] in a way that they embed backyard gardening space. The implication is that every household at Rhulani has a home garden and most of them use it in one way or another some rainfed, others irrigated. However, only a handful have developed home gardening into an irrigated production practice.

The movement of households to irrigated home gardening, like several other trajectories, is taking place in the context of the presence of capital, social relations and institutional setups, which provide both enabling and constraining factors. From a natural capital standpoint, land for home gardening is readily available to every household, although it is provided in small sizes and cannot be expanded. Land rights on a home garden are part of the rights to residential plots and are not seen as a different portion subject to different criteria, and are thus very secure. Irrigation water is, however, difficult to access due to limited sources as well as limited infrastructure (rainwater tanks or piped infrastructure), a fact cited by several home gardeners as an important limiting factor.

Evelyn, a widow born in 1954, started farming in her backyard in the 1970s when she settled at Rhulani, but this had been dry-land maize, pumpkins, and groundnuts farming. She began vegetable farming in 2010 after having unlawfully connected scheme water to her yard. She aspires to increase her gardening but there is no space for expansion. She uses family labour including herself and two daughters to work in the garden. For Evelyn there is enough labour power to use within her family.

[1] Rhulani is a betterment village whose residential plots are pegged at 50 m x 50 m in size = 2500 m^2.

She said she is looking for someone who can finance her to buy seeds and chicken manure so that she can start commercial gardening. She thinks she can pay back the money in two years' time.

Shortage of irrigation water is caused largely by a lack of financial capital and proper institutional arrangements. Irrigated home gardening is being practised mainly by households that have had the money to drill their own boreholes (drilling one borehole costs between R 25 000 and R 30 000). Others who have recently started irrigating are using unlawfully connected raw water from the Julesburg scheme. This water supply may not last, because scheme farmers have already started complaining that unlawful connections by home gardeners are leading to water shortages in the scheme.

Trajectory 2: Homestead to independent irrigated plot

The move to start farming on independently irrigated plots is predominantly motivated by the desire to generate monetary income and make a profit. Many farmers have started on this practice without previously having farmed in home gardens, for various reasons including not having a water supply to irrigate their residential plots, or being away from home working in urban centres. This portrays a picture of a quantum leap as opposed to incremental growth in agriculture, starting small in gardens and moving to larger scale in fields. The significant leap into farming at field-scale is often explained by the power of either the push or pull factors exerted on an individual or household to generate cash income.

Some of the households that jump straight into independently irrigated farming are pushed largely by survival-oriented motives the central one being to earn enough money to support themselves and their families. Characteristically, such a farming trajectory comes as a response to realities and threats of unemployment. On the other hand, others are pulled onto this pathway by their desire to achieve success by exploiting farming opportunities they have identified. Such individuals get into farming even when other attractive opportunities for employment exist.

Independently irrigated farming needs substantial supplies of capital – including financial, human and natural – to produce at profit-making levels. At the study site, farmers are largely able to access land for farming, which gets allocated to them by the local Traditional Authorities. Although accessing the land is not a major challenge, the institutions of tenure are not very favourable to farmers. Rights in the land are issued according to the Permission To Occupy (PTO) system, which is a form of bastardised customary land tenure system. The PTO system denies rights of ownership and is very prohibitive on matters of succession, leasing and disposing. This has a significantly adverse impact on financial capital; because conventional money-lending institutions such as banks do not offer loans to farmers for this kind of land right. This can have a knock-on effect on other farming components, such as water and labour supply, which need substantial input finance.

After running a hardware business for a decade, Edward moved into farming. He acquired his farm (10 ha) in 1989 through the chief and was issued with a PTO certificate. "When I closed my hardware business, I was planning to get into farming. Farming had always been in my plans". He started by digging a borehole for irrigation water. "The establishment phase of this farm was very difficult, but I

already had massive experience in running businesses so I did not lose hope because I knew where things would end up at". He used money from his retail businesses to erect fencing, make boreholes, buy tractors and other farming equipment, as well as starting inputs. His challenges are that he does not have enough water; he has one borehole to serve the whole 10 ha plot; and he does not have enough money to buy inputs, especially fertilisers and pesticides.

Ben's case captures the main obstacles that affect independent irrigators. Ben says the main challenge in farming is that the market is very difficult to deal with, and prices can drop any time. "We sell to Johannesburg markets via agents who charge us agent fees, storage fees and transport fees, and we cannot know the prices they sold our products for. As a result of all this, you end up receiving too little money. At some point after posting many boxes of green beans to the market, I received a R 25 cheque. The agent told me that all my money had been absorbed by packaging, storage and transport charges. The only way to solve the marketing challenge is to sell to local people. But the problem with the local market is that they buy in very small quantities and their buying pattern is often erratic. If you depend on the local market it is risky to plant in bulk, say 2 ha of green beans because you cannot be sure if they will buy in time".

There are some big companies around Nkowankowa who ask farmers to supply to them, but these companies often arm-twist farmers into accepting very low buying prices for their produce. He said there is a tomato sauce processing company in the area to which he sells tomatoes. When a farmer takes his produce to them, the company tells the farmer the amount it wants to buy the produce for. The farmer does not have power to tell the company what their tomatoes are worth. The company often asks them to either accept its offer or go back with their tomatoes. At the end, farmers often choose to take the offer because tomatoes are perishable – it is better to accept less money than to take them back where they will get rotten and the farmer will lose completely.

He said another obstacle for him is lack of a tractor. He depends on hiring, and tractor services have become very expensive. He said that besides being expensive, tractor operators have gotten into the habit of robbing farmers, especially when ploughing. Sometimes they leave weeds in the ploughed field; some tractor operators create very big clods, and others do not dig deep enough. As a result, the farmer has to go back to the ploughed portion and work it using hand hoes. Either the farmer performs this work by himself and his family, or is forced to hire labour, at extra cost.

His other challenge is water. His farm is close to a fruit juice factory in Nkowankowa and he shares the same river with the factory. The factory discharges its waste water into the river, which he alleges often contains chemicals, especially ammonium which is bad for crop health. The contaminated water burns his crops when it is in highly concentrate levels. "As a result, I cannot enter into supply contracts with big shops such as Spar because some of my crops come out in compromised quality, and in worst cases the crops get so burnt that they die or fail to produce at all. I lodged a complaint with the company but they ignored it. I later approached the local municipality and finally lodged a complaint at the Public Protector's office. But so far nothing has been done. The company is big and powerful". Ben has a water licence from the local municipality authorising him to use water from this river.

He said that in order for him to grow, he needs to target the market strategically, especially concentrating on pay points; however, for this he first requires a *bakkie*. He thinks that he can solve the water problem by drilling his own borehole. He has opportunities to get more land on lease, but his major obstacle is the lack of a tractor to plough the big land. As far as market problems are concerned, Ben thinks that the government needs to assist them to negotiate market deals with powerful buyers.

Trajectory 3: From homestead to scheme plot

Households/farmers that have taken this pathway (from the household straight on to be an irrigation scheme farmer) have mainly leveraged on the existence of supportive institutional arrangements that provide for free access to land and irrigation water. Provision of free water in the scheme significantly cuts down operation costs, enabling farmers to continue farming, some with very low profits and others running at a loss. However, there is no guarantee that scheme farmers will continue to enjoy free access to irrigation water, and at times there is not enough water available. Despite these uncertainties, the scheme seems to offer more physical capital than the independent irrigation model.

However, the fact that diverse individual farmers are made to share a single water supply system demands a strong dam operating regime and scheme water rules to govern matters of use and allocation, amongst other things. There is a Water Committee for the scheme and a set of allocation rules is being used, although the rules often get trumped by recalcitrant members. The big gap regarding water institutional arrangements is that there is no formal arrangement with the DWS, and no allocation of use rights from it. This poses a big threat and causes uncertainty, given that access to water is becoming more difficult due to competition over allocation rights among the numerous water users, including municipalities, industries and mines.

The present low level of Tours Dams has worsened this situation for farmers (Figure 8.2). At a water meeting between scheme farmers and an extension officer this year (2015) in November at Tours, farmers were told that Tours Dam, from which they get water, was running low due to an extended dry spell. In response to this, water supply will be cut significantly and farmers will henceforth be allowed to plough a maximum of one hectare each. Water abstractions for farms are not measured or monitored.

FIGURE 8.2: Tours Dam at about 50% of its normal water reserves

There is access to land which is allocated in 5 ha plots by the local Traditional Authorities working together with the Scheme Committee, and there is opportunity to expand because the scheme is not

fully occupied. In fact, of the 48 plots in the scheme, fewer than 20 are occupied. Institutions of land rights are that farmers have to use the land in order to retain the rights to continue occupying it. Rights of ownership vest with the chief but farmers can occupy the allocated plots for as long as they demonstrate use. The chief allows farmers to borrow land from other villagers.

There are however some challenges that constrain scheme farmers' expansion and growth. The most challenging include water resources, mechanisation, marketing knowledge and lack of access to organisations, but many other hindrances exist also.

Trajectory 4: Intensifying and expanding the home garden

This pathway is for farmers who are using their garden spaces to capacity, or at least at a 100% cropping intensity rate. Intensification involves growing one's farming enterprise without adding more land. It is often achieved by increasing cropping intensity, as well as by adding a supply of inputs such as water, fertilisers, seeds and labour. One of the biggest triggers of intensification in home gardens is increased access to a reliable water supply, which goes a long way in enabling farmers to plant throughout the year. Access to unlawfully-connected raw water from the Julesburg irrigation scheme has substantially increased the practice of vegetable home gardening at Rhulani village. However, there are almost no opportunities to expand home gardens because homesteads are settled very close to each other on planned and strictly demarcated spatial surfaces.

The following case illustrates a scenario of growing home gardening by intensification. Ophelia is a 36-year-old widow. When she married, she aspired to make farming their main source of food, as well as a significant contributor to household income through the sale of farm produce. In the home garden she introduced a 300% cropping intensity of vegetable crops. Although this has been done successfully, the garden plot is too small to produce for selling. Since the introduction of intensified cropping, the garden has significantly improved the family's own food supply and thus reduces money spent buying vegetables. Ophelia's main obstacles to the expansion of her home gardening are a lack of land to expand onto, and the expensive cost of digging a borehole for irrigation water.

Trajectory 5: From irrigated home garden to independent irrigated plot

Going from home gardener to independent irrigator is one of the theoretically typical and normal development trajectories in small holder farming, but in reality there are very few farmers who have walked this path in the Greater Tzaneen study site. The few that have, have built on the small step-like successes that they achieved in home gardening, including successful farming experiences and encouragement from positive market responses that serve to catapult their farming ambitions to higher levels.

Daniel started with a small irrigated home garden on which he produced mainly for sale. He bought a water pump and pipes, and started expanding his cropped land yearly, from half a hectare to two hectares in three years. As he continued to expand, his water needs became more than the machine could cope with. Daniel approached the Department of Agriculture, which, after a two-year period of continued discussions, hired a contractor to set up drip irrigation by drilling a borehole, connecting electricity and laying pipes on two and half hectares of his land.

Trajectory 6: Expanding and intensifying the irrigated independent plot

Opportunities to expand independently irrigated plots are progressively closing in as unallocated land is becoming scarce in Greater Tzaneen, where only one case of this kind of growth was found. In 1994, after leaving Johannesburg, where he worked for 30 years, Ben approached the chief looking for land. The chief gave him a 2 ha plot and a PTO certificate, for which he has been paying R 350 yearly. He later applied for another two hectares, which the chief granted him. After eight years he applied for an additional two hectares, which were also granted. In total he presently holds a 6 ha plot, "…but I was paying something at every time I applied for an extension of my plot," Ben said.

Although in some cases it is possible for farmers to apply for and obtain additional pieces of land, the land allocated is likely to be far from the applicant's existing farm. When this happens, the farmer has to start from scratch establishing another irrigation system and erecting fencing. This not only increases financial expenditure, but also divides the attention of the farmer, who then has to run two separate farms.

Intensification seems to present better and more favourable opportunities to grow independently irrigated farming. Several farmers have followed this pathway, and many others aspire to it. Nelson holds a 10 ha plot which he has been using below capacity since 1997 when he started farming, largely due to shortages of irrigation water. He has a single borehole which is too small to adequately supply water to his field, so he needs another borehole. Currently he is busy saving for more pipes. The shortage of irrigation water is limiting his farming to 5 ha (half his plot) only. He is renting out the other 5 ha so that his land is kept cleared. He thinks that if he gets a second borehole and cold-room, he will be able to farm the whole plot. He thinks that if the government fails to give him the cold-room he will soon start saving for it, and hopes to buy it by 2020. He has recently bought a Toyota *bakkie* which he uses to transport produce from the farm to home and to the market. The money to buy the *bakkie* came partially from farm sales, as well as from one of his sons who works in Johannesburg.

Edward is planning to grow his farming through intensification. He holds a 10 ha plot on which he employs an average of 6 workers every month. He aspires to grow his farming by putting all his land into use. He is currently using about 65%, mainly because his water supply is inadequate. He has one borehole only; in addition, he does not have enough money to buy inputs, especially fertilisers and pesticides. He plans to start growing special and high value crops that include green pepper, cucumbers and sweetcorn, as well as getting into greenhouse farming. "To achieve this, I need to start implementing my vision: that is, to invest heavily in farming through, among other things, paying my labourers well. Happy workers are often very productive". Edward does not believe that it can be too late in life to start farming as he notes, "How can you say it is too late when you do not know when you will die?"

Trajectory 7 : Irrigated home garden to scheme plot

This is another ideal case of a progressive growth pathway, and this development can be influenced by several factors. A main factor is that the farmer has used the home garden space to maximum capacity but still has the ability to grow the farming enterprise. Another factor can be the encouragement a farmer feels by successes in their irrigated garden, which can motivate them to start farming at a larger scale.

Muthembi is a farmer at Julesburg Irrigation scheme who lives in an urban location in Nkowankowa. He started gardening in 1989 when he bought a house there. In 2008 he extended his house and the backyard garden space was taken over, but he did not stop gardening, resorting to planting in old tyres. The garden is mainly meant to provide fresh vegetables at home, although his children sometimes sell some, especially tomatoes. He irrigates it using metered municipal water that he pays for. He thinks that having practised farming in the backyard garden had some influence on his later decision to apply for a plot on the scheme, because he had been used to seeing green and enjoying the benefits of harvesting from his own plot.

He chose to farm on the scheme and not to start his own independent irrigated plot because it is difficult to find land now. He says that most of the independent irrigators got land many years ago, when there were still unoccupied lots of land, and the ones that get it now are connected to the tribal authority. “I know that driving every day from Nkowankowa to Julesburg is expensive. I use about R 2000 on petrol per month, but I have no choice. I tried to look for land around Nkowankowa, but all was occupied”.

Muthembi cites a number of challenges that confront farmers on the scheme, and said he would prefer to be an independent irrigator in order to avoid conflicts over water distribution. In addition, the fencing problem at the scheme is compounded by the fact that scheme members do not want to contribute to fencing because they argue that the land belongs to the chief. Farmers who want to fence their plots are now forced to do it individually, making it more expensive.

Muthembi aspires to make farming a full-time source of food and cash income for him and his family, but these aspirations are being frustrated by too-expensive inputs and tractor services. He argues that input costs are going up every year but the prices of farmers’ produce are not increasing at the market. He cites an example of a 10 kg bag of green beans seed, which he says cost R 1100 in 2013 but increased to R 1400 in 2014. He thinks the government needs to bring back the practice of establishing Farm Depots near to farmers.

Muthembi says that he has enough land (5 ha) and thus needs to grow his farming enterprise by increasing cropping intensity. He aspires to practise dense cropping, which he calls the Chinese Cropping System, but this can only be practised successfully when a farmer uses drip irrigation and has enough equipment, including a tractor for spraying. Currently he is not using all his 5 ha land because a part is not fenced. He said many people have left the scheme because of a lack of fencing.

Yet another case is 79-year-old Sijwahodemo, who started farming after being retrenched from work. When he was notified of his pending retrenchment a few years before, he began to think about taking on farming, but he did not plan for it or start to save money. He says that if the chief did not give him a plot in the scheme, he would not have gotten into irrigated farming but would have continued with dry-land farming. The availability of irrigation water on the scheme enables him to farm for business, whereas he would not have been able to do so if he continued with dry-land farming.

Sijwahodemo's original objective in joining the scheme was to make money out of farming. When he got the scheme plot he used his pension funds to buy a tractor for R 35 000. He rendered ploughing services to other farmers within and outside of the scheme; however, the tractor was involved in an accident in 2013 and was busy being repaired when we met with him for data collection. Prior to getting the scheme plot, he had a small hand-irrigated garden along Nwaveti River on which he grew vegetables and sugarcane, but had no means for a pump to expand. It was this garden that made him to aspire to get a big irrigated plot. The garden used to give him good yields, especially sugarcane, which he used to sell to Zion Church congregants during the Easter holidays. Sijwahodemo has stopped using the garden since the time he obtained his scheme plot, saying that he needs to concentrate all his energy, time and resources into the scheme. He chose to farm on the scheme rather than establish his own independent irrigated plot because there was nowhere he would find water for irrigation, and it looked impossible to get a large enough portion of arable land the size of his plot (5 ha) as there was no vacant land anymore. "Even if I can get an irrigable plot somewhere, I cannot move from the scheme now. I am getting enough water in the scheme and have no intentions to start new things".

Sijwahodemo's children and wife are helping him on the scheme. His children love farming, and he thinks they will soon take over, but he is not sure if the chief will allow his children to continue farming on the plot after he is gone. He said there was a rumour that the chief was planning to take back the plots. "This makes me think about the need to establish my own independent irrigated farming plot, but I do not have money to make my own borehole. Drilling a boreholes costs about R 25 000".

Trajectory 8: Expanding and intensifying the scheme plot

At the Julesburg irrigation scheme, this pathway seems to be one of the most common and easiest for growth. Expansion is made easy by the abundant land on the scheme, which currently has a ploughing and use rate of less than 10%. The prevailing land administration system allows farmers to apply for more land should they need it; it equally allows farmers to borrow and lend land from and to each other, provided such arrangements are reported to the responsible scheme committee. It is also easy for farmers to grow through intensification, largely because the 5 ha plots that are allocated to them are being used at less than 50% capacity.

Evah is a 46-year-old single mother who has grown her scheme plot from 5 ha to 25 ha. Initially Evah, like all other scheme farmers, was allocated a 5 ha plot. After three years, she approached the chief and scheme committee, asking for more land because she was using her plot to capacity. The

chief gave her another 20 hectares of land. However, she said "…I do not use all the 25 ha in a year. I practice shifting cultivation. I plant on one portion this year and leave it fallow the following year and plant on the one I had not used the previous year. This is necessary to preserve soil fertility. We are using furrow irrigation which erodes top soil each time we irrigate. Drip irrigation is the best because it does not erode the soil. But we cannot use drip irrigation because the water does not have enough pressure".

Evah is a hard-working farmer who currently is said to be the most prosperous scheme member. She generally irrigates at night when everyone is asleep as water is then available. She said it is difficult to irrigate during the day because everyone needs water and farmers often end up fighting over it. She employs about ten workers, especially during harvesting times. At the time of our data collection, she had eight workers picking green beans. She bought two bakkies, two tractors and built two houses with cash using money she has earned from the farm.

Her major challenge is cattle that destroy her crops at night. "Some cattle owners are jealous of what we are achieving in the scheme. They break the fence at night, drive in their cattle, and drive them out before dawn. But the community rule is that if cattle destroy your crops, you report the owner to the headman who assesses the case at a community court and fine the cattle owner if he finds him guilty of negligence. But we are failing to make use of this rule because the cattle come in at night and leave our fields before we see them. This makes it difficult for us to report the case because we have no evidence of who owns the cattle. We cannot guard our fields at night because we fear that these cattle owners will kill us. I think there is need for an electrical fencing and may be hiring trained security guards. We are prepared to pay for these services. We know that there is nothing for "*mahala*"(free). She says these people's intentions are to destroy the farmers' crops out of jealousy. Sometimes Evah drives to her field in her *bakkie* at night armed with a gun.

Trajectory 9: Scheme plot to independent irrigated plot

It is interesting that some of the Julesburg scheme farmers reported that their preferred growth trajectory is to develop from being scheme farmers to independent irrigators. In developmental terms, an independent farmer has more say over his/her affairs, including water, will be more of a business figure, etcetera, and that moving from a scheme to independent irrigation farming is the inevitable trajectory of success. These farmers argue that having access to water is the most important factor in business farming, saying that although there is water on the scheme, farmers often fight over its distribution and at times the weaker ones end up being unable to water their plants appropriately. "Independent irrigators enjoy uncontested rights over their water, and hence are capable of properly planning their irrigation sessions according to crop water needs." This perception, however, is not the reality for the many independent irrigators who were interviewed.

Mark is another farmer who followed this pathway. After farming on the scheme for a decade he moved to his independent plot. He says the main reasons for this move are that independent irrigators enjoy control over their water resources, and that land tenure security is far better on independent lands, to which farmers hold individual PTO certificates (whereas on the scheme,

farmers just get letters confirming the chief's approval). Dubious tenure rights are discouraging farmers from undertaking long-term investments in the plots, including fencing.

He is planning to drill a borehole on his independent plot and start irrigating. He has enough land, and aspires to grow his farming by increasing cropping intensity and diversifying crops. He wants to divide the home plot into two halves; one portion will be dedicated to fruit trees that include mango, leachies and bananas, and the other will be used for vegetable cropping. Mark sees this as a long-term strategy with the potential to keep his farming stable and sustainable.

While the perception that 'all will be solved with water' portrays the critical issue of water-need, it perhaps belies other challenges relating to the farming system, knowledge, input-production-output value chain, etcetera which are recognised by the farmers. It also seems to be a case of 'the water is more plentiful on the other side'. In reality, independent irrigators are unlikely to enjoy 'uncontested rights over water' in a context of intense irrigation and prevailing stress in most catchments. That said, independent irrigators, due to their independence, have a much greater determination over the own future, and no reliance on collective action for water-service provision. Given their relatively small scale, they often simply abstract what they can when it is available in rivers or rely on groundwater, although both of these have significant costs, reliability implications and risks attached.

Trajectory 10: Independent irrigated plot to scheme plot

In this study cases were also found of farmers who abandoned their independently irrigated farms because they were unable to cope with water-pumping costs, and moved onto the scheme to farm. It is also clear that not only uncertainty around water, but also misunderstandings and substantiated fears in relation to land-tenure security play a key role in defining aspirations – or even providing a virtual boundary to aspirations, because the farmer is acutely conscious of the practical and profound implications of land and water uncertainty and thus are realistic and therefore bounded. Following his early retirement from work, Robert started farming a 10 ha plot as an independent irrigator form 1997 at Burgersdorp village. In 2004, however, Robert moved to Julesburg irrigation scheme where he got a 5 ha irrigated plot. The main reason for this shift was it was very expensive for him to run the Burgersdorp farm because there was no free water. He had to spend a lot of money running the electrically-pumped water-supply system, and his savings were depleting too fast while his profits were not big enough to cover his operational expenditures.

Yet another example is Mark, who holds arable land of about eight hectares at his residential plot at Nyanyukani village. When he left work in the late 1980s, Mark bought pipes and connected water to two-thirds of this plot. After several seasons of practising independent irrigation, Mark moved to Julesburg scheme in 2004, where he is farming now.

Trajectory 11: Scheme plot to home gardening

This trajectory typically takes place when a farmer who initially was farming only on the scheme establishes a home garden, which is then farmed simultaneously with the scheme plot. This is a case of growing farming by adding more plots at a different farming location. Typically, this happens

when a farmer uses savings from profits made on the scheme to dig a borehole and connect water to their residential yard. An exemplary case is that of Leon Mushwana.

Leon applied for land on the Julesburg scheme in 1982. At the time he was working as a General Manager for Gazankulu Bus Service at Linyenye, about 13 km from Rhulani. The scheme was functioning and the then homeland government gave him a portion of land. This was in a low lying area of the scheme and as a result it often got water-logged and sometimes the crop would be washed away by floods. Leon dug drainage basins and used a modified motorbike engine to pump water. He planted wheat and rice, which he sent to the Johannesburg Fresh Produce markets. It was his wife and children who mainly worked on the farm, while Leon provided management and financial support, although he worked there on weekends and holidays. After five years of farming on the scheme, Leon drilled a borehole at his residential plot to provide water for domestic use and home gardening. He is very business-minded and is now running a spaza shop and a shebeen from his home. When he was being interviewed, a teenage girl walked into his yard and bought a 20 litre bucket of water for R 1,50, a further indication of his business orientation in a cultural context where domestic water is typically viewed as a shared resource.

This trajectory sometimes takes place in a somewhat downscaled form wherein the farmer stops farming his/her irrigation scheme plot and starts home gardening. This often happens when farmers choose or are forced to decrease their scale of operation. Home gardens at Rhulani are very small as they are located on residential plots of 50 m x 50 m, the space of which is shared by houses, fowl runs and other homestead necessities. Most home gardens do not exceed 400 m^2 in total size even though the plots are 2500 m^2. Thus, when a farmer moves from planting a 5 ha plot to a home garden of this size it is a significant downscale. The development could be as a graduated process of vacating farming (stepping out). The study did not reveal explicit description of this process most probably because the selection of respondents targeted individuals that are engaged in irrigated farming by design, as non-farmers would not represent any pathway. Cases of farmers abandoning large-scale arable plots in favour of home gardens have been widely documented elsewhere in South Africa due to the much higher complexity, costs and risks related to larger scale field production, which are manageable at home-garden scale (Denison et. al , Fay, 2013 among other).

Trajectory 12: Independent irrigated plot to home gardening

This trajectory is not very different from trajectory 11 (movement from scheme plot to home garden). The movement from independent irrigator to home gardener can occur in two ways, the first being expansive, in which case the farmer grows his/her farming enterprise by adding an irrigated home garden to an already-running independent plot. Mrs Mangena provides a typical case. Her household holds a 9 ha independently irrigated plot, which they have been irrigating since 1980, but had no home garden because there was no irrigation water supply at home. She started home gardening recently in 2013, after using savings from income made on the farm to buy pipes to convey water to the homestead from the Julesburg irrigation scheme bulk supply. These connections are done for a fee, paid to local technicians (in this case entrepreneurial local youth) to make an 'unofficial' connection to the bulk supply line (untreated). The initial reason for bringing water to the homestead was mainly to support domestic consumption. What is interesting about this case is that

the fact of greater water availability and accessibility was the catalyst to irrigate vegetables in the home garden, confirming findings that provision of bulk water in the homestead is a catalyst for food production, but not necessarily the same driver for field agriculture with many other limiting factors other than water (Denison et. al, 2015).

8.3.3 Issues and development pathways at Greater Tzaneen

The diversity of cases shows that the experiences of farmers are heterogeneous and it is clear that it is not so much the route by which the farmer arrived at a certain location of farming (home-garden, scheme or independent plot) but the final location of farming itself that determines these challenges. A summary of issues is presented in Table 8.4 with groups pathways by locality of farming, and thus captures the challenges faced by the farmers.

TABLE 8.4: Issues in relation to successful irrigation development pathways at Greater Tzaneen

Priority Issues	Comments on historical pathway challenge
Home-gardeners (Rhulani village)	**Pathways 1, 4, 11 & 12**
Irrigation water supply	Irrigation water is not available from existing piped domestic sources. People innovated technically and invested financially to get water.
Water infrastructure costs	Costs are high. Garden irrigators have invested in either storage tanks (roof runoff), borehole development, or an individual (unlawful) connection to the bulk irrigation water supply system outside of the village.
Extension advice	Agricultural advice is absent. Extension officers do not visit home gardeners in the village to advise them on best vegetable farming practices. People rely on insufficient family and local knowledge.
Scheme farmers (Julesburg)	**Pathways 3, 7, 8 & 10**
Water resource (bulk supply)	Unreliable, insecure source. Tours Dam is at risk, not reliable in drought, and farmers on the scheme are the first water consumers to have their supplies cut. Supply insecurity prevails.
Irrigation infrastructure (gravity pipeline to furrows/sprinklers)	Primary water system is unmaintained, partly functional and steadily degrading. Infield costs are manageable with own finance as supply pipeline pressure eliminates need for pumping. Existing irrigation methods are wasteful of water (haphazard canals, furrows, leaking pipes, etc.). Degraded infrastructure prevails.
Water institutions	Their DWS allocation and water-use entitlement is not known. The Irrigation Water Committee operates with an un-formalised relationship with the DWS. Institutional uncertainty prevails.
Mechanisation	Limited, costly services. Delays in getting government or contractor mechanisation to the field are serious. There are too few tractors to meet the demand in time, and few farmers can afford market rates. Subsidised tractors are R 500/ha while commercial land-preparation is approximately R 2500/ha.

Priority Issues	Comments on historical pathway challenge
Marketing knowledge	Perennial major challenges with fresh produce market interactions. Agent trust and understanding of pricing structures are the most important issues that farmers engage with constantly, but struggle for profitable outcomes. Transport, aggregation (small individual volumes), packaging, and cooperative market engagement are important, related challenges.
Input finance	The complete absence of production financing for farmers below 10 ha (reported Land Bank cut-off) has meant that all but a few scheme farmers are eligible for government loans. Nobody has been able to secure production loans, although ad-hoc government grants and inputs have been received over the years. Loan access is limited by the absence of water licenses, business plans, and ownership and lease rights. Family resources, savings and personal loans alone drive the agricultural cycle.
Independent irrigators (Greater Tzaneen)	**Pathways 2, 5, 6 & 9**
Irrigation infrastructure – pumping costs	Almost all independent irrigators rely on pumped irrigation systems. The investment costs (R 30 000-R50 000/ha) are extremely difficult to secure without external financial support (a grant or loan). Operating costs are a major issue. Furrows and drip are preferred in-field and associated with lower investment/operating costs.
Mechanisation	As above, but independent farmers showed more persistence in mobilising the Department of Agriculture, DTI and Land Affairs as a characteristic feature of their pathways.
Marketing knowledge	Local market engagement (green maize, tomato, dry beans, cabbage, potatoes) was successfully achieved widely, although in varied and dynamic ways. However, access to distant, bulk fresh-produce outlets (markets, supermarkets) is a dominant challenge (see above – scheme farmers).
Input finance	As above. Independent farmers generally have more financial capital and support their farming enterprises in this way. Limited financial capital limits enterprise size.
Rules of land access and control	PTOs are the main modality of tenure, and most (but not all) view this as adequate for on-farm investment (fencing/piping) on their present farm sizes.
Rules of transfer (rentals/leasing)	PTO arrangements are, however, severely limiting for new entries and farming expansion, as unoccupied land is not available. Lease mechanisms for occupied but unused land are weak or absent, and there is fear of losing land when leasing. Limited land lease mechanisms are thus a critical limitation to all of the expansionist pathways.
Rules in respect of water authorisations (GA/license)	Formal permissions from the DWS to use water are largely absent, and farmers operate in institutional isolation. Where not reliant on boreholes (i.e. Tours Dam. released into Nyaveti River), the water-use entitlement is perceived to be insecure, posing risks to farming investments made.

Useful insights into how challenges can be overcome were taken from the cases, and informed the outlined interventions proposed in the next chapter. These proposals were workshopped with local stakeholders and farmers with a view of adapting them to make them acceptable and implementable. The results of this consultative strategy-development process are presented in Chapter 9. A detailed discussion of the issues in relation to pathways is then discussed in detail in Chapters 10, where conclusions on pathways-related challenges are drawn and solutions derived from the research and consultative discussions are presented.

8.4 Discussion on pathways

The detailed case histories were set out in Chapter 8 and exploration of challenges and related solutions with farmers, was detailed in Chapter 9. This work showed substantial diversity in the development pathways of irrigators. The project pathways framework (shown in Figure 8.3) defines 12 possible development trajectories that farmers can follow, arriving at one of three physical locations (home-gardens, schemes or independent plots). It was found that while all of these trajectories were reflected by the case histories, it was the final location of the farming activity, rather than the route by which it was reached, that dictated the challenges that farmers face, and thus the solutions that are needed. The research evidence found that the pathways leading to scheme plots and home gardens are easier to pursue and achieve, while the pathways leading to independent farming have significantly greater hurdles but with interest and action incentivised by the prospect of higher rewards. The findings detailed in Chapter 8 in relation to the three groups are discussed first, followed by the proposed and farmer-validated solutions that were developed to address these.

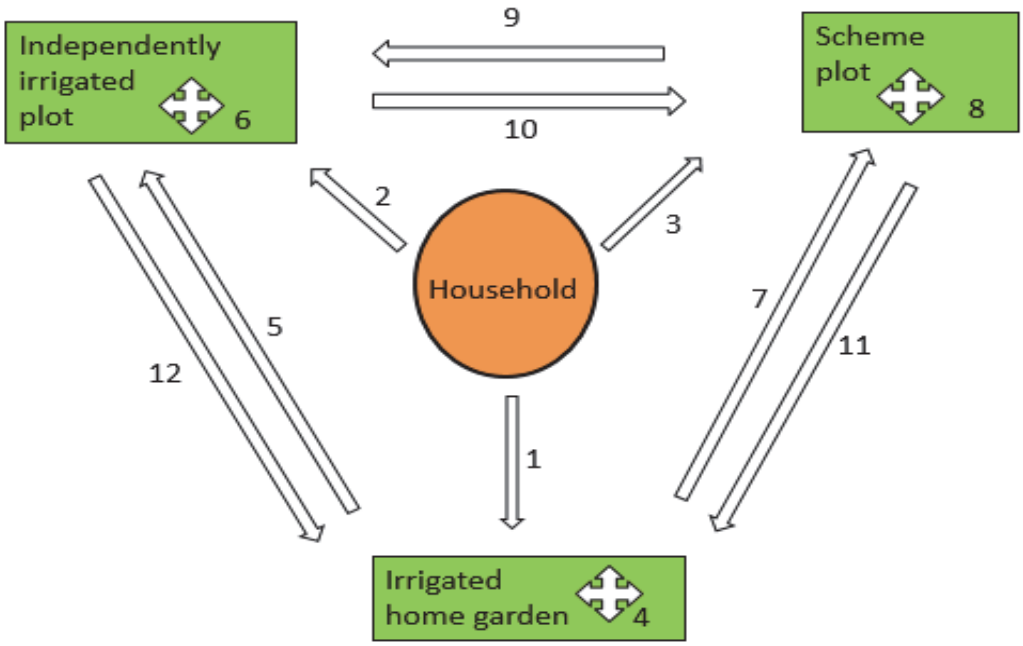

FIGURE 8.3: Pathways framework adopted for the project

8.4.1 Pathways to the home-garden – a solution in water

In Thulamela, the population of home gardeners is represented by homesteads in the villages of Manamani, Tshivhuyuni and Itsani Block 3, which border the Dzindi Irrigation Scheme. The survey sample of 125 homesteads in this study area showed that every single one of the homesteads that were sampled produced crops (annuals) in their home garden during the period 1 July 2012 to 30 June 2013. In Greater Tzaneen, the survey was restricted to a sample of 180 of the estimated 900 households in Rhulani village adjacent to Julesburg scheme. Most of these, at 165 or 92% of the respondents, indicated that they are involved in *farming at home*, with varying purpose. 40% farm as an extra source of food, 30% farm as a main source of food, 21% farm as a main source of monetary income, 7% get extra income from farming while 1% were farming as a leisure activity.

The survey in Thulamela also showed that the great majority (97%) of households in the general population of home gardeners did not have access to arable land other than their home garden, which formed part of their residential site. This scenario was similarly reflected in Rhulani Village (Greater Tzaneen site) where 84% of home-food gardeners had no access to any other arable land, either irrigation or rainfed. The implication is that access to arable land will be one of the key factors limiting expansion from home-gardens to farming at larger scale on arable lands, though it is an established fact that numerous other factors such as water, aspirations, finance, knowledge, capability, markets, etc. must also be assessed as limiting factors to an expansionist or intensification trajectory.

Water for irrigation of home-food gardens

In the homesteads of the Vhembe villages it was observed that irrigating the home garden was often problematic when access to water for this purpose was difficult or even totally absent. For example, in Manamani, which is located across the river opposite the Dzindi Scheme, the acute water shortage prevented all but 12 of the 74 homesteads in the sample (16%) from irrigating their home garden crops. In Tshivhuyuni and Itsani Block 3, both located on the same side of the river as the Dzindi Scheme, access to water for irrigation of home garden crops was better. This probably explains why irrigation of home garden crops in Tshivhuyuni and Itsani Block 3 was practised by 45 of the 51 households (88%).

In Rhulani village adjacent to Julesburg scheme (Greater Tzaneen), home garden irrigation was similarly difficult. Of the 165 households who practice farming at home only 8% irrigate their home-gardens. This data reflects a similar situation between the Vhembe and Greater Tzaneen villages in regard to water availability for homestead irrigation (noting the exception of Tsiyhuyuni and Itsani Block 3 which appear to get water from Dzindi scheme supply).

Increasing crop production in home gardens

As indicated in the Thulamela villages, among the probability sample of 125 households representing the 'home gardener' population every single one had grown annual crops in their home garden during the period 1 July 2012 to 31 June 2013. The goal of the large majority was to obtain an additional source of food and/or to enrich or diversify their diet. Home gardening as an additional

source of income was mentioned as a goal four cases (3.2%) only. Interestingly, there were also two cases who indicated that any surplus they had would be used to support family members, who were living elsewhere (donations). Clearly, commercialisation of home gardening was not a predominant practice. Yet aspirationally, all 74 households in Manamani, and 24 of the 46 households in Itsani/Tshivhuyuni expressed the desire to 'grow' their home gardening activity, but all indications were that 'growth' was desired for the purpose of producing more and better food for their own consumption and not for the purpose of selling produce.

The full participation in home garden cropping at the Thulamela villages, and the high percentage (92%) at Rhulani village (Greater Tzaneen) contrasts somewhat with results obtained in recent case studies in other rural parts of South Africa, where participation in home gardening was significantly lower. For example, participation rate in crop production (primarily in the form of home gardening) in two rural settlements in the former Ciskei region ranged between 61% and 64% (Hebinck & Van Averbeke, 2012) and in a more recent survey of 164 households, 63% (Denison *et al*., 2015). It is of interest that the findings of regional differences between Limpopo and the Eastern Cape in this study resonate with observations made by the Tomlinson Commission in the mid 1950's (South Africa, 1955). Tomlinson similarly noted that the people of the northern parts of South Africa showed substantially more care of their agricultural and irrigation assets and participated with more enthusiasm in field cropping, than the people of the Eastern Cape. While not comprehensive, the present data in Limpopo, compared with well-documented work in the Eastern Cape suggests that the regional patterns of interest in agricultural activity have not changed much over the last 6 decades.

The results of the survey showed that production and productivity in home gardens were primarily a function of water availability. On average, the residential sites at Manamani covered an area of 2723 m^2, whilst at Itsani/Tshivhuyuni they were about 1000 m^2 smaller (1 683 m^2), probably because the size of residential plots in the area has been declining over time, and Itsani is a younger settlement than Manamani. The average home garden area cultivated in Manamani (1 447 m^2) was more than double the average in Itsani/Tshivhuyuni (673 m^2), while at Rhulani village was much lower at 440 m^2. Yet, the average value of self-provisioned food obtained by both groups, primarily from home gardening, was more or less equal, i.e. R670 in Manamani and R657 in Itsani/Tshivhuyuni, and was very low at Rhulani. This similarity of self-provisioning crop-value in the Thulamela villages, despite the large difference in home-garden size can only be explained by the superior access to water (and therefore productivity) in Itsani/Tshivhuyuni, with 45 out of 51 households irrigating their garden compared to 12 out of 74 in Manamani and 33 out of 165 at Rhulani. In the villages of Manamani (Thulamela) and Rhulani (Greater Tzaneen) where activity was low, unlike Itsani/Tshihuyuni where activity was high, households had limited options for home-garden water supply, and expressed high dissatisfaction with the availability of water. These findings align closely with the Eastern Cape study (Denison *et al*., 2015) which, despite the relative lack of home-garden productivity in the Eastern Cape, found that of the 63% of households who are irrigating their home-gardens, the average intensity was 175% on plots averaging 680 m^2 in size, with water supplied by roofwater tanks or 'unlawful' connections to municipal and adjacent irrigation scheme bulk water systems.

The findings in the study thus concur strongly with the literature; the provision of bulk water within the boundary of the homestead is strongly associated with higher food production, and is a dominant factor linked to increased home garden activity, intensity and productive use of (the limited) available land. The work on obstacles discussed in the next chapter, confirmed the dominance of this factor in the home-garden context, though this is definitely not the case on schemes or independent farms.

8.4.2 Land issues: a rock-strewn pathway limiting access to schemes

The Permission To Occupy (PTO) system is the dominant land-tenure mechanism in the project area but is the subject of varied application, misunderstanding and misapplication of the law. To understand the impact of this tenure type on schemes and related pathways to schemes, it is necessary to understand the PTO system first. The elaboration of the PTO system that follows should be read in the context of land legislation history which is described in Section 2.1.3.

The PTO system in South Africa

The exact date that the PTO system was introduced as an instrument of land administration in South Africa is not clear, but Lahiff who has written widely on land tenure in South Africa, states that PTO certificates originated from the Land and Trust Act of 1936 (Lahiff, undated). This act provided for all communal land to be held by the state in trust for Africans and the PTO system has persisted in various and increasingly diverse forms since then. The system became the principal order of land tenure administration especially in self-governing territories that included the former Gazankulu in which the study site is located. The PTO "was a system of lesser rights to land where land is rented for life and rent is paid to the government via homeland authorities (e.g. magistrates)" (Lahiff, undated). The chief, local magistrate and Department of Agriculture all played roles in the PTO system.

This plural administrative system created confusions among landholders. It was not clear which one among these institutions to go to when they had land-related issues to be solved. In communal systems land property relations are defined in terms of user and not exclusive ownership rights. Adams *et al*. (2000) state that the state is the owner all lands in communal former homelands. But Lahiff (undated: 308) gives a different view when he states that "generally ownership is vested in the chief/traditional authority who acts as a trustee of the community's land and has the responsibility to distribute it". What is important here is not that commentators or policy makers disagree on who the ultimate owner of communal land is, because this issue is already resolved by legislation. Colonial legislation especially the 1913 Native Land Act transferred ownership rights to the Crown, and the democratic state has not materially reversed this. The minister of Rural Development and Land Reform is still the nominal owner. But what is significant is that the differences between these two authorships mirror the *de facto* confusions that have been blighting landholders' understanding of how to deal in PTO regulated communal lands.

In the dying stages of apartheid, the de Klerk government formulated a land tenure reform policy which among others promulgated the Upgrading of Land Tenure Rights Act 112 of 1991. The Act

aimed to end state role of being the nominal owner of communal lands and transfer them to tribal authorities and upgrade PTOs. The post-apartheid administration amended this Act in 1996 and limited its applicability to residential and business sites in urban settlements, thereby perpetuating the ownership role of the state in communal lands (Lahiff, undated).

Fundamentally, the ensuing confusion around the PTO system today results from the way the past-apartheid government handled the Land Reform Policy of 1991 of the de Klerk administration. Among others, the 1991 Land Reform Policy passed the Abolition of Racially Based Land Measures Act which repealed *inter alia*, the 1913 and 1936 Land Acts. But the policy did not repeal the proclamations issued in terms of these Acts. For instance Proclamation R188 which had been issued in accordance with the South African Development Trust, and Land Act 18 of 1936. In addition, the Upgrading of Land Tenure Rights Act which provided for upgrading of PTOs was left intact (du Plessis & Pienaar, 2010).

Confusion was planted by the democratic government's bifurcated stance in land tenure reform that simultaneously seeks to protect and discontinue the past. The state felt compelled to protect *de facto* tenure rights, but at the same time needs to restructure land tenure systems in order to respond constitutional provisions. Resultantly, a bifurcated approach was adopted in which (i) legislation was passed to protect existing rights for the duration of the tenure reform processes, including the Interim Protection of Informal Land Rights Act 31 of 1996 and (ii) a new tenure reform programme was set in motion by promulgating new legislative measures (Du Plessis and Pienaar (2010).

Scrapping of apartheid land tenure administration tools at a time when the new dispensation did not have replacements in hand created a vacuum in local land administration. Unsurprisingly therefore, although they are no longer legally recognizable, PTO certificates are still being issued. In a recent study Murata and Denison (2015) found that landholders at Mbekweni village in the Eastern Cape had their PTO certificates issued in the 2000's. Lahiff (undated) gives a statistical account that demonstrates the degree to which the PTO system has become a confusing affair in the post-apartheid South Africa. In 1997, about 32% of South Africa's population lived in the former homelands of which 63.6% had PTO certificates for the land they held, and while 26.8% did not have the certificates the remaining 9.6% were not certain whether they had them or otherwise.

Compounding this policy confusion is the continued role of traditional leadership in the administration of PTO-governed communal lands. The structures of traditional leadership exert an enduring presence in the majority of villages in the communal areas of South Africa, despite varied contestations by other leadership bodies such as civic organisations and agents of municipal administration. Traditional leadership is structured in various hierarchical divisions in such a manner that its agents are present at almost every level of community spatial organisation. Among the Xhosa speaking communities of the Eastern Cape Murata and Denison (2015) found a connected complex hierarchy of which at the bottom end is the clan head, head of hamlet, sub-headman, village headman, headman and chief in an ascending order. All these divisions get involved in matters of land allocation in one way or the other using different systems of communication and

coordination. This makes the institution very influential in people's day-to-day experiences of and narratives about land deals.

The institution of traditional leadership survived into the new dispensation and is recognized by the constitution, but its role and powers are not clearly spelt. The 1996 Constitution limits its influence to "customs and traditions in communities observing a system of customary law" Lahiff, undated). Lahiff (undated) argues that the continued role that traditional leaders play in allocation of land is largely because the whole system of land administration in these areas is virtually collapsing. Land tenure mechanisms as they are practiced are thus highly varied and often divergent from legal interpretations, leading to additional uncertainty for irrigators. Rights of exchange in particular are extremely uncertain and inadequate.

Julesburg scheme land

The scheme as it is now operated under the auspices of the Nkuna Tribal Authority is meant to support smallholder commercial farming: farmers that produce for the market and employ a few workers. For that reason, the plots are pegged at 5 ha size each, a scale deemed big enough for smallholder commercial production. The 240 hectares that make up the scheme were thus divided into 48 plots at the time of handover from the apartheid era Agricultural and Rural Development Corporation (ARDC) to the tribal authority. Although initially consideration was given to residents of the Julesburg villages (Rhulani, Bordeaux, Mariven and Hoven) only, recently rights to access land in the scheme have been opened broadly to all villages of Nkuna Tribal community which comprises over 1000 households. Not surprisingly, there are some conditions set to especially justify who gets land and who loses its.

In order for applicants to qualify for a plot in the scheme they need not to be in arrears with regards to payment of special levy locally called *timangeni.* This is a sum of R10 paid by every homestead annually to the chief. Plot holders that abscond paying the special levy just like those that do not use their plots can lose their user rights. This understanding was reported by the majority of scheme farmers. But during a focus group session with the Nkuna Tribal Council Agricultural Advisory Committee, it was reported that it is difficult to take back land after allocating it to community members. The committee said the Tribal Council does not have legal powers to kick people from communal land. This could be true because there were lots of inactive farmers on the scheme whose plots have been lying fallow many seasons. These people have not been kicked off the scheme, let alone there was no story of loss of rights to land through repossession that was reported during this research. In fact in 2012 there were 34 plot holders that were actively using their lands. The number declined to 28 in 2013 and it went down to 10 in 2015. This means from 2012 to 2015 a total of 24 plots have been left fallow, but what is intriguing is that these plots were not re-possessed.

Interested land applicants submit letters of application to the Department of Agriculture at Berlin Farm which stamps and submit them to offices of Nkuna Tribal Council. The Tribal Council assesses the applications, and in collaboration with the newly formed Julesburg Irrigation Scheme Committee, allocates plots to successful applicants. There is one PTO certificates for all scheme plot holders in which their names are registered. The certificate is not issued to them, but is kept and

from time to time gets updated by the Tribal Council. This has caused problems with regards farmers' understanding of their rights in land.

In the absence of written rules, tenure issues often get communicated and understood differently. The reality further complicates this as there are multiple players in the land allocation process, including approvals by officials from the Department of Agriculture at Berlin Farm, traditional leaders from Nkuna Tribal Council and members of the Julesburg Irrigation Scheme Committee. Predominantly, plot holders expressed feelings of tenure uncertainty in the scheme. Their uncertainty mainly revolved around lack of documentation to assert their rights on the land to justify investment, despite no precedent of ejection from the scheme. This is closely similar to many of the Thulamela case histories where land tenure uncertainty translated to a significantly disincentive to investment and was a source of conflict and distrust .

It was reported that some of the applications for land happening these days are merely verbal between the applicant and the chief who if he approves makes a phone call to the scheme chairman to allocate a plot to the applicant. This does not only confuse farmers' understanding of the protocols of land acquisition, but more importantly it projects an image of unlimited centralisation of powers in the person of the chief.

What is mostly misunderstood, or better said, understood in multiple ways is the condition of *use it or lose it*. The traditional leadership reported that as long as a farmer uses their land, their rights of use remain secure for a period indefinite. Since the beginning of the reign of the chief in the scheme in 2000, there has not been a single case of arbitrary repossession of plots by the leadership. One person whose plot was repossessed in 2012 had left the plot unused for close to five years and fellow plot holders were complaining that the then bushy plot was providing shelter to wild animals. But the clause, though unwritten, that farmers stand to lose their rights in land if they either do not productively use their plots or abscond in payments of local very provide the day-today understanding of conditions of land access. This perpetuates uncertainty and sometimes exaggerated fears among farmers.

Mphaila and Dzindi schemes

The schemes are similar in how land is administered and details are set out in Chapter 8 noting some differences in the process, but the general approach is highlighted below. The schemes share a common dominant finding that insecure land tenure institutions are a major disincentive for new entrants and expansion of farming**.** *Land-leasing is prevalent, but highly insecure with fear of loss of land to lessees a dominant reason why people do not want to lease land.*

Land access and control: At present, the process of transferring a plot starts in the family of the deceased plot holder. For all practical purposes it is the family who decides who the new registered plot holder will be. Once negotiations on this matter have been concluded, the family meets with the Scheme Committee who verify documents, record changes and send a letter to the Tribal Authority, along with application forms issued in terms of Proclamation No. R.5 of 1963, along with a

letter from the extension officer. This goes to the Tribal Authority approval and then the Municipality for issuance of a Permission to Occupy certificate.

Rules of transfer (rentals/leasing): When research at Dzindi started in 2003, land exchange in the form of renting was said to be non-existent at the scheme, and field observations showed that renting land was definitely not common; if it occurred it was done clandestinely, because scheme leadership forbade it (Van Averbeke, 2008). Land exchange has since become common at Dzindi and is also the case at Mphaila, but is formalised and has resulted in significant uncertainty and numerous issues, expanded earlier in Chapter 8. Some land exchanges between these farmers were formalised and some of them were not formalised and in the case of Mphaila, he/she had to pay debts of prior lessees, at least in part. All in all, land exchanges are based on either: payment for land preparation services by the lessee; sharecropping; lump sum cash payments; or monthly cash payments.

While the informal rules in relation rentals are established, and to an extent even formalised at Mphaila (recorded by the extension officer), the reality is that many lessors have experience of 'losing' land to lessees, and lessees enter have experience of entering into agreements which are arbitrarily terminated or simply ignored. Farmer's leasing land reported the 'owner' harvesting their crops as this was 'their land' or others using land they had leased without permission. The complete inadequacy of land institutions across all of the schemes is a critical limiting factor in securing adequate land in a way that justifies investment. Informal and semi-formal Leasing arrangements are not trusted and while other factors (water supply and marketing in particular) contribute uncertainty and risk as expanded in the next chapter, land institutional inadequacies are a critical limiting factor to expansion on schemes, and limit entry to schemes for most prospective irrigators.

8.4.3 Water institutional uncertainty leads to parched scheme pathways

Like independent irrigators, most of scheme members did not start by farming in home gardens before they got into scheme irrigated farming because they do not have access to productive water in their residential plots. They obtained plots mainly through family inheritance and sometimes as was the case at Julesburg, through application to the Chief. Access by outsiders to the plots on the Thulamela schemes is difficult and unusual.

The Julesburg scheme is currently supplied by Tours Dam, built in the 1980s in the homeland era. At that time the dam was called Masuma Dam and was located in the Lebowa Homeland, while Julesburg scheme was located in the Gazankulu homeland. The initial purpose of the dam was to supply drinking water to the surrounding villages in Lebowa and to the Tours Irrigation Scheme, across the river from Julesburg. Julesburg scheme initially drew water via a diversion weir on the Nwaveti River, with gravity flow to the scheme. After 1994 the scheme membership made an application to Middleburg DWA office and the Tours Dam water committee and was allowed to use water direct from the dam, via a gravity pipeline. *While a WUA does exist in name, currently there is no water fee charged. Infrastructure supplying the scheme is completely dilapidated. While the bulks supply line to the scheme is in good condition, there are major leaks within the scheme, and*

intentional breakages of pipes to access water via rudimentary canals. Water reliability and security of supply are low and present a major problem for farmers.

At Mphaila, those who pump from the canals are allowed to do so subject to a monthly contribution, and are allowed to irrigate from Monday until Friday. At Dzindi, a 60 year old furrow irrigation scheme that has seen little maintenance over the decades, water is accessed from the canal without any form of payment, guided by an irrigation timetable, but with major issues of 'unlawful' upstream use by the adjacent dense peri-urban settlements for domestic and other uses (taxi-washing, laundry). Formal licensing at the schemes and set allocations are not known by farmers and no formal certification is in the hands of the farmers organisations on the schemes. As a result of this combination of factors, water is insecure in quantity and unreliable in scheduling.

Many of the farmers on the schemes is that *moving from the scheme to independent irrigation farming* (i.e. Pathway 9) reflects a trajectory of success. Some farmers argued that having access to water is the most important factor in business farming, though the analysis of obstacles shows this clearly to be untrue with a more complex reality given other critical factors which are also at play (see Chapter 9). They argued that although there is water in the scheme, farmers often fight over water distribution and the weaker ones at times end up being unable to put water on their plants at appropriate times. "Independent irrigators enjoy uncontested rights over their water, and hence are capable of properly planning their irrigation sessions according to crop requirements". This perception of scheme farmers that the grass is greener elsewhere, is also clearly not the case from the information obtained from the independent irrigators as they also do not enjoy uncontested rights and access to water. That said, independent irrigators have by virtue of their independence much greater determination over the own future and no reliance on collective action for water-service provision as is the case with schemes where farmers must share operational, management and maintenance functions.

Despite the prevalent water issues, farmers who have taken the pathways to arrive at an irrigation scheme have mainly leveraged on the provision of free access to irrigation water. Provision of free water in the scheme significantly cuts on investment and operational costs, hence enabling farmers to continue farming some in circumstances of very low profits, or even when running at a loss. However, it is not guaranteed that scheme farmers will continue enjoying free access to irrigation water, and this not aligned to the NWRS 2, nor the NDP, which aim for economic returns on the scarce national water resource on the 'user-pays' principle. In addition to the infrastructural dilapidation and dysfunctionality due to age, deferred maintenance and the near-absence of water-management organisations on schemes (WUAs, etc.), the water resource itself is in all cases stressed. Regardless of these real physical, administrative and institutional uncertainties, the irrigation scheme environment still seems to offer more physical capital and lower risks than the independent irrigation model, particularly for those without financial capital to establish independent operations.

8.4.4 Independent irrigators face institutional adversity

At the study sites independent irrigators hold arable lands that range in size from 2-10 ha. There is no single route through which these farmers apply for land. Some of them submit their applications to the Tribal Council. Others apply through extension officers who in turn submit the applications to the Department of Agriculture. Independent irrigators, unlike scheme farmers are issued with individual PTO certificates that state conditions of land tenure.

The certificate gives the landholder rights to use the land for farming. But it prohibits the landholder from letting, ceding, leasing or undertaking any other means of transferring the land without prior written consent of the controlling authority, the magistrate. Moreover, the controlling authority wields power to, for any reason deemed expedient to itself, withdraw the permission and resume possession of the land. The system vests all the ownership and decisions about the transfer of land rights in the powers of the controlling authority. Instead of describing the scope of the powers and rights of the grantee on the land, the PTO exclusively talks about and entrenches the power of the magistrate and the state on the land.

Access to land by independent irrigators in Thulamela

Fieldwork showed that farmers became independent irrigators in different ways. Probably the dominant way was by up-scaling from home gardening, sometimes combined with dryland cropping, to independently irrigated farming, as in the case of Tshiombo. The third way was to expand their irrigated holding on the irrigation scheme by adding an independently irrigated plot. Another was by switching from scheme-based to independent irrigated farming, usually in response to acute water shortages on their scheme plots. Independent irrigators may be described as exerting entrepreneurial behaviour or having an entrepreneurial outlook. When land is available, accessed and occupied, their knowledge of irrigation is used not only to intensify their cropping enterprises but also to innovate and diversify. Accordingly, the gross farm incomes obtained by several of these independent irrigators is substantial. Whilst most independent irrigators, such as those of Khubvi, Manamani and Maungani, transition from dryland to irrigated farming, there are also some, such as the independent irrigators at Dzindi, who are also holders of a scheme plot. This provides evidence of extensification on the part of the independents, while they access markets through the presence of a neighbouring scheme or one in close proximity.

In Khubvi, where there is no irrigation scheme, independent irrigators farm on tribal land. Tribal land is land held in trust by the paramount chief, in this case, Chief Tshivhase, on behalf of the people. The independent irrigators of Khubvi obtain farming land by approaching their extension officer, who takes them to their headman Randima, where negotiation for land takes place. Some farmers of Khubvi pay an initial fee of R500, whilst others are exempt. The price for first access to land here is R250 per hectare, and the annual fee is R250. Headman Randima then escorts the farmer to Makumbane, where their purchase of land is registered. Upon registration, they receive a small booklet which acknowledges their permission to occupy and on which, annual payment is documented. The two Khubvi independent irrigators who have been selected for further analysis obtained their land in different ways. One followed “standard” procedure, but also registered use of

this land with the municipality. The other stated that he did not follow “standard” procedure, because he inherited his 20 hectares from his father. Inheritance of land, however, marks transfer of “ownership” of land and transfer of land is endorsed by the extension officer first, then the headman and last, the paramount chief through his tribal council.

The dubious nature in which independent irrigators obtain their farming land implies risk, because their investment falls outside of the ‘legality’ that comes with farming on an irrigation scheme. While not all independent irrigators were asked whether or not they had obtained a PTO from the Thulamela Municipality, one Tshiombo farmer did obtain a PTO from the municipality – he is also the farmer who does not hold a scheme plot. In obtaining a PTO issued by the municipality, it suggests that he distrusts the headmen-tribal council-purchase of land arrangement. This echoes with the independent farmers in Greater Tzaneen. Except for two who had formal title deeds, the rest had P.T.Os, the latter insistent that the lack of tenure security was cause for caution on investment, particularly in fencing and water infrastructure.

Whilst an outsider may question the legalities of this arrangement and investigate ‘laws’ created by these bodies, these farmers are not in a position to do so, because of the rural community’s long-standing fear of Chieftaincy and the consequence that such investigation may have on their land purchases. For example, a farmer went through the “proper” channels of land purchase, only to be confronted by another headman with questions on where he had obtained permission to farm on his land. This second headman insisted that the farmer was occupying his land and forced him to pay an additional R500, though the tribal council had already issued him with a PTO Instead of returning to the headman with whom he lodged his first application to inquire on whose land he farms, the farmer makes annual payments that reflect the use of land in both headman’s areas.

While, the independent irrigators of Itsani, Shayandima, Manamani and Maungani are seen as “clearers” of unused land and did not mentioned payment for land, they too occupy and invest in land which, legally, is not their own. Further, the occupation of and perceived farming success on what was seen as unusable land, creates tension within communities and the legality of land use by the independent irrigators comes into question.

Access to land by independent irrigators in Greater Tzaneen

The controlling authority in the PTO system in Greater Tzaneen is a confusing affair to the independent irrigators. The old homeland certificates are still in use. On these ones, the magisterial institution is the controlling authority. The new ones that have been issued mainly from the 2005 acknowledge the Provincial Department of Co-operative Governance, Human Settlements and Traditional Affairs as the controlling authority. The new PTO certificates are issued in accordance with the old Proclamation R188 of 1969 and Proclamation 45 of 1990. It does not say anything about the chief or any other traditional structures of authority. Yet the institution of traditional leadership is the one that is doing the great part of practical land allocation and handling land-related disputes. While it is not stated on the PTO certificates, plot holders pay annual levy of between R200 and R350 to the Tribal Council in lieu of the rights granted to them in land.

The new PTO certificates are issued to among others, farmers that have been holding their land on the same certificates from the times of the former Gazankulu homeland administration. It is not clear if the new ones are meant to replace the old ones. The case of NN illustrates this confusion. He holds a 6 ha plot of which PTO certificate he got in 1986 from the Department of Agriculture under Gazankulu homeland government. In 2012 an extension officer who helps him with technical advice told him that the Department of Agriculture was asking all plot holders to apply for new PTO certificates. Now NN holds two certificates the old one and the new one. The new one does not seek to repeal the old one, nor does it offer different content with regards to conditions of land access. Worse still, although the new certificate was issued with reference to the same legal institution on which the old one was issued, it does not acknowledge the reality that the grantee had been holding the same piece of land for decades under the same institutional regime. It looks like the grantee is getting the land and the permission for the first time.

Uncertainties surrounding the issues of power and role sharing in administering PTO land between the state and customary institutions are narrated by most of the independent irrigators. The example of MK, who in 1986 occupied a vacant plot land of about 1.5 hectares in size just about 300 m from his house is illustrative of this institutional chaos and its consequences. He cleared the land and started farming it without consulting any leadership whether the chief or municipality. After a year he went to the chief to tell him that he had occupied the land and was asking for a PTO certificate. The chief refused to give him, and threatened to evict him from the land. MK approached the local municipality to ask for institutional blessing of his access to the land. The municipality told him that the land was not scheduled for development, so he could use it. But they could not issue him with a PTO certificate because they did not have powers to do that. He went back to use the land, and unsurprisingly the chief asked him to vacate the land. Sensing danger of losing the land, MK consulted Legal Wise who advised him to continue using the land and wait for the chief to write him an eviction letter which he would present to Legal Wise. Since then the chief has been quiet. MK has continued on the land but doubts the security of his rights. Legal Wise could not help him acquire the PTO certificate, neither did the municipality. He thinks it will be even more difficult for his children to continue with land after his passing. He said this uncertainty is discouraging him from committing into long term investments such as fencing and investing in boreholes for water supply.

8.4.5 Drivers of independent and scheme development trajectories

Farming is a traditional local practice that many households have lived both for generations. Dry-land farming growing traditional crops that include maize, pumpkins, dry-beans and cowpeas is predominant in this area. This is sometimes complemented by vegetables which are either grown in the backyard gardens or in dry-land fields during the rainy season. The local people use maize meal to cook maize-meal ('pap') which is called *buswa* among the Tsonga speaking households and *mohobe* by Sepedi communities. 'Pap' is often consumed with vegetables either harvested from arable plots or harvested from the forest/veld. The dish is the centuries-old staple food of the local households. The implication is that in one way or the other, almost every household practices farming, and household members learn farming at home from parents and neighbours. However, with regards to irrigated farming which by and large farmers practice in order to sell and earn some

cash it was found that reasons for initiating it and processes through which it starts and develop are quite varied and nuanced. There are three drivers that seem to explain the underlying reasons why people launch into irrigation.

i) A family history of dryland farming and incremental growth ('born-and-bred')

This trajectory highlights the importance of family farming history in which traditional crops were grown largely for subsistence purposes as a starting point for irrigation success – or as it was communicated "…when you smell the first rains you know you just have to plant!". Those who were successful started small, and savings and profits were used to buy irrigation pipes and support irrigation expansion. Existing land for this group is their starting point, but water supply, irrigation-infrastructure, input finance particularly seeds and fertilisers are raised as major challenges. Intensification to double or even triple cropping is one goal for growth, as is expansion to farming on the whole plot which is typically underutilised. Two women farmers who were widows illustrate this pathway-driver. Their successes at a small scale led to larger investments, one on a 9 hectare plot, the other on a 3 hectare plot. Both were born into families that had been practising dry-land agriculture as their main source of food since the times of their great-grand parents.

> One had married into a headman's family with relatively large arable land and relatively higher security of tenure and the family had a long history of dry-land farming where they grew traditional crops for food, with occasional surplus sale. She focussed the families limited financial resources first on fencing to allow farming at scale (rainfed), then later bought a few pipes and have irrigated by gravity for the last 34 years, slowly increasing the area under irrigation as she could afford. Irrigation did not initially result in crop success, as she had not learnt to fertilise sufficiently, but with experience, she diversified into vegetables and peanuts, generated savings and bought more irrigation pipes. Only in the last five years has she covered the full 9 ha (i.e. a 29 year growth curve), but still struggles with input finance. She aims to crop at 200% intensity (double cropping) in the future. Interestingly, she has recently started home gardening as she could afford to buy pipes and get water to the homestead with small profits made from the field. While the reason for bringing water to the home was mainly to support domestic consumption, is now being used to irrigate vegetables.
>
> The second is a young widow in her mid-30s. She was married to a wheelchair-bound husband who depended on social grant as his main source of income and grew up with passion for farming. She studied agriculture at high school and her parents were prosperous farmers who practised irrigated farming, which she introduced to her husband's family, who were previously farming mainly rain-fed traditional crops. She later also grew vegetables in an irrigated home garden after buying pipes that she had connected to a nearby small dam. When she married she wanted to make farming the main source of food and a significant contributor of household income through sales of farm produce. In the home garden she introduced a 300% cropping intensity of vegetable crops and this has significantly improved the family's own food supply and reduces money spent on vegetables. To accelerate her enterprise, she modernised production with mechanisation in the irrigated fields, better fertilisation and made gains in productivity and profitability, moving to a cash-generating venture. This led to more

water investments but challenges of pipe-theft combined with her husband's death left her struggling to use the full 3 ha area. Her plans are to intensify her cropping system, but lack of irrigation infrastructure and capital to buy inputs are key challenges to overcome.

ii) Farming as a last resort and steady slow growth ('the desperates')

Farming for this group was initiated by the priority need to survive; first by producing food for the household, then with selling as a supporting agenda. Subsequent growth allowed the enterprise to move towards cash-farming. Aspirations within this trajectory are to increase the marketable share of produce, increase scale and intensification, and continue to supplement household food needs. Some farmers turned to irrigated farming as an entrepreneurial activity when all what they had planned for their lives had failed. What is common about these farmers is that they first started in life with job-seeking and employment in various companies. For diverse reasons they all lost their jobs and after time also hope of finding other employment opportunities. These farmers reported that although they grew up in families that were practising dry-land subsistence farming, they never considered farming to be an income generating activity until they lost their jobs. The implication of this is that they all got into farming without proper planning both in terms of acquiring necessary resources and thinking through some implementation frameworks. The following paragraphs give some condensed descriptive accounts of how each of them got into the farming business and illustrate this driver of irrigation development.

After losing his job at the age of 39, Walter who was born in 1954 had not options so resorted to farming on a two-hectare dry-land field he had inherited from his parents. He had worked for about 10 years in Checkers stores around Tzaneen and had a sense of how markets work. He started by planting about 20 lines of dry-beans mostly for sale and would save money to finance his farming; paying for tractor services and buying fertilisers and better seeds. After practising dry-land farming successfully for four years he expanded into irrigation. He bought pipes and a petrol pump (R3000 in 1995) drawing water from the Nwaveti River, about 400 m away from his field, and later sprinklers for about R350 each. In the fifth year, he started to use one hectare. When he expanded, Walter diversified with high-value crops including green maize, green beans, spinach and cabbage. He chose these crops because they fetch more money on the market and are in high demand. Further expansion is limited by high infrastructure costs of both fencing and irrigation technology, but he was steadily collecting materials to achieve irrigation of the full two hectares. His focus now is on buying a *bakkie* and increasing his cropping intensity. Interestingly, he could not get a plot in the nearby Julesburg Irrigation Scheme because he is of the Pedi tribal group living in a predominantly Pedi village which was under Lebowakgomo homeland. The Pedi and Tsonga share a long history of tribal hostilities that has outlived the apartheid era of state-sponsored social engineering and Julesburg scheme is located in the former Gazankulu (Tsonga speaking people).

The second illustrative vignette is that of Eric who has no matric and was unable to get work in Gauteng. Frustrated and desperate he returned to his home village and started farming as he had to feed his family and generate some income. He started by planting 14 lines of tomatoes and ½ ha of maize on his family's 1.5 ha plot on Julesburg scheme. He had no pipes so could not irrigate. He supplemented income from selling tomatoes and taking up piece-jobs within the village. After three years of farming and working as labourer, Eric bought some pipes and started irrigating using furrows. Initially he just aimed to produce maize and dry-beans for food for his family, but after another 3 years he expanded into tomatoes and green maize as cash crops. He is now planning to

grow his farming enterprise by expanding and renting half of his neighbour's plot. By the time of this data collection, they had not finalised the deal but Eric was confident in his steady expansion.

iii) Employment experience with startup investment ('the forward planners')

These farmers have started after a period of careful planning and saving, building on personal skills and financial resources obtained from years of employed work. They put aside money and bought equipment in preparation. Unsurprisingly, this group starts farming with a significant initial step-up (albeit self-financed) and this is reflected in typically larger irrigated farms and with greater success than those who got into farming via a progressive dryland route, or through desperation.

> Daniel started with a small irrigated home garden producing mainly for sale, using a pumped sprinkler irrigation system. He started with a half a hectare and expanded to two hectares in three years. As he continued to expand, he needed a larger pump and with his wider set of business skills, engaged and lobbied the Department of Agriculture to assist. After two-years of persistent effort, he obtained support and advanced to drip irrigation with an electric pumped borehole for the full two and half hectares of his land, and also obtained support for fencing his field. On the platform of this success, he managed to get a tractor from the Department of Trade and Industry with grant funding and in 5 years has established himself as a credible farmer, determined to achieve success. Following few years of production and selling, he managed to extend irrigation into another six hectares using savings from farm sales, as well as from his retirement pension funds. His intention to become a business farmer at scale was being realised, but marketing became limiting and the Department of Agriculture once again helped him make a market arrangement with Woolworth and Shoprite stores. He supplies vegetables such as pepper, butternut and tomatoes to Shoprite. At the time of our data collection, he had two hectares of sweetcorn he had to supply to Woolworth. When produce is ready for the market, he takes a sample to his buyers who then drive to his farm gate to collect. This arrangement guarantees him of market and frees him from having to through difficulties of arranging transport each time when he needs to send produce to the market. His success has attracted more success, and he is linked to the Agricultural Research Council (ARC), supported by an NGO Technoserve, was one of 34 South African farmers funded by Government to attend a global agricultural show in Italy. This case demonstrates the value of research, development and state support plus exposure to wider horizons, to facilitate higher-aspirations and turn consecutive small successes into accelerated growth and significant achievements.

8.5 Conclusions on pathways

The chapter presents extensive details on how farmers arrived at their irrigation farming enterprises via different routes. It is evident that successful, or marginally successful irrigation, as the case may be, is reflected by diverse pathways, but it is the destination that is most important, rather than the pathway route as such. The project pathways framework showed 12 possible development trajectories that different farmers follow to end up practising small holder irrigated farming in some or other way. The cases show that all of these trajectories do in fact existing, but it was found that is more the location of the present farming activity that dictates the challenges (i.e. scheme, independent, home-gardener), than the route by which the farming activity arrived there. The research found that the pathways leading to scheme plots and home-gardens are, on the evidence obtained, easier to pursue and achieve; and that the pathways leading to the independent farmer

have significantly greater hurdles with interest and action incentivised by the prospect of higher rewards. This is said noting that outsiders have great difficulty getting access to existing schemes. The data on pathways highlighted the major hurdles experienced in the establishment and pursuit of irrigation activity which were subsequently explored in detail with groups of farmers, issues were ranked and solutions were developed. These are described in full in Chapter 9. While there is substantial diversity and 12 trajectories as such, the pathways can be usefully characterised by their risk profile.

Lower-risk pathways: The most immediately accessible development routes are those centred on home gardening and irrigation-scheme farming (1,3,7,11,12), with both of these characterised by hereditary land access on both, but on schemes, some informal and semi-formal land-leasing allows new entry to a limited extent. These pathways are perceived by farmers to have fewer challenges and lower risks than independent irrigation. The preference for intensification or expansion of farming effort that is located in the home-garden or on the scheme is strong despite i) the cost to the individual to install water-systems in the homestead; ii) the need to develop on-farm irrigation systems on the schemes (installation of small pumps at Tshiombo or piped sprinklers at Julesburg); iii) the reality that there are high transaction costs in getting water due to failed or weak scheme water management institutions, and iv) difficulty accessing plots and widespread tenure insecurity in rental arrangements. In the case of home gardening, the investments to bring additional water (boreholes, water-tanks or 'unlawful' pipeline connections to an adjacent irrigation scheme are almost always for dual purpose applications, i.e. these are multiple use systems (MUS) (van Koppen et.al, 2009). The substantial evidence of organic growth of MUS systems, despite individual cost, warrants further attention as a strategy. Although the scheme is farmed at a much bigger scale than the home-garden, farmers are assisted by provision of irrigation water and suitable land (albeit these are generally acknowledged to be difficult to access and are insufficiently secure). There are generally no irrigation or service fees payable. Validation discussions on pathways and challenges with farmers led to the conclusion that providing greater institutional structure and certainty in water and land tenure institutions, alongside upgrading of irrigation and key infrastructure would be essential interventions to facilitate these lower-risk pathways.

High risk – high return pathways: Independent irrigation farming is in general terms the pathway requiring the most vibrant and capable irrigation farmers (pathways 2, 5 and 9). While many scheme farmers at Julesburg, Dzindi and Tshiombo have demonstrated substantial success, the independent irrigators are generally a notch above in their marketing suss and their enterprise sophistication. The route of the pathway to finally arrive at independent irrigation farming, say via schemes or home-gardens does not seem to be an important consideration. The independent farmers are characterised by a business outlook where markets are established or envisioned at the time of planting and the business is operated with intention to generate profit. While they face uncertainties across numerous domains in the farming system and which is addressed in Chapter 9, the discussions with farmers showed that the difficulty to access markets effectively, land tenure uncertainty (which limits their willingness to invest on-farm in the form of fencing and piping, etc.), and water uncertainty (both licenses and physical resource access to dams, rivers, pipelines) are priority issues.

Dryland farming experience: While the analytical framework does not talk of irrigator development from dryland farming through to irrigation farming, be it in home gardens or arable fields, prior dryland farming experience was found to be an important factor underpinning irrigation development trajectories. Both negative experiences, usually in regard to rainfall uncertainty, and positive experiences, in the incentive of relative successes, show that the hard-earned financial and food gains as well as the frustrations suffered by farmers in dryland farming are associated with learning, and later, successful irrigation development outcomes.

The motivation for getting into irrigation farming were also identified from the case histories and throws some light on how successful irrigation farmers evolve in their development trajectories:

- *'born and bred farmers': These* are farmers who have a family history of dryland farming. Their inculcated knowledge, passion and historical dependence on farming for food, leads to irrigation investment, intensification, surplus and profit, leading to incremental growth.
- *'the desperates':* Irrigation farming for this group stems from unemployment, lack of options and typically, a time of desperation prior to irrigation startup. The priority need to survive and produce food for the household is the initial driver. Incremental production success and increased sale to markets leads to steady expansion and intensification, but given the origins of prevalent poverty which appear persistent, they seem to have difficulty launching to scale.
- *'The forward planners':* These farmers have started after a period of careful planning and saving, building on personal skills and financial resources obtained from years of employed work. The initial financial leverage and workplace-skills and experience seem to set this group on a faster more successful trajectory.

Water tenure security, land tenure security and access to markets arose as critically limiting issues in relation to expansion, both within schemes, moving onto schemes as well for independent irrigation pathways. The confusing, conflicting and variable interpretations of land institutions, particularly the process to obtain and value of a PTO are a major limitation to irrigation development pathways, and a strong disincentive to irrigation development. Fear of losing land to lessees was a dominant theme limiting land-leasing transactions on schemes and for independent irrigators. The weak land rental arrangements, the prevalence of water stress, combined with the widespread absence of allocations and formal mechanisms of access and control compounds the institutional risks that both scheme and independent irrigators face. In the focus group sessions held with farmers documented in Chapter 9, the researchers in collaboration with farmers captured detail of these challenges and solutions were proposed to address them.

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Chapter 9 Obstacles to Pathways and Strategies in Response

9.1 Introduction

9.1.1 Overview

The obstacles that were identified in the case-study analysis were assessed in the context of the reviewed literature and were then discussed with irrigators. Participants' perspectives were documented through a series of interactive workshops with focus groups and key informants (see Chapter 3 for detail on method). This combination of injection of ideas based on literature, and participative development of solutions based on grassroots experience, led to a set of responsive strategies to overcome the identified obstacles. Chapter 9 describes the process of consultation, expands on the various obstacles faced by farmers and sets out the jointly formulated strategies that can support smallholder irrigators to achieve greater success.

The two sites are discussed separately, with the Thulamela obstacles and solutions presented in Section 9.2 of the report and the Greater Tzaneen content presented in Section 9.3. Each trajectory is dealt with separately, and for each the presentation starts with a brief and general description of the start and end points of the trajectory as observed in the field. The trajectory is described within the local context in terms of the scope and scale at which it occurs, and in terms of critical resources and processes followed.

9.1.2 Specific objectives of the participative sessions with farmers

The farmer report-back and strategy-development sessions were conducted with three objectives in mind.

1. The first objective was to *facilitate farmer learning and promote ongoing interest in the research process* by relaying selected research findings back to the farmers in an appropriate way. The focus was on information that is relevant to their farming activities and the intention was to explain to farmers in overview what has been found, to acknowledge their contribution to the research work, and to facilitate a better understanding of what the research team is doing with the information obtained.

   It is the experience of the research team that smallholder farmers in general have limited interest in research per se, but are keen to engage and talk about aspects that specifically relate to their immediate challenges and improving their lives in a direct way. Discussions on policy, livelihoods analysis and theory, for example, were therefore limited other than when it was particularly interesting, or was necessary for context or to address specific questions. The farmer report-back sessions focussed on the priority issues identified from the case analysis, with an emphasis on obstacles and possible solutions.

2. The second objective was to *facilitate feedback on the research findings* at the two sites through critical discussion of the team's interpretations, to achieve greater confidence in the analysis.

3. The third objective of the sessions was to *develop and critique the intervention responses* proposed by the project team that aimed to address the primary obstacles faced by farmers on the various identified irrigation development trajectories.

9.1.3 Group sessions and individual informant interviews

The farmer feedback sessions included four focus group sessions during the course of 2014 to 2016, as well as ongoing and multiple key informant interviews throughout the research period, on the subject of obstacles and possible solutions. There are 3 populations who are the subject of the research effort, each with some shared challenges, but also with particular challenges given their different group contexts. Some of the key challenges of the scheme irrigators, for example, relate to the scheme-specific topics of land tenure, water and organisational issues, which are not of direct relevance to either independent irrigators or home gardeners. The time available for feedback and discussion in a 1-day session was relatively limited, so to achieve outcomes it was decided to target priority issues for the different groups in multiple sessions (Table 9.1).

TABLE 9.1: Summary of farmer report-back and consultation days

Research Site	Round 1 – General issues	Round 2 – Validation of obstacles and solutions
Greater Tzaneen	January 2015: Scheme farmers (17)	19 November 2015: Scheme farmers (19) and home-gardeners (5) 20 November 2015: Independent farmers (16)
Thulamela	August 2014: Scheme farmers (7 – a selected, highly- knowledgeable focus group)	July – Sept 2015 and Feb 2016: Multiple key informant interviews across 3 population groups.

9.2 Information-exchange at Dzindi Irrigation Scheme

9.2.1 Discussion on access to land

The first topic put on the table was connected to land access and the ways in which a person interested in farming obtained land. The participants were asked to imagine that they were young individuals who wanted to get into agriculture, did not have the land, but possessed the farming knowledge that they have now. The land that they sought had to be a piece of land with water, and it could be on an irrigation scheme or it could be outside of a scheme. They were asked to tell us what they anticipated they would encounter.

Response from the participants to this question raised a number of issues. On accessing farming land (when it is available in the Thulamela District), responses showed that this land is, largely, obtainable with the consent of tribal leadership. One participant highlighted how intricately involved the Tribal Authority is throughout this process, with PTOs reportedly being sanctioned by this organisation.

Responses also showed a disjuncture between national and municipal institutions on the running of irrigation schemes, with participants complaining of double-billing from the Municipality and Department of Water Affairs for their water tax levies.

Regarding women and how they access land, it is known that in the Thulamela District, women may not approach tribal leadership to ask for land. When a woman marries, her husband may approach a Musanda (tribal leader, headman), whilst fathers approach the Musanda on behalf of their sons. The group, when the issue of women's access to land was raised, focused more on *why* women need to obtain land on irrigation schemes, and the participants' view on this is that "women need to get on the scheme because they cannot get government jobs".

The women who participated in the focus group have access to beds on family plots on the irrigation scheme, which raised the issue of how rules regarding the subdivision of pots on irrigation schemes are not only broken, but signed off by scheme management committees; another issue raised was the powerlessness of extension officers to enforce irrigation scheme regulations. The transfer of a scheme plot occurs when the individual in whose name the plot is registered passes away. The family of the deceased will come together and decide which family member the plot will now be registered under. The name of this member is then taken to the Scheme Management Committee (SMC), registered, and filed in plot-holder documentation.

The first female participant is planting on both her mother's bed and the bed assigned to the registered plot-holder. The question that she posed was: "if the registered plot-holder is no longer interested in farming and no longer resides in the community, why should he remain the registered plot-holder, instead of the farming individual?"

The second female participant stated that she was against the process of families deciding on who will be the registered plot-holder. She stated that most of the time these decisions are not unanimously agreed upon, and that often – as in her case – the plot-holder will harvest one's crop and the farmer will be left powerless to do anything because the plot-holder is "the boss".

Participant 2, who at one time served as Chairman of an SMC, responded to the women by stating that families have to resolve any issue they have amongst themselves before approaching the SMC, and the extension officer added that to prevent such conflict, all family members had to be present when the SMC is approached, and that when the agreed-upon name is stated, it should be accompanied by an affidavit. Having said that, the extension officer reminded the participants that the sub-division of the plot was not allowed and in so doing, the extension officer was well within his right to take the plot away from the family, so this issue should not even be raised. He did, however, add that enforcing this regulation would only be "asking [the farmers] to pick up a panga and chop my head off".

9.2.2 Discussion on irrigation equipment

Participants were asked to discuss how they obtain their irrigation equipment if they have land with water available but outside of an irrigation scheme, as well as where or how they receive financing.

All the participants agreed that one should start planting on a small portion of one's land and that this portion should be close to the water, so that one could dig one's own furrow or use buckets to irrigate. On sharing one's plot if not all of it is in use, the participants all stated that while it is a good thing to give a person space to farm, one should never share his land with another person. They stated that sharing one's plot created petty jealousies which often lead to a farmer being accused of witchcraft or using *Zombies*. They also stated that in a number of cases, plot-holders or land owners discovered that the individuals whom they had allowed to farm on their land had "approach[ed] a Musanda to apply for that land".

Regarding approaching loan sharks to apply for money to finance purchase of their equipment, all participants stated that approaching loan sharks was never an option for them, describing it as "gambling" and "inviting poverty in large amounts". The consensus is that a farmer should "start small, save money, plant more in the next season, save some more until you can afford your pump".

9.2.3 Discussion on markets

Participants were asked to imagine that they had obtained their land, that they had their equipment, they were producing well and selling to neighbors, local traders or even local supermarkets. However, they had they reached a stage where the local market was too small, necessitating the search for markets elsewhere. What was their experience in trying to access far-away markets, such as national fresh produce markets? How difficult or easy was it to do so, and what problems were encountered in stepping out of Thulamela to access other markets?

In response to these questions, participants first raised the problems that they have encountered using unreliable agents to access larger markets. They listed the costs incurred for packaging, transportation, storage and fuel, and said that these are often paid only to have an Agent inform them that their crop did not meet a set standard, or that the quantity was not large enough to send to the national market. They also stated that even when one's product did reach the market, the chain followed to get the produce to the market was long and costly, preventing farmers from making decent profits. Secondly, the participants cited the stringent requirements set by certain supermarkets as a stumbling block. They referred to one supermarket in particular that requires that farmers not use chemical fertilizers, and only use water from boreholes to irrigate.

The consensus amongst the participants was that the only way to successfully gain access to national markets was by forming co-operatives that would provide them with the services that marketing agents would.

9.2.4 Discussion on irrigated farming as a livelihood option for youth

In Topic 4, the participants were asked, "In light of their farming experiences over the years, do they think it is presently easy for young people to start small-scale commercial farming, and if they were a young person would they choose this or look for something else?"

The participants all responded that yes, in the prevailing circumstances, a young person could easily transition to small-scale commercial farming, but only if financing was made available to start up. However, they stated that the younger generation was irresponsible and purely lazy with no interest in farming, giving examples of incidences in which youngsters had obtained financing for farming and had squandered the money on liquor houses or on cars. They also referred to a number of farming competitions where, instead of money prizes, farmers were awarded farming equipment and farming inputs.

The participants also believe that with schools no longer teaching agricultural studies as a subject, children are not forced to understand the meaning of being a farmer. Participant 7, who forms part of this younger generation, stated that her peers thought her lacking in intelligence for wanting to be a farmer, and that these peers were primarily interested in men and spending their time in beer halls.

9.2.5 Discussion on Government organisations

The last topic focused on government institutions. The participants were reminded that the mandate of the Department of Agriculture and Forestry (DAFF) and the Department of Rural Development and Land Reform (DRDLR) is to assist farmers with different areas of emphasis; agriculture and land. Participants were asked what they would say to representatives of these departments if they were given the chance to speak to them, and more specifically, what would they tell the representatives that they need to do for them, the farmer?

The participants raised the issue of financing. They would like government departments to assist them with funding for the purchase of better equipment and assets such as tractors and bakkies. The participants spoke of being given the opportunity to merely present their farming plans and proposals to obtain loans. They stated that government bodies insisted on the formation of co-operatives to apply for loans, yet when created as needed, the funding is not forthcoming.

9.2.6 Summary and conclusion of Thulamela consultations

The multiple discussions with key informants at Thulamela over the research period led to the analysis of obstacles as set out in Table 9.1. The trajectories or pathways that are referred to follow from the descriptions in Chapter 8 of the report.

Incentives of **secure land tenure, water use rights** and **leadership in organisational structures** are seen as critical conditions (pull factors) for the expansion from homestead food gardening to smallholder irrigation farming, increased water-use, productivity of crop production and improved livelihoods. The workshop outcomes support the findings of considerable fieldwork amongst home gardeners, scheme farmers and independent irrigators in Thulamela, which are that these incentives are largely absent.

Expansion in scale occurs in spite of the prevailing disincentives. Accessing land is a confusing and high risk process with multiple gatekeepers, governmental and traditional, all seeking to obtain some benefit from the transactions. While demands are made in the name of due-process, these are often not supported by any legislation or policy, but are given pseudo-legitimacy in the absence of legal clarity and formal institutions. Legislation has loopholes and is variously interpreted or ignored, and the resulting legislative vacuum leaves those wishing to make a living from the available land and water exposed to unacceptable uncertainties in regard to their land and water use rights, and aspirant farmers are very often exploited.

Use of own resources: To obtain the equipment needed to irrigate, people largely depend on their own resources. There are, in effect, no financial institutions that provide financial support in the form of reasonable loans for this type of business development.

Irrigation farmers are on their own when it comes to marketing. They learn from failures and get better as individuals, but not as a class. They face barriers in understanding and benefitting from tight value chains, particularly fresh produce markets where they believe they are exploited, The government is absent when it comes to assisting small-scale irrigators with market access.

Government is primarily seen as a potential source of money. This is not its primary function, but that appears to be what people expect from Government. Ploughing assistance is particularly important at Greater Tzaneen but has distorted the local mechanisation-contractor market.

Youth stay away from farming. Farmers call the youth lazy, noting the reality that most of the independent irrigators are older than 50, though there are cases of young entrepreneurial irrigators. However, when one considers the circumstances of high risk, complexity of farming and difficulty achieving profits, who can blame the youth from staying away from farming.

TABLE 9.2: Important obstacles experienced by participants in Thulamela who established, expanded or intensified their irrigation enterprises

Trajectory	Location	Obstacle	Severity	Explanatory notes
Home gardeners (1, 4, 11, 12)	Manamani	Access to water	4	Those who wish to irrigate their gardens find it difficult to access irrigation water due to water limitations where they reside.
	Itsani	Theft	2-3	Theft of flowers, grown for sale, from home gardens and fear of crop theft in future.
Scheme irrigators (3, 7, 8, 10)	Mphaila	Monthly electricity fee for pumping	3-4	Both plot holders and lessees consider the fees excessive and struggle to make payment.
		Informal rental agreements	4	Concern over the validity of verbal arrangements when formal arrangements can be accessed.
		Access to roads from the scheme	4	• Limits access to markets • Makes transportation of produce difficult
		Theft of equipment	4	Financial burden of continued replacement of equipment is a disincentive
	Dzindi	Access to water	4-5	Plots on tail-end blocks access very little water
		Social 'institutional' obstacle of subdividing the plot	4-5	• Restricts the area on which the plot holder may farm • Depending on the location of the assigned beds, the plot holder may be denied access to water
		Informal leasing of scheme plots	3-4	• Being chased away from rented land before harvesting the crop • Being assigned beds/strips that are located on a section of the plot where it is easy for the plot holders to prevent access to water • Plot holders harvesting the lessee's crops
		Accessing additional land	3	• No written contract permitted • Being an outsider increases chances of refusal • Perceived success decreases potential further access

Independent irrigators (2, 5, 6 ,9)	Thulamela	Accessing land and tribal leadership	3-5	• Local TA expects payment for every transaction in which he is involved • Local TA accepts payment from the highest "bidder"; a farmer who has been assigned a piece of land may have to repeat certain steps of access, including payment of associated fees • Many steps have to be taken within the chain of tribal authority, and all steps have a fee
		Accessing the local market	1	Relatively easy to sell directly to consumers, street traders and bakkie traders
		Supplying to supermarkets	3-4	• One may have to obtain a certificate from the DoH to supply to a supermarket • Supermarkets do not offer suppliers a formal contract • Supermarkets decide on the pricing of the produce • All costs before delivery to the supermarket are incurred by the farmer
		Middlemen (agents) in attempting to access national fresh produce markets	3-5	• Farmers work through agents to send their produce to the national markets • The chain followed for produce to reach these markets is unclear and farmers have reported large financial losses
		Access to finance for natural and physical capitals	2-3	• Impossible to access loans or any form of financing from banking institutions. • Financing is accessed through: - employment - self-employment - savings - reinvestment - cross-investment - build-up
		Accessing farming knowledge	1-2	Knowledge is obtained from family/parents, fellow farmers and/or extension officers
		Obtaining hired labour	1-2	Done only when necessary and affordable

Severity of obstacle	1	2	3	4	5
	none	minor	moderate	major	critical

9.3 Proposed development interventions that will address priority challenges of irrigators at the Thulamela site

9.3.1 Pathway 1: Upgrading a rainfed home garden to an irrigated home garden

Brief description of home gardening in Thulamela

Rainfed and irrigated or partially irrigated home gardening is widely practised in Thulamela, almost exclusively for home consumption and social purposes (gifts). In the few instances where selling does take place, it is mostly done opportunistically. The sizes of the home gardens vary but rarely exceed 1000 m^2. The size of the home garden is related to the size of the residential site, with older sites tending to be larger than more recently allocated sites, with bigger home gardens. The contribution of home garden produce to total household income, mainly in the form of food consumed by the household, is limited, and typically of the order of 1 to 3%. Important summer crops in the home gardens of Thulamela are maize, cow-peas and pumpkin. The latter two crops are dual purpose, because besides grain or fruit they are also harvested as a leafy vegetable (pumpkin leaves are widely consumed as a vegetable). Winter cropping only occurs where irrigation water is available. Winter cultivation is usually done on a small portion of the home garden, usually less than 10% of the total garden area. Leafy vegetables, including non-heading Chinese cabbage, Swiss chard and nightshade, are the most commonly-grown crops.

Upgrading a rainfed home garden to an irrigated home garden

In Figure 8.1 (previous chapter) this trajectory is assigned the number 1, but also includes trajectories 4, 11 and 12. Upgrading of rainfed home gardens to irrigated home gardens in Thulamela was closely associated with the availability of a reasonably reliable source of water, usually in the form of piped tap water (75% of home-garden irrigators used tapstands within the homestead). Only a minority of home garden irrigators collected and transported water from sources other than a tap, noting however that the irrigation canal that serves Dzindi scheme is the second-most prevalent source, as it flows past the households living in Itsani (i.e. Itsani village only uses this source). The installation of household groundwater pumps was rare and no cases of rainwater harvesting from roofs were encountered.

Proposed intervention 1

Rainwater harvesting technologies exist and have been documented and tested (see for example Stimie *et al*., 2010; 2010a; 2010b; 2010c; and Baiyegunhi, 2014). It is proposed that appropriate rainwater harvesting techniques (i.e. suited for small gardens located close to the dwelling (roof) in a semi-arid to sub-humid climate with summer rainfall) are identified and that their implementation is rolled out by appropriate agencies. Roofwater harvesting and underground storage appears to be a suitable option for local conditions. This technique will provide water for supplementary irrigation in summer as well as for water for winter cropping on small parcels of land in the home garden. Storage in roto-moulded plastic tanks (commonly called 'Jojo' tanks) is quick and easy to install, but affordability is a question (approximately R1000/cu.m, plus guttering and installation). The DWS Resource Poor Farmer's Subsidy (DWAF, 2004) makes specific provision for funding of such water harvesting tanks.

Response of participants to the proposal

Participants expressed a strong desire to water their home garden, and highlighted that water for irrigation was of secondary importance to water for household use. In Manamani, by far the most water-stressed site covered by the study, obtaining water for household purposes is a daily struggle. It was observed that people who had water tanks on their plots had positioned these tanks far away somewhat distant from their dwellings and were filling them with water obtained from the piped municipal system, not with roofwater runoff which is an obvious source given the prevalence of corrugated iron roofing. This likely due to the reality that these tanks are used as buffer-storage, drawing water from the piped system when it is available by hose-pipe (hence the proximity to the tap and not the house), and using the stored water when the piped supply is inoperable. In this malaria-prone area the risk of increasing mosquito breeding conditions by implementing roof water harvesting and storage techniques must be considered carefully, and technical solutions, such as a floating layer of polystyrene balls, or proper mesh screening (using shade-cloth) of inlet and outlet pipes are affordable and easily implemented.

9.3.2 Pathway 2: Growing from (irrigated) gardening to independent irrigation on a field scale

Brief description of independent irrigation in Thulamela

For the purpose of this study, independent irrigators are defined as smallholders who have direct access to a source of irrigation water and extract, convey and apply this water using privately-owned equipment. Three categories of independent irrigators were identified in Thulamela based on the way in which they extract and convey irrigation water to their plots, namely: pumpers, diverters and collectors. Pumpers are defined as independent irrigators who extract their water by means of an electric, petrol or diesel pump. Pumping water has important financial implications because of the cost of the pump and of the energy to drive the pump. Forty-two of the ninety-eight independent irrigators were categorised as pumpers, and all owned at least one pump. Thirty-five independent irrigators were categorised as collectors. Collectors are defined as independent irrigators who extract and convey their irrigation water manually from source to plot. The distance which irrigation water is carried varies among farmers. The striking feature of this category is the physical labour attached to lifting and carrying water from source to plot, and applying it with buckets. This high labour requirement limits the size of their cultivated area, and in some instances decreases yields. Finally, twenty-one irrigators were categorised as diverters. Diverters are defined as independent irrigators who extract irrigation water by diverting a water flow onto their plot/s. Water is diverted into a pipe or a furrow dug by the farmer.

Up-scaling from home gardening to farming on an independently irrigated plot

In Figure 9.1 this expansionary process is represented by trajectories 2, 5, 6 and 9. Up-scaling from home gardening to field-scale irrigation is typically accompanied by a change in the purpose of production, from primarily for home consumption to primarily for commercial purposes. In Thulamela this process is probably the main way in which irrigated smallholder farming is expanding. The process involves individuals using their own initiative and relationships

to identify and gain use-rights to land (formal or informal) that has physical access to irrigation water. This may or may not involve payment, either once-off or on a regular basis. It is usually a complicated process that involves satisfying multiple authorities and the acquired security of tenure over this land is often very limited. In Thulamela, land used for independent irrigation is mostly found near rivers, but land adjacent to spring, dams or irrigation canals is also utilised.

At this stage it is important to stress that in the great majority of cases, the land being used by independent irrigators in Thulamela is not capable of supporting irrigation sustainably, because it is located on slopes that are too steep, or on soils that are too shallow or too wet (e.g. wetlands in Tshiombo), or combines more than one of these major limiting factors. The reason why such land is being used for irrigation regardless is that there are no substantial reserves of land that are both irrigable and close to a water source. In fact, the main reserve of such land in Thulamela is found on existing irrigation schemes in the form of unused plots.

Once people had secured access to land and water they were able to acquire the physical resources to farm and establish their independent irrigation enterprises, some of which were more successful than others. Independent irrigation enterprises in Thulamela are characterized by a wide diversity of farm sizes, production levels and gross incomes. In some of these enterprises, cultivation and irrigation is done by the farmer on plots that are a fraction of a hectare, without additional labour and using very basic hand tools to cultivate and irrigate In others, production takes place on farms that exceed 10 ha in size, using hired labour, farmer-owned tractors and sophisticated equipment including drip systems with fertigation. Despite this diversity, common to all was that enterprises were built using personal financial resources. Not one enterprise accessed finance from institutions, be they formal or informal, mainly because their applications for loans were rejected (formal institutions) or because they considered borrowing money for farming from informal institutions as too risky, due to the high cost.

From interactions with independent irrigators and scheme farmers at the upper end of the production and gross income scale, It was clearly evident that growth of their irrigation enterprises was usually curtailed by market access, which became problematic (too risky) as soon as they ventured beyond the local market, which consists of selling to private consumers, street traders and bakkie traders (see Manyelo *et al*., 2015 for a detailed description of the operation of this 'local market').

There are three main ways in which Thulamela farmers have tried to expand their marketing beyond the local:

1. by supplying local supermarkets;
2. by responding to local government procurement tenders; and
3. by attempting to access the national fresh produce markets in Gauteng.

They reported six problems associated with supplying both local and distant supermarkets:

1. Obtaining a certificate from the DoH which declares that the site/farm/plot on which the produce is grown and stored after harvest is not contaminated.
2. The costs incurred.
3. The absence of contracts between farmers and local supermarkets.
4. The zero control farmers have over the sizing and pricing of their produce.
5. The period it takes to receive payment from local supermarkets is too long.
6. There are too many farmers supplying to local supermarkets.

Dzindi irrigation scheme farmers reported that they are no longer able to obtain the required certificate because the rules pertaining to the use of canal water are no longer implemented, so canal water is often used for bathing and to wash household laundry, and human faeces have been found alongside the canal. In order for the certificate to be issued, an official from the DoH inspects the farmer's plot to establish whether or not there is a toilet constructed on it and in the vicinity of water used for irrigation, and collects samples of irrigation water for testing. Thereafter, the official inspects the farmer's post-harvest storage facilities. Farmers reported that certificates are not issued to them due to the contaminated canal water.

The farmers that supply local supermarkets without a certificate from the DoH reported that operating in this market is very expensive because the farmer is expected to do his own harvesting, washing and bundling of produce and to transport it to the supermarket. Furthermore, local supermarkets do not offer the farmers a contract. Instead, the supermarkets dictate the size of produce bundles and the price at which the bundles will be sold; payment is received two weeks to one month after delivery of produce. Payment is often based on what was sold by the supermarket, not on what was delivered. Farmers also reported that this market is saturated, because a large number of them had the wherewithal to supply local supermarkets.

Farmers who have tried to gain access into national fresh produce markets have had negative experiences and listed three disadvantages to operating in this market:

1. Their inability to produce in sufficiently large quantities.
2. Their distrust in market agents.
3. The high cost and associated risk of packaging, transportation and storage of produce and the lack of monitoring of what happens to their produce once it leaves the farm.

With reference to the need to be able to produce and deliver produce in large enough quantities to access National fresh produce markets, an independent irrigator stated: *"[Our access] to the outside market is [curtailed] by our poverty. What you must know and understand is that you can only take your product to the outside market, if you are able to meet targets set by the market. You have to produce many things and because we are poor, we are only able to produce limited [amounts]."*

A Dzindi scheme farmer added: *"Not long ago, I harvested chillies and wanted to send them to the market. When I reached Levubu, I was told that to send my chillies to the market, I need more*

than 50 bags; I only had 30 bags. They told me to find a farmer to partner with to obtain more than 50 bags. I ended up coming back home with my 30 bags of chillies. I tried to find a place where I could sell them, and in the end I had to throw away my now-rotten chillies.

Farmers' experiences in dealing with market agents is often negative and the farmers tend to distrust the agents after their negative dealing, as illustrated by the following: *"From the 12th to the 26th of May 2015, I sent four loads of green beans to the Johannesburg market through Levubu. For these green beans, I purchased more than 200 boxes at R 5 per box. To harvest the green beans, the labourers charged me R 15 to fill one 20-litre bucket. I would then transport the beans every week to Levubu, where I had to pay R 150 per load to be transported to Johannesburg. For my first load, I was paid R 360, for my second load I received R 2000 and for the third and fourth loads, I received nothing and was told that my produce was rotten.*

"To the same market, I sent over 50 crates of okra, when okra was valued at R 200 per crate. I received no payment for my okra and, again, I was told that my produce was rotten. My wife visited the market and confronted the agent with whom we had been dealing. She demanded to see her rotten produce and for her boxes to be returned. The manager of the market stated that no rotten produce was kept on their premises. When she refused to leave, she was handed a cheque of an amount that covered the cost of their boxes. Further, I was recently informed by Levubu that I still owed them R 70 towards the "pilot" (transport to the market).

"Although we had had bad experience with agents and the market several years ago, we decided to try again with this market because of the good experience we had had with an agent in Pretoria in 2014 with the sale of habanero chillies and green beans.

"They are stealing too much at the market. Once I sent sweet potato through another agent, it was a good time to send the sweet potato because it was in high demand. When I phoned to check on my produce, they told me that they would check on their system of its arrival, forgetting that they had phoned to tell me that they had received it. I complained until I gave up and, in the end, I was informed that I, again, owed them money. I was very disappointed with the Johannesburg Fresh Produce Market and I decided to return to focus on my hawker and bakkie trader clientele."

Farmers also stated that transportation of produce is difficult because many do not own a vehicle, and when they do have personal modes of transportation, they are unable to transport their produce in large enough quantities: *"I have a bakkie but it is small and I cannot transport too much."*

The hurdles farmers have to cross to access 'large' markets has caused the majority of both independent irrigators and scheme farmers being unable to grow beyond the category of market-oriented smallholders in loose value chains (**SH Code 2**) (see Table 9.2). It follows that enabling smallholder irrigators in Thulamela to progress to a higher category (**SH Code 3** and **SH Code 4** in Table 9.2), requires supportive intervention.

TABLE 9.3: Typology of smallholders in South Africa (Cousins, 2014:34 & Manderson, 2015:8)

Attribute	**Smallholder categories and codes**			
	Subsistence-oriented smallholders (**SH Code 1**)	Market-oriented smallholders in loose value chains (**SH Code 2**)	Market-oriented smallholders in tight value chains (**SH Code 3**)	Small-scale capitalist farmers (**SH Code 4**)
Objective of production	Household consumption	Household consumption + cash income	Cash income + some home consumption	Profit
Proportion of marketed output	None or insignificant	50% or >	75% or >	100%
Contribution to household income	Reduces expenditure	Variable – from small to significant	Significant	Very significant
Labour	Family	Family + some hired	Family + significant numbers hired	Hired
Mechanisation	Very low	Low	Medium to high	High
Capital intensity	Very low	Low	Medium to high	High
Access to finance	Absent	Some	Significant	Very significant
Households in SA	2-2.5 million	200-250 000	?	?

Our proposed intervention in support of the 'growing from (irrigated) home gardening to independent irrigation on a field scale' trajectory has two main elements

Intervention 1: Identify and secure irrigation land for small-scale farmer settlement outside the former homeland areas.

The most evident place to find irrigation land for small-scale farmer settlement is on existing white-owned irrigation schemes, as proposed and elaborated by Cousins (2014). Stipulating the conditions for implementing smallholder settlement is outside the scope of this project but a lot could be learnt from the way in which white irrigation schemes were settled during a time of South Africa's history when poverty and unemployment affected the rural white population. Of primary importance is that private land ownership is one of the ultimate outcomes of the settlement process. Restricting land tenure to usufruct rights only, which is the case on existing smallholder schemes, is not recommended. Field research has shown that over time such tenure restrictions tend to lead to parts of the scheme land not being used productively and to variable

interest among members in the upkeep of the irrigation infrastructure, which is a collective asset. The lack of interest is understandable as the (water) organisational development challenge is in itself complicated and time consuming, but is extremely difficult in a context of highly dilapidated and partly functioning infrastructure requiring high investment costs to remedy, which are far beyond any group of farmers' ability to do so.

Intervention 2: Reduce risk in market access.

The most obvious way in which to address the small scale of the production of individual farmers is through the formation of cooperatives. This intervention has been proposed by many, but implementation has lacked success. We believe that many smallholder cooperatives have been formed in response to the promise of getting access to state resources, a type of 'rent a crowd' approach, and argue that cooperative formation should instead be an **organic process during which members develop and express mutual understanding and identify a common purpose**, such as collective marketing. This common purpose should be the primary incentive for the formation of a farmers' coop. There is also the opportunity to optimise local procurement, by targeting various smallholder groupings to supply fresh produce (peri-urban groups) and semi-perishables (distant groupings). Lastly, we are of the view that trusted links must be developed between small-scale farmers and fresh produce markets. This will require the setting up, monitoring and evaluation of a value chain in which the interests of small-scale farmers are considered and protected to the same extent as those of large commercial producers. Pilot studies of this nature are recommended.

Response of participants to the proposal

1. **Identify and secure irrigation land for small-scale farmer settlement outside the former homeland areas.**

The response of independent irrigators to the option of packing up and settling on a scheme where land and water would be available varied from outright willingness to move, to (regretful) decline of the offer. Typically, those who were 'ready to pack and go tomorrow' were relatively young, highly dependent on irrigated farming for their livelihoods, ambitious in their outlook, but constrained by the conditions in which they operated. At the other side of the spectrum were the elderly farmers who had strong ties to the place where they were residing and farming at present. Several of them indicated that if such an option would have been offered to them twenty years ago, they would have taken it.

2. Reduce risk in market access.

On the formation of cooperatives, one farmer responded: *"I tried to convince the farmers in my village to start a cooperative but they laughed at my proposal because I am uneducated. Cooperatives are important for exchange and transfer of knowledge amongst the farmers. Also, government will only work with you if you form part of a cooperative. If we form a cooperative, we will be able to achieve more, we will produce more as a group and meet the numbers of the market. I have people that I want to form the cooperative with and to get them to agree, I even plough their land for them."*

Another farmer added: *"I like cooperatives, as a cooperative, you are able to put more pressure on the government. I am a member of the water-users' association and I am working on a proposal on how we, the plot holders, can pay less for the maintenance of the canal with the government's assistance. As individuals, we pay more for the cleaning and maintenance of the canal than we would if we would band together."*

On the optimisation and improvement of local procurement, a farmer responded: *"That could work if procurement is targeted. Take Matangari, it is too far and the farmers are always crying about not being able to transport their produce to the market. They can be offered tenders to supply their sweet potatoes to the hospitals and schools and our area can be offered tenders for what we grow best."*

On setting up trusted links between small-scale farmers and the fresh produce markets, farmer responses indicated that their produce was not considered important: *"White people send their harvests to the market and wait there and, if they get lower money than they expected, they query it. Black people don't do that. People who are working in the market are driving beautiful cars with the money they made out of robbery. When you go there, they will tell you that your crops were rejected and didn't make money, whereas they are lying."*

9.3.3 Pathway 3: Growing from (irrigated) gardening to irrigation on a scheme plot

Brief description of smallholder irrigation schemes

Most of the irrigation schemes in Thulamela are simple small gravity-furrow schemes (<200 ha) developed in the 1950s and 1960s comprising a diversion weir on small rivers, a lined main canal, lined distributory canals leading to earthen field canals. The design of the schemes anticipated central management and water-control operated by a bailiff with established rules and existing hydraulic units are not particularly conducive to equitable distribution, with many small distributory canals drawing directly, in series, from the main canal – which exacerbates top-end, tail-end inequity of supply. The schemes are old and have had little upkeep for 60 years, so are not only hydraulically very inefficient but the state-funded bailiff's are long-gone. The remnants of rules for water apportionment still in place, but (re-)organised by the farmers. Water shortages are the norm and water conflict is a dominant issue as a result. The reader is referred to van Averbeke (2012), in which a detailed overview of the state of all smallholder schemes in Vhembe, which includes Thulamela, is presented.

Up-scaling from home gardening to farming on a smallholder irrigation scheme. In Thulamela the greatest reserve of irrigable land is on existing irrigation schemes but in practice it is very difficult if not impossible to access plots on schemes or even to grow one's own enterprise as a scheme member by getting more land, due to institutional vagueness and weak governance. Mechanisms for land-exchange are inadequate and insecure and while land may be available on schemes this does not mean water is available. The marked deterioration of the scheme infrastructure makes it impossible to use the schemes at full capacity, combined with reductions

in supply due to peripheral abstractions (such as from the Dzindi canal for domestic and small commercial use), this has led to the reality of irrigable land without water supply. At Tshiombo, the last two blocks along the canal are no longer served and a similar scenario is rapidly developing at the Dzindi canal scheme.

Proposed intervention 4: The proposed intervention in support of growing from (irrigated) gardening to irrigation on a scheme plot is to **restore institutional clarity** and to **re-establish functional governance structures**. A rule system is in place but is no longer enforced. The various rules contained in this should be reviewed and subjected to input from plot-holder communities. The re-establishment of a rule system that is enforced is the only way in which the functioning and sustainability of existing smallholder schemes can be improved.

Response of participants to the proposal: Whilst plot holders lament the absence of clear rules, they also admit that they enjoy the current vagueness because it offers them more room to manoeuvre. Extension staff stated that the old rules governing irrigation schemes were clear, known by all plot holders, but no longer enforceable. They said that any extension officer daring to enforce the rules would end up dead.

9.4 Information-exchange at Greater Tzaneen

9.4.1 Setting the scene for participants

The information-exchange process commenced with a brief overview of the national context of smallholder irrigation to explain that this research work will help to answer some of the difficult questions facing government and smallholder irrigation farmers across South Africa. This means that experiences, knowledge and insights gained from the farmers will not likely have a direct benefit for farmers, but will make a contribution to solving the challenges of smallholder farmers across the country.

Responses and discussion: The general introduction and context was well-received and the participants fully appreciated that little direct benefit will accrue to them from this specific project – yet re-iterated their willingness to contribute time, information and knowledge. They did however point out that it is important that they are left with something at the end of the research process they can use to mobilise support. One participant raised the long-standing question of what happens to all of this research, and wanted to understand the process and who exactly receives all the published work generated, and if this information in fact gets to the decision-makers. This was an interesting insight, particularly given the extended struggle of the team and WRC to transform valuable research into practice via exposure to decision-makers.

The research team had a sense that the contextualisation of the research was appreciated, and while participants were clearly more interested in practical, usable and beneficial information, they were willing to be engage with this more ephemeral agenda.

The contextual introduction was followed by a short explanation and discussion on two essential frameworks that were adopted by the research team: livelihoods and systems. These provided a logical and helpful structure to the discussions in relation to the people who are farming, and their irrigation farming enterprises. This part of the session also served to expand people's ability to engage more critically with researchers and future consultants who may be involved at the scheme.

Systems approach to understanding irrigation activities

The systems diagram was explained and well-received and seemed intuitive to the farmers as a way of understanding what is involved in their irrigation farming activities. Each element of the system and the linkages was explained and then discussed.

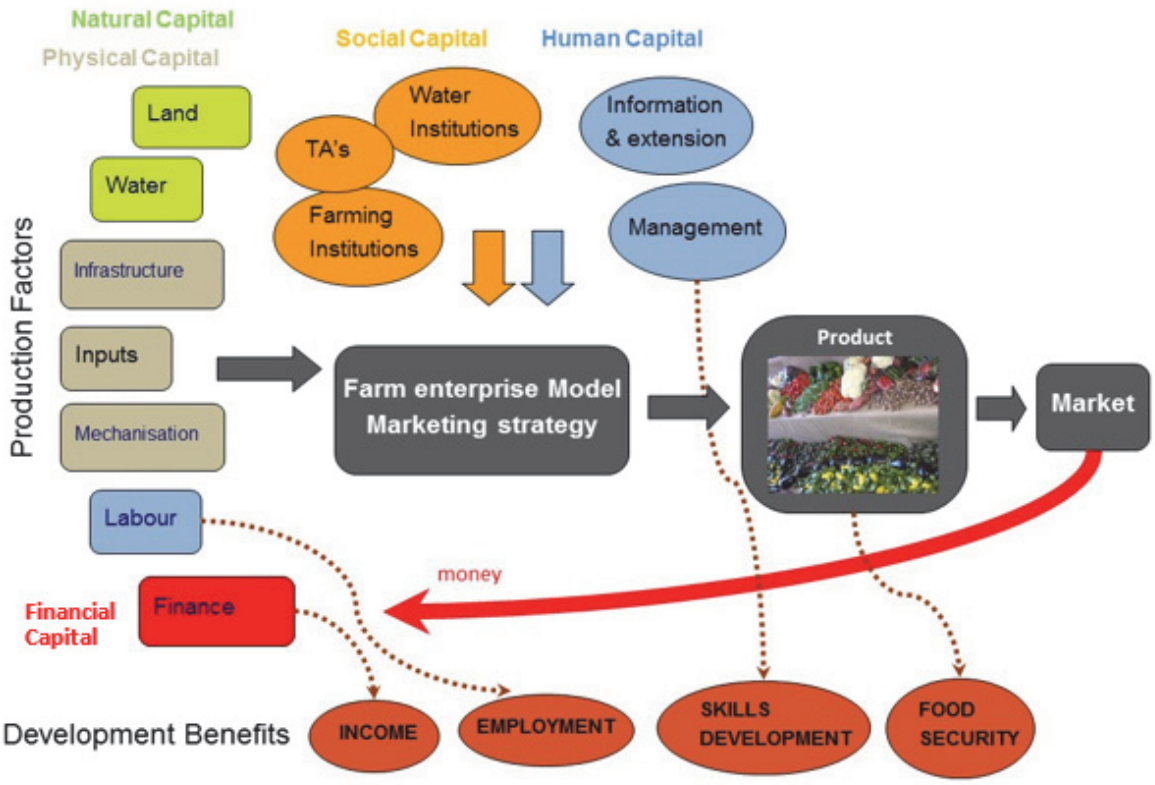

FIGURE 9.1: A Systems view of irrigation farming (adapted from Denison *et al*., 2015)

Responses and discussion: By the end of the session the participants fully appreciated the set of factors and their interconnections as well as the idea that any successful intervention needs to consider all of these and assess the current status and related issues. Initially, participants brought up various factors they consider to be "the problem" (such as a lack of tractors, the need for title deeds, problems with the water system and marketing issues). However, after extended discussion around the systems schematic, it became widely understood and supported that addressing water issues alone, or mechanisation or fencing alone, would be unlikely to turn their situation around. The farmers fully agreed that a comprehensive view was essential to identify weaknesses in the whole system and prioritise where efforts must be made. The systems diagram was a helpful tool to structure the discussion, to define relative priorities, and identify

challenges and opportunities. The priority issues facing farmers at Julesburg based on the systems framework were discussed and informally ranked in importance, as follows: marketing; water infrastructure and distribution issues; mechanisation; land issues; fencing; farming skills and knowledge.

9.4.2 Farmers' feedback on marketing issues

From the data collection conducted in 2014 to understand farmer aspirations when engaged in farming, all scheme members interviewed reported that their main objective is to make money. Farming is thus seen as a business venture from which to generate income. This makes the market a very critical element for scheme farmers. The research team started discussion on the market by presenting two major findings gleaned from various sessions of data collection.

1. The first one is that farmers rely on national markets, especially the Johannesburg and Pretoria Fresh Produce Markets. The process of getting their produce to these markets is long and involves many role-players, some of whom they do not know, and they have no control over what these role-players do with their merchandise.
2. The second finding is that the farmers know very little about the processes that take place when produce goes to the market. Farmers cannot rely on the local market (selling in the villages) because they produce large quantities at a time.

Farmers use agents to sell their produce at the national markets. The agents charge the farmers for transport, storage and merchandising, but the farmers do receive any break-down of these charges, and most of the farmers have never met their agents in person in order to establish a personal relationship.

Marketing uncertainties are made worse by the fact that market prices fluctuate widely. This leads to situations in which farmers are not able to know what to expect after sending produce to the market. A case in point is a box of green beans, the market price of which often fluctuates from R 70 to as low as R 25 on different days. One farmer reported that sometime in 2013, after sending 40 boxes of green beans to the Johannesburg market, he received a 25 cent cheque. Sometimes farmers do not receive anything at all after sending their produce to the market. In such situations, farmers are often told by agents that their produce got rotten before it was sold. However, farmers said they doubt such messages because the agents do not return the rotten produce so that the farmer can see for themselves.

Farmers also recounted how produce gets lost in the lengthy processes of transporting, storing and merchandising. One farmer explained that because agents receive lots of produce from many different farmers at one time, they often end up mistaking one farmer's produce for another's. When this happens the money that was supposed to be paid to farmer X gets paid to farmer Y. Naturally the one farmer gets aggrieved but he cannot do anything because he does not know how the marketing system works, nor how to audit such events. He further explained that every farmer should have a Packaging Unit Code (PUC). This is a unique number that serves as an identity number and should be stamped on every box so that marketing administrators

know the farmer to which the boxes belong. Unmarked boxes get fined by deducting some money, or do not get sold at all. Apparently, farmers are not told of these details by their agents.

These uncertainties of how the marketing system operates and feelings of powerlessness in controlling the way their produce get sold on the market are constraining farmers' aspirations to grow their enterprises, and is a major opportunity and development factor going forward. The short-term advice that farmers provided to each other was that each farmer should have the contact details of their agent and should follow up after their delivery with phone-calls, confirming whether the agent has the correct quantity of produce sent to him by the farmer, and trying to understand the pricing range of that day at the market.

9.4.3 Water and irrigation infrastructure issues

The research team explained the basic water and irrigation situation at Julesburg, highlighting government intentions regarding agricultural water in the future, and related policies on HDI farmers, subsidies and the National Development Plan (NDP), not least that irrigated agriculture is the defining pillar of rural development interventions envisaged in the NDP. The scheme water issues identified to date were listed and discussed.

Water allocations and scheme water-use entitlements are not known. The allocation from Tours Dam for irrigation supply was not known by the farmers and there has been no initiative to date to formalise water institutions on the scheme by the DWA. Numerous queries to the DWA in Tzaneen and Nelspruit did not result in any clarity on allocations from Tours Dam. However, one DWA official recalled a letter written some years ago defining a total of 100 ha of irrigation from Tours Dam, including Julesburg and Tours Irrigation Schemes – which together are more than four times that size if fully utilised. Thus, while water is 'free' at present, farmers were informed that future national water stress and agricultural water priorities will certainly result in some changes to the current situation. The farmers confirmed that while they were unaware of any of the above, they have an ad-hoc water committee of farmers to deal with water-sharing practices at outlet boxes and water-conflict, but little else.

Infrastructure is old and in poor condition. The scheme irrigation water system comprises a bulk mainline from Tours Dam to the scheme edge, which is also shared by Tours Irrigation Scheme, upstream of Julesburg. This was constructed around the year 2000, and is serviceable. The mainline terminates at Julesburg in an estimated 15 valve chambers (distributed across the scheme at varied intervals), where after the original intention of the irrigation designers becomes unclear. The practice at present is that farmers coordinate around the closest valve box and through a mix of creative workmanship – and in one case simple physical destruction – get access to the piped water. Most farmers use 65 mm black plastic pipes to convey the water from the valve-chamber to their fields, and irrigate using furrows. A few farmers use sprinkler irrigation on their fields. Technology is ad-hoc and grossly sub-standard, and leakages and losses from the overall system are high. One leak alone was estimated at 20 litres per second, sufficient to irrigate approximately 20 ha at any one time.

The capacity and hydraulic limitations of the system are not known, and while the on-scheme distribution system is grossly inadequate in every way, the actual bulk water supply is presently not limiting, but must be placed in the context of a very low level of irrigation activity.

The lack of on-scheme water infrastructure has led to major challenges for farmers to use the available water, with capital and labour cost implications and negative impact on productivity.

Water is essentially received at no monetary cost. Farmers pay nothing for water, nor do they maintain the system in any way. In discussing crop budgets, the cost of water (estimated on the basis of commercial scheme irrigation service fees, R0.4/cu.m) was included in the budget. It was noted with interest by the farmers, that for higher value crops such as okra and beans, a typical irrigation service charge would in fact be affordable. They were intrigued by the idea that if the irrigation system was rehabilitated, and the supply was reasonably secure, they would if fact be able to cover the full costs of operation, management and maintenance – thereby achieving reliable supply. It was also understood that government would be unlikely to invest in the scheme without a completely revised arrangement for irrigation operations and management, as well as irrigation service charges to cover short, medium and long-terms costs for sustainable operations.

The farmers agreed that the combination of water issues (mainly weak or absent irrigation infrastructure in the fields, and largely absent arrangements for water management, fee setting and recovery) bring insecurity and risk for their farming business. There was an appreciation that into the future, water would not be a free input and that when looking forward, thinking about conservation had to predominate.

9.4.4 Mechanisation issues

The availability of mechanisation was identified as a critical obstacle, and while clearly topical and a key challenge, was met with a largely uniform collective view. Participants confirmed that a number of farmers have financing in hand, from savings or otherwise, but despite this were unable to find a mechanisation contractor (either government or private) to assist. Total mechanisation costs were in the region of R 3400/ha, including ploughing, discing and harrowing, but excluding planting. The absence of mechanised services is one of the most urgent issues facing the farmers, and given that most of the active farmers had some financial means, a market-linked mechanisation solution would be welcome and sustainable, as farmers are willing to pay. The team suggested that what is needed is an investment programme to set up tractor-contractors in a ploughing business, through a combination training-and-financing programme for tractor-business operators. This idea was well-supported and farmers are keen to pursue it further through engagement with the Department of Agriculture.

9.4.5 Land Issues

Findings

The research team presented its findings on the land allocation and tenure system that is taking place at the scheme, with the more applied aspects being emphasised in the presentation.

Legal and administrative: The land at Julesburg scheme is communal land administered by the Nkuna Tribal Authority under chief Mohlaba, who is responsible for aspects of administration in ten villages. Because it is communal land, every household that lives in the Nkuna community in principle qualifies to get a plot in the scheme if they apply through the relevant offices of local land administration. The scheme is divided into 48 plots, each of which is 5 ha in size, so only a selected few have access. The local Land Administration Authority, Nkuna Tribal Authority, had to find a land allocation method that is just and allows opportunity for all who live in its lholder farmers due to complex terminology and challenging legal details which dewith the ethos of communal resource administration, land at Julesburg Scheme belongs to the chief, who holds it in trust for his community members. Accordingly, successful land applicants enjoy rights to use but not own or transfer the land. The chief has the right to repossess the land if plot holders do not use it, although since the re-organising of the scheme to give individual access around the year 2000, no-one has had their user-right removed. In 2013, the chief gave a blanket PTO to the scheme committee, with individual allocations on the scheme listed in it.

Low and declining utilisation of irrigation land. When the research started in 2012, 32 of the 48 plots (5 ha each) in the scheme were being used. By end of 2014, the figure had dropped to 21. Along with this sharp reduction in farmer activity, cropping intensity of those remaining farmers has also decreased. The estimations which underpin the heart of the discussion were not presented in detail, given the relative complexity of calculating cropping intensity, but the essence summarised in Table 9.4 was explained. Plot utilisation (quantified as the cropping intensity) was estimated at 60%-70% (approximately 1/3 of the land cropped twice per year). At the start of 2015 it was estimated from transect surveys that on-farm intensity for that year would likely be in the vicinity of 20% (1/10 of active plots cropped twice per year). The net result of the decline in number of farmers farming and on-farm intensity is a significant drop in scheme cropping intensity from 40% to 18%, i.e. less than half the overall land-use activity on the scheme. This is a trend of major if not terminal decline, and is well below the threshold for scheme survival, where cropping intensity would likely need to be a minimum of 100%, or ideally 160% to 180% (i.e. all the land used 1.6 to 1.8 times per year).

TABLE 9.4: Estimations of overall scheme cropping intensity in 2012 and 2015

	2012		**2015**	
	Number	**%**	**Number**	**%**
No. of farmers active (5 ha plots)	32 of 48	67%	21 of 48	44%
Cropping Intensity per plot	35% per season	60%	20% per season	40%
Scheme cropping intensity		**40%**		**18%**

Shared perspectives on tenure type and utilisation. Farmers confirmed the findings of land-use and production in decline and gave several explanations for these. The first was that they felt they had to farm under very risky land tenure conditions. The Tribal Authority does not give them any form of documentation to acknowledge their rights on land and which can be used to mobilise loans or funding from banks. The research team advised that communal land/tribal land cannot be issued to individuals using the system of individual deeds of grant without major and unlikely legislative transformations across RSA, at least in the foreseeable future, and other alleviating solutions are thus needed.

Farmers agree that it is not practicable to apply a system of individual land ownership on tribal land, but are adamantly insistent that something needs to be done to strengthen their user rights within the context of the communal land allocation system. Farmers were also alerted to confusions and uncertainties regarding PTO Certificates, and it was explained that PTO certificates do not confer rights of ownership of land to plot holders, other than user rights. This limits the already small possibility of a PTO certificate holder to bargain for loan funding.

While the prevailing thinking around uncertain land rights prevents farmers from committing to long-term investments (such as setting up efficient irrigation infrastructure and erecting fencing around their plots), it was found that since the scheme has been operating there has not been a single incident in which a plot holder's land has been repossessed by the chief/ tribal authority, whether arbitrarily or for any other reason. This goes some way to demonstrate that the absence of documentation in land administration is not a sufficient cause for insecurity in relation to use and access on a year-to-year basis, even for extended years, as set by the local precedence. However, right of the Chief to arbitrarily remove someone remains understood by all parties. In addition, while those using their plots do not fear losing their rights, they are unable to use the land for loan financing, or as a basis for medium-term business planning for commercial loans, given the year-to-year mandate of the PTO. It was agreed that even though ad-hoc rental arrangements are made, there are obvious limitations regarding exchange or use as collateral.

While the transfer of rights on land at Julesburg Scheme has enjoyed stability since its inception to the present, at a scheme meeting that was held in November 2014 the scheme committee chairman reported that the chief was threatening to repossess all of the plots that were not being used, with the idea of giving them to other community members who wanted to use them.

This issue was discussed and participants agreed that the chief was issuing a positive threat, forcing farmers to use the irrigation land. Moreover, farmers reported that the chief allows farmers to practise land exchange among themselves as long as they do not sell the land. This last finding does not, however, discount the need to put in place formal methods of land administration which increase tenure security and bring certainty regarding the conditions under which plot holders can lose their land rights.

The lack of formal structured leasing arrangements explains to some degree why many 5 ha farms on the scheme are used neither by those with use-rights, or by others keen but unable to

secure access to the land. However, it was concluded that while land-tenure presents many issues for the participants as individuals trying to farm, there are other, more pressing explanations for their low land-use intensity.

9.4.6 Fencing issues

There is no fence around the perimeter of the scheme so individual farmers must invest in their own fencing, and some have done so. Fencing remains a priority issue, with several farmers reporting having lost their crops to cattle every season. The community rule is that if cattle destroy one's crops, the owner is reported to the headman, who assesses the case at a community court and fines the cattle owner if he is found negligent. However, most cases do not get reported because the complainant does not see the cattle in his/her field, waking up to see their crops destroyed and the cattle long gone. Fencing a 5 ha plot is estimated to cost in the region of R 40 000 to R 50 000. Farmers said that lack of secure rights on land, and the uncertainties related to many aspects of farming including land-tenure, discourages them from undertaking such big investments. The high cost of fencing, they agreed, is however a major factor in explaining why most of the plots are not fenced, not just the reality of insecure land tenure. The few farmers whose plots are fenced are generally those that were previously in good jobs and are now using their pension funds to finance farming.

9.4.7 Farming knowledge

Although most farmers at the scheme did not study farming at school, farming knowledge is easily accessible to them. There are about seven extension officers deployed in the Nkuna community in general, and one who is dedicated to service the scheme. The Julesburg scheme is located within the service area of Berlin Farm, an arm of the regional Department of Agriculture whose task is to provide extension services to local farmers. The scheme is easily accessible by road from Berlin Farm offices. On the agronomy side of farming, Julesburg plot holders are well-serviced, mainly by their input (seed, fertiliser and chemicals) suppliers, all large firms based in nearby Tzaneen. What they lack is knowledge on the best (most profitable) crop to plant in a season. This needs a solid understanding of market behaviour and trends. It was suggested that Berlin Farm, as the centre of the local Departmental Extension effort, needs to dedicate personnel that work closely with farmers, providing advice on crop choice and market trends.

9.4.8 Information exchange on typical crop budgets

The second main project survey included detailed data collection on the production costs and returns (gross margins) of all crops grown in the period July 2012 to June 2013. Detailed crop budgets were entered into a database and reported on in Chapter 5. The main purpose of the engagement was to introduce farmers to a way of preparing and analysing crop budgets. Typical crop budgets were selected from the data set and were consolidated and presented to farmers to facilitate learning and to cross-check the summary analysis. This activity proved to be of real interest to participants and the group was able to arrive at best estimates of gross margins for maize, okra and green beans. It was immediately evident to farmers that growing maize under

irrigation was investing in an enterprise that was only likely to break even, but okra and beans in particular were lucrative and justified risks. Interestingly, when indicative future irrigation service charges were added to the input costs of okra and green beans, it seemed that farmers could accept the (potential future) input cost of water, given the advantages of a more secure irrigation water supply.

9.5 Proposed development interventions that will address priority challenges of irrigators at the Greater Tzaneen site

9.5.1 Summary of obstacles

The identified obstacles to farmer development are outlined in Table 9.5. The farmer discussions and case studies were analysed, leading to a prioritisation of challenges. The situation of home gardeners was obviously found to be the most simple as they primarily grow at a small scale, mainly for home use, on land within the homestead. Scheme and independent farmers on the other hand grow at significant scales (2 to 10 ha), primarily for the market, so the nature and scale of challenges is thus very different for these two groups.

TABLE 9.5: Obstacles to successful irrigation development pathways at Greater Tzaneen

Priority Issues	Comments on Historical Challenges
Home gardeners (Rhulani village) (pathways 1,4,11,12)	
Irrigation water supply	Irrigation water is not available from existing piped domestic sources. People innovate technically and invest financially to get water.
Water infrastructure costs	Costs are high. Garden irrigators have invested in either storage tanks (for roof runoff), borehole development, or individual (unlawful) connections to the bulk irrigation water supply system outside of the village.
Extension advice	Agricultural advice is absent. Extension officers do not visit home gardeners in the village to advise them on best vegetable farming practices. People rely on insufficient family and local knowledge.
Scheme farmers (Julesburg) (pathways 3,7,8, 10)	
Water resource (bulk supply)	Water comes from an unreliable source as Tours dam is at risk, not reliable in drought, and farmers in the scheme are the first water consumers to have their supplies cut off. Supply insecurity thus prevails.
Irrigation infrastructure (gravity pipeline to furrows/sprinklers)	The primary water system is unmaintained, partly functional and steadily degrading. However, infield costs are manageable with one's own finance, as supply pipeline pressure eliminates the need for pumping. Existing irrigation methods are wasteful of water (haphazard canals, furrows, leaking pipes, etc.), and degraded infrastructure prevails.
Water institutions	Their DWS allocation and water-use entitlement is not known. The Irrigation Water Committee operates without a formalised relationship with DWS, and institutional uncertainty prevails.

Mechanisation	Services are limited and costly, often with serious delays in getting government or contractor mechanisation to the field. There are too few tractors to meet the demand in time, and few farmers can afford market rates. Subsidised tractor services are R 500/ha while commercial land-preparation is approximately R 2500/ha.
Marketing knowledge	Perennial major challenges with fresh produce market interactions. Mistrust of agents, and not understanding pricing structures are important issues that farmers engage with constantly. Transport, aggregation (small individual volumes), packaging, and cooperative market engagement are important related challenges.
Input finance	The absence of production financing for farmers with less than 10 ha (reported Land Bank cut-off) has meant that all but a few scheme farmers are ineligible for Government loans, and although ad-hoc government grants and inputs have been received over the years, no-one has been able to secure a production loan. Loan access is limited by absence of water licenses, business plans, and ownership and lease rights. Family resources, savings and personal loans thus drive the agricultural cycle but are a limiting factor.
Independent irrigators (Greater Tzaneen) (pathways 2,5,6,9)	
Irrigation infrastructure – pumping costs	Almost all independent irrigators rely on pumped irrigation systems. The investment costs (R 30-50,000/ha) are extremely difficult to secure without external financial support (a grant or loan), and operating costs are a major issue. Furrows and drip are preferred in-field as they are associated with lower investment/operating costs, compared with sprinklers.
Mechanisation	Independent farmers face similar mechanisation problems to scheme farmers. However they showed more persistence in mobilising Department of Agriculture, DTI and Land Affairs as a characteristic feature of their pathways.
Marketing knowledge	Local market engagement is generally achievable through bakkie-traders and outlets at taxi stops and pavement stalls. However, access to distant bulk fresh-produce outlets (markets, supermarkets) is a dominant challenge (see above – scheme farmers).
Input finance	Similar to scheme farmers, although independent farmers generally have more financial capital to support their farming enterprises. Limited financial capital limits enterprise size.
Rules of land access and control	PTOs are widely the mode of tenure, and most (but not all) view this as adequate for on-farm investment (fencing/piping) on their present farms.
Rules of transfer (rentals/leasing)	PTO arrangements are severely limiting for farming expansion and new entries, as unoccupied land is no longer available. Lease mechanisms for occupied but unused land are weak or absent, and there is fear of losing land when leasing. Limited land lease mechanisms are thus a critical limitation to all of the expansionist pathways.
Rules of water authorisations (GA/license)	Formal permission from the DWS to use water is largely absent, and farmers operate in institutional isolation. Where not reliant on boreholes (i.e. Tours Dam, released into Nwaveti River), the water-use entitlement is perceived to be insecure, putting farming investments at risk.

9.5.2 Ranking of obstacles in relation to main identified pathways

Scheme and independent farmers face different organisational challenges, as the collective dynamics of farming on a scheme bring unique challenges, mainly around the operation, maintenance and management of the water supply system itself. The physical proximity and shared boundary of the scheme also presents a natural opportunity for collective action by farmers in relation to agricultural activities (inputs, markets, etc.). Apart from organisational differences, the actual challenges faced in the agricultural sphere are largely similar for both scheme and independent farmers. The analysis of agricultural-systems factors in regard to obstacles is therefore the same for scheme and independent irrigators, whereas obstacles in relation to organisational and institutional elements are addressed separately for scheme and independent irrigators.

The focus of the project is on the promotion of smallholder farming in a transition from home-gardening to field farming. The discussions on obstacles and solutions includes for: Pathway 1, home-garden intensification through irrigation; Pathway 2, independent irrigation farming; and Pathway 3, irrigation scheme farming.

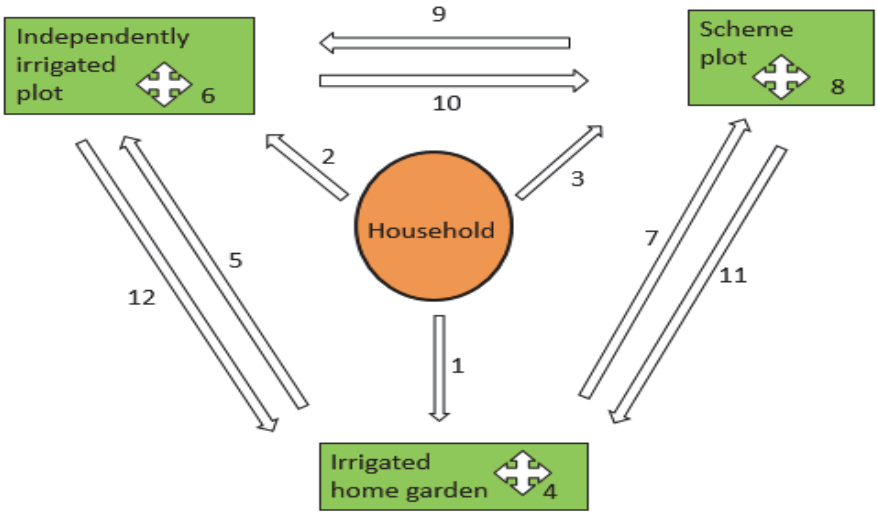

FIGURE 9.2: Development Pathways (Trajectories) Framework

The pathways can be aligned with the Cousins (2014) typology. Pathway 1 is characterised by intensified irrigated food production in the home-garden. While pathways 11 and 12 were described in cases, the understanding of obstacles is mostly about the site of practice, rather than the route to get there. The irrigated home garden scenario is well-aligned with the smallholder (SH1) in the Cousins typology. The independent irrigators (Pathway 2) and scheme irrigators (Pathway 3) fall across both categories (SH2 and SH3) (Table 9.6).

TABLE 9.6: **Qualitative alignment of pathways with smallholder typology for South Africa (Cousins, 2014:34 & Manderson, 2015)**

Attribute	**Smallholder categories and codes**			
	Subsistence-oriented smallholders (**SH Code 1**)	Market-oriented smallholders in loose value chains (**SH Code 2**)	Market-oriented smallholders in tight value chains (**SH Code 3**)	Small-scale capitalist farmers (**SH Code 4**)
Pathway 1 (also 11,12) (intensified home gardener	all	---	---	---
Pathway 2 (also 5,9) (independent irrigator)	---	Yes	Yes – majority	few
Pathway 3 (also 10,7) (scheme irrigator)	few	Yes – majority	Yes	---

A ranking exercise was carried out in the consultation sessions, as shown in Table 9.7. The purpose of this prioritisation process was to understand, from the farmers' perspectives, which challenges have presented the greatest limitations to their progress as farmers thus far, and thus warrant the most attention in any formulated response to address obstacles. The exercise also served to focus discussion on solutions which would have the most impact on accelerating their development trajectory.

The scoring of the severity of the challenge was done qualitatively using a scale of 1 to 5, with 1 reflecting elements which are readily addressed without intervention, and 5 reflecting elements which are critical with progress effectively blocked due to the obstacle. Arriving at indicative values of severity required extensive discussion on each item but in all cases led to a general sense of agreement on the scoring.

It is important to note that the independent farmers were observed to be comparatively sophisticated in their business strategies, particularly in obtaining production information from input suppliers, and in their marketing approaches. This reflects the reality that all of the independent farmers commenced farming on their own initiative, usually with little or no external support. They are generally more capable and resourceful than Julesburg scheme farmers, who are characterised more by endurance as a quality. It is of interest, but cannot be applied more widely than the group participating in the workshops, that in the Greater Tzaneen sessions, the home gardeners and scheme farmers present had difficulty comprehending the basis and systematic application of the severity scale to discussions, but all of the independent farmers were able to engage with the rationalisation approach immediately and coherently.

The summary of priority challenges for irrigation farmers was ranked and colour coded, and the data in Table 9.7 shows priority challenges as orange (severe = 4) or red (critical = 5) hotspots. The farming systems framework was used to list agricultural factors, which facilitated easier engagement by farmers. The organisational and institutional factors are addressed separately in Table 9.8, focussed on independent and scheme irrigators, as the home-gardeners are not subject to these limitations.

TABLE 9.7: Severity of obstacles to successful irrigation development pathways at Greater Tzaneen site in a farming system framework

Farming system factors	Obstacles for Pathway 1 (home gardeners)	Severity	Obstacles for Pathways 2 and 3 (independent and scheme irrigators)	Severity
Water resource	Boreholes used but expensive. Roofwater tanks not widespread. Unlawful connections increasing.	4	Resource from Tours dam at risk and not reliable in drought. Reliable source < 25% of surveyed total.	3
Land resource	Homestead space limited in size but secure in exclusive use-right.	1	Physical portions of unused irrigable land is available but getting access to use the land is difficult.	1
Irrigation infrastructure – pumped	Hand-watering or hose systems generally adequate for small gardens. Pumps not essential.	2	Very high capital investment costs – nearly impossible to develop at scale without loan finance.	5
Irrigation infrastructure – gravity	As above, delivery to garden not limiting in itself. Cost of storage and supply is main water issue.	3	Manageable with own finance but difficult.	3
Fencing – ability to install fencing	Homestead plots are typically fenced.	2	Can manage somehow to sort out the fencing although it is difficult.	3
Mechanisation – availability	Hand-cultivation prevails in the gardens.	2	Available but delays of 4 weeks or more in getting them to the field.	3
Labour availability and willingness	Family labour.	1	Labour available for work in the fields when they are paid; affordability is the issue.	1
Farming knowledge and skills	Production knowledge needed but can be accessed via local or commercial networks.	3	Some feel access to knowledge is easy, others found it significantly more difficult	2
Marketing knowledge	Not a key driver of Pathway 1	1	Major challenges with transport, aggregation (small individual volumes), and agent trust regarding prices.	4
Input finance	Financed by household income.	2	Impossible to get input financing as small farmers: water and land issues; business plans required.	5
Climatic and pest risks	Exposure to risk, but overall impact relatively small, given other primary livelihoods means.	3	High risks of climate/pest impact that leave farmers exposed – can partly mitigate with insurance.	5
Risk to profitability (local markets)	Not a key driver of Pathway 1	1	Green maize, tomato, beans, cabbage, potatoes for local market. Limited absorption, but predictable.	1
Risk to profitability (distant markets)	Not a key driver of Pathway 1	1	Green beans, okra, green pepper, chilli (mainly distant market). Unpredictable but attractive.	4

TABLE 9.8: Severity of organisational and institutional obstacles at Greater Tzaneen

Institutions impacting on farming	Institutional Obstacles for Pathway 2 (independent irrigators)	Severity	Institutional Obstacles for Pathway 3 (scheme irrigators)	Severity
Rules of land access and control	Irrigable land available but distant from water sources. Verbal agreements with Traditional Authorities prevail. Limits to very small scale < 4 ha	4	Annual PTOs viewed as an uncertainty and disincentive. Minimal investment in on-farm infrastructure (fencing, piping, etc.).	4
Rules of transfer (rentals/leasing)	No formal provisions for leasing on tribally-managed lands. Major disincentive when scheme and other land is unused.	5	Cannot lease unused scheme land as plot-holders with rolling annual tenure fear losing their rights if they lease out unused portions.	5
Rules of water authorisations (GA/license)	Lack of knowledge of authorisation and licensing requirements. Bureaucratic hurdles viewed as major. Not linked to CMA or allocation systems.	4	Julesburg farmers have no formal permission to use water and are uncertain on rights. Tours Dam water supply is over-allocated and legally insecure.	4
Scheme Operations and Maintenance rules	Independent irrigators need no on-farm collaboration around irrigation systems.		Coordination of water efforts is limited. System is in dire straits technically. Ad-hoc emergency repairs only. Rules are weak or absent. Repair needed.	5

Severity of farming challenge	1	2	3	4	5
	none	minor	moderate	major	critical

9.5.3 Strategies to address primary challenges at Greater Tzaneen

The priority obstacles were focused on and interventions developed through a discussion process that was subject to a two-way information stream, with farmers sharing their own perspectives and the team providing additional knowledge, experiences and examples of solutions from the literature. The proposed interventions outlined below are targeted to address the critical factors which are presently sub-threshold.

Intervention 1: Market education

Facilitate market education, and facilitate access to fresh produce markets in particular. This can be done by: i) implementing market education and real-time market-information systems so farmers both understand how the fresh-produce markets work in relation to logistics, agency fees, produce quality, labelling, packaging and payment arrangements, and can be empowered with daily market price information so they can negotiate and deal with agents informed by real prices; and ii) active involvement to leverage efficiencies within the value-chains of the most important crops by analysis of the value-chain, and follow-on interventions which exploit opportunities that emerge from the analysis. The latter could include organisational interventions which combine packaging and transport so that costs are minimised, and delivery to markets being done in bulk for more efficient agent handling (and agent interest), thereby avoiding multiple small shipments which have inherently high losses and costs.

Intervention 2: Land leasing protocols and related local administrative systems

Provide increased institutional certainty for land-leasing and on-farm investment through renewed land tenure institutions. This intervention needs to build from the local land administration arrangements already in place on schemes and for independent farmers, and should aim to ensure up to a 10-year lease of irrigation farms or scheme plots. Local land leasing systems are well-established in their justification and methodology in South Africa, and this prior work can readily inform the nature and detail of land-administration and leasing interventions.

Intervention 3: Dedicated support to acquire water-use licenses

Provide active institutional support for HDI irrigation farmers (individual irrigators and scheme farmers) to secure water-use licenses and thereby obtain greater water security to justify risks and personal investment. One of the priority motivations for the current review of the National Water Act is set out in the DWA Policy Review Positions Paper (DWA, 2013), which highlights the complete failure to achieve Water Allocation Reform (WAR). The priority objective of the WAR strategy (DWAF, 2008) was to achieve political redress of severe historical water inequality and mechanisms are in place in the now Department of Water and Sanitation (DWS) to provide for preferential treatment in regard to licensing of water use for Historically Disadvantaged Individuals. However, the reality for the participating farmers is that they have been unable to secure water use licences despite the evident political will. The water administration bureaucracy is very complex terrain and effectively marginalises smallholder farmers due to complex terminology and challenging legal details which demand lobbying capability and a high degree of capability (van Koppen & Schreiner, 2014). Active and dedicated support to drive a process to conclusion in the form of secure water use

licenses is a critical need for farmers, and one that the DWS has been unable to provide at the study sites.

Intervention 4: Grants and/or loan funding for home storage, bulk and infield irrigation infrastructure.

While secure tenure, water entitlements and market knowledge are all critical and at below functional thresholds, these serve no purpose without a functioning irrigation system to convey water. Substantial irrigation infrastructure investment is needed for independent irrigators and on government smallholder schemes. The DWS Resource Poor Farmers Subsidy is a suitable and appropriately structured instrument specifically intended to provide avenues of funding for water infrastructure feasibility studies, bulk water investment and operational subsidies, water-harvesting tanks, and reservoirs, among other categories of support. However, funds allocated for the whole of South Africa were reportedly only ZAR 1.7 million per province in 2015 (Ngilana, 2015), which is inadequate for any intervention beyond one or two mini-projects. While the subsidy instrument is responsive to the need, the administrative process to access funds, and the amount of funding is dramatically short of what is needed to transform the smallholder irrigation sector. In the absence of direct support, expansion of this sector will be limited by the high capital costs irrigation practices demand. While the introduction of high tech, lower cost, irrigation systems such as low-cost low-pressure drip systems for independent irrigators, supported with technical guidance, might assist, the unavoidable reality is that irrigation investment costs (both new and rehabilitation) are significant and largely unavoidable. The unavoidable fact of high capital investment requirements, means that agricultural returns must similarly be high to ensure significantly positive cost-benefit ratio (min 12-15% financial internal rate of return (FIRR)), demanding attention to all elements of the agricultural enterprise production system.

Intervention 5: Scheme water management institutional development

An intensive effort to establish self-financing irrigation water management institutions on schemes is needed. Irrigation services provision on the small schemes that are typical of South African smallholder schemes (100-2000 ha) is practical and achievable using farmer-centred, participatory irrigation management (PIM) approaches. Water services based on affordable fee recovery can be effectively tied to lease arrangements as part of that separate intervention, closing the loop of control for effective water administration and enforcement. The dysfunctional precedent and weak local knowledge of water-management, maintenance, administration and conflict resolution processes likely require supported, transitional service arrangements for irrigation water provision on schemes.

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Chapter 10 Discussion and Conclusions

10.1 Context of the study

The economies of many countries, both developing and developed, are experiencing a structural crisis, which is expressed most visibly in high levels of unemployment amongst the youth. South Africa is one of these countries. Statistics South Africa (2015) reported that of the 19.5 million South African youth, which it defined as people aged 15 to 34 years old, 9.89 million (50.2%) were part of the labour force, whilst the remaining 9.82 million (48.8%) were not economically active (still at school , not seeking work, or given up looking for work). Considering only the labour force, 6.24 million youths (63.1%) were employed and 3.65 million (36.9%) were unemployed. If the group of discouraged work-seekers among the youth, which stood at 1.53 million in 2015, were added to both the youth labour force and the unemployed category, the unemployment rate among South African youth rose from 36.9% to 45.3%, a crisis indeed. In South Africa, unemployment and poverty are closely associated, and the rural areas are nodes of both unemployment and (chronic) poverty (Aliber, 2003; Armstrong *et al*., 2008). Economic development of these areas is, therefore, imperative.

How to bring about economic development in the rural areas is not self-evident (Aliber, 2003) but agrarian development appears to be the most obvious route in which to use local resources to create employment (Van der Heijden & Vink 2013). Elsewhere, particularly in Asian countries during the Green Revolution, pro-poor agricultural development has raised farm incomes and rural employment, contributed to lower food prices, and generated strong growth linkages in the non-farm economy (Hazell *et al*., 2010). However, Hazell *et al*. (2010) pointed out that pro-poor agricultural development was dependent on the relatively even distribution of land. South Africa does not have a relatively even land distribution, on the contrary, its land is extremely unevenly distributed (Ortmann & Machete, 2003).

Van der Heijden and Vink (2013) contend that South African farmers can make a living from small plots if they participate in high value markets. Fruit and vegetables are examples of high value crops that can be grown on smallholdings but in a dry country like South Africa, these crops are usually dependent on irrigation (Betek & Jumbam, 2014).

In a deregulated economy, markets are supplied by private enterprises. Deregulation of the marketing of most agricultural products in South Africa occurred in 1998 (Vink & Kirsten, 2003). Since then the South African agro-food sector has seen an ongoing trend towards vertical integration and consolidation (Louw *et al*., 2008; Madevu *et al*., 2009, Ramabulana, 2011, Van der Heijden & Vink, 2013). Supermarkets have been the principal drivers of this trend. They have actively developed 'preferred supplier networks' to ensure reliable supplies of large quantities of fresh produce that meets their quality standards. These supplier networks are dominated by a relatively small number of predominantly large-scale farm enterprises and researchers agree that, *ceteris paribus*, the scope for smallholders to become part of these networks is limited (D'Haese & Van Huylenbroeck, 2005; Louw *et al*., 2007; Louw *et al*., 2008; Ortmann & King 2010, Ramabulana, 2011; Van der Heijden & Vink, 2013). Greengrocers and informal street traders also play and important role in the fresh produce trade (Louw *et al*., 2004; Madevu *et al*., 2009) but generally they source their fruit and vegetables from national fresh produce markets, which are found in all the major cities (Madevu *et al*., 2009). These city markets are accessible to smallholders but high implicit and explicit transaction costs of marketing relatively small quantities of produce depress margins (Senyolo *et al*., 2009; Ortmann & King 2010; Ramoroka, 2012). There is, however, evidence that smallholders can participate effectively in local markets (Manyelo *et al*., 2015). This

'main' opportunity for smallholder market participation was also pointed out by Aliber & Mdoda (2015), when they lamented the pre-occupation of South African researchers and policy makers with linking smallholders to formal markets instead of building consciously upon the informal and quasi-formal market system that seems to exist already. These market systems are dominated by small-scale entrepreneurs.

Enhancement of entrepreneurship is seen by many as key to growth in a free-market economic system. Entrepreneurship in the South African informal sector is by and large, small-scale entrepreneurship, and largely synonymous with self-employment (Rolfe *et al*., 2010). Two categories of informal enterprise have been identified, namely survivalist enterprises and micro- or growth enterprises (Morris & Pitt, 1995; Rogerson, 1996, Finmark Trust, 2010). Whilst survivalist enterprises are motivated by necessity, generate limited income and rarely go beyond self-employment (Calvin & Owalade, 2011), micro-enterprises tend to be more motivated by opportunity and offer the best potential to grow, create employment and bring about economic development.

Smallholder agriculture, irrigation and entrepreneurship are central to one of the main developments proposed in the agrarian development strategy elaborated in the National Development Plan: Vision for 2030 (National Planning Commission 2011), which is the response of the South African government to persistent and rising unemployment response. This proposal is to establish a vibrant smallholder sector based mainly on irrigated agriculture. Smallholder agriculture, irrigation and entrepreneurship are also the central themes in this research project. This suggests that the findings of this project could prove useful when implementation of the proposed agrarian development strategy is considered.

Work in this research project was aimed at meeting two main objectives. The first was to empirically determine how and to what extent smallholder irrigation and entrepreneurship affected the livelihoods of people. The second part was aimed at discovering the various pathways people had used to enter (entrepreneurial) irrigated smallholder farming, to record the constraints and limitations they had experienced on their journeys, and to identify suitable ways of facilitating important pathways.

10.2 Irrigated smallholder agriculture, entrepreneurship and livelihoods

10.2.1 Irrigated smallholder agriculture and livelihoods

Comparison of the livelihoods of three groups of households, consisting of home gardeners, scheme irrigators and independent irrigators at two research sites provided compelling evidence that irrigated smallholder agriculture and improved livelihoods were closely associated. In terms of natural capital base, irrigator households differed primarily from the largely landless home gardeners, by having access to land and also to water to irrigate that land. At the Thulamela site scheme irrigators held about 1 ha of irrigation land on average, and independent irrigators about 2 ha. At the Greater Tzaneen site the average irrigation holding of scheme farmers was 5 ha and 6 ha for independent irrigators. The results showed that the human, physical and financial capital base of irrigator households was also significantly greater than that of home gardener household, as were important livelihood outcomes. Incomes of irrigator households were two to three times higher than those of home gardeners, and, on average, well above the upper-bound poverty line, whilst the average income of home gardeners in Thulamela was below this line, and in Greater Tzaneen just about on this line. Irrigator households were also more food secure than home gardener households, because they spent more money on food, which is an indication of a better and more diverse diet (Budlender *et al*., 2015), and also produced larger quantities of food for own consumption. Burney and Naylor (2011) considered smallholder irrigation to be a successful poverty alleviation tool when it paved the way for increased

consumption, asset accumulation, and reduced persistent poverty among users, and over time lead to institutional feedbacks that support sustained economic development and nutritional improvements. The evidence collected at the two study sites indicates that most if not all these criteria had been met.

Having come to this most exciting observation, it is right time for some caution. Firstly, associations between factors do not necessarily indicate causation. Comparing the livelihood activities of irrigator households with these of home gardeners through the various income flows it can be seen that irrigator households had significantly higher incomes in the form of regular inflows made up of employment income, grants and remittances, and also higher incomes from non-farm economic activity, especially at the Thulamela site. To what extent irrigation was the enabler of the strengthening of livelihoods or the result of an already superior asset base is difficult to establish conclusively but the results obtained from scheme farmers in Thulamela suggest that in their case irrigation was the enabler. Secondly, the evidence from both sites clearly shows that irrigator households are predominantly-male-headed, whilst among home gardeners female-headed households are dominant. Aliber (2003) identified female-headed households as one of the groups most prone to be stuck in chronic poverty. Van Koppen *et al*. (2005), who paid particular attention to gender and women in smallholder irrigation, recommended the 'removal of obstacles' that prevented women from full participation in irrigated agriculture but merely removing obstacles may not be adequate. The case of Nthuseni, the female-headed three-generation rural dweller household, presented in Chapter 7 of the report, provides some insights. Given access to irrigation land, would this household mobilise its human resources to construct an agrarian existence? Thirdly, evidence from elsewhere in Sub-Saharan Africa casts doubt on the universality of the positive association between livelihoods and smallholder irrigation (World Bank, 2008). The lack of impact of irrigation on poverty reduction appears to result from the failure to raise other input levels. Water is a necessary factor to achieve optimum plant growth but it is not a sufficient factor. High levels of plant production also require that other plant growth factors are optimised (Fanadzo *et al*., 2010). Of particular significance in irrigated agriculture are the use of fertilisers and improved seed (Faurès & Santini, 2008; World Bank, 2008).

10.2.2 Home gardening and irrigated farming

One of the striking differences between home gardening and irrigation farming was the purpose of production. Where home gardening was done primarily for own consumption (subsistence), irrigation farming was done primarily for markets (commercial). The second important difference was that in terms of inputs home gardening was largely a LEISA (Low External Input Sustainable Agriculture) system whilst irrigated farming involved purchased inputs, mainly fertilisers, but also seed and plant protectants.

The current study showed that production in home gardens and other farming activities made a significant contribution to food consumption. In Thulamela, home gardener households consumed on average R27.88 worth of food per day and farming activities (R680) supplied this food value for 24 days. In Greater Tzaneen, where households consumed on average R25.71 worth of food, faming supplied this food value for 56 days (R1 454). Quantitatively, these contributions are surprisingly similar to the value of R750 arrived at by Altman *et al*. (2009) who estimated the saving on food expenditure by own production from the gap in the 2005/06 household expenditure on food between urban and rural households. A similar approach was used by Aliber and Mdoda (2015) on 2010/11 data to estimate the value of production on land in the former homelands. Their estimate was R658 ha^{-1}. The findings in this project suggest that a significant part of this value (perhaps as much as 40%) could be generated in home gardens.

A high degree of commercialisation of farming, defined as the proportion of gross income that was derived as sales, was observed on both scheme and independently irrigated plots in Thulamela, hovering around 90%. Ten years ago at Dzindi (2002/03) this value was only 48% (Van Averbeke, & Mohamed, 2006). This indicates that the purpose of production has almost completely shifted away from subsistence to market-oriented, and this could well be related to the rising cost of irrigated farming.

10.2.3 Irrigated farming and entrepreneurship

The enquiry into entrepreneurship among households at the two sites produced interesting results. Farmers in the three household groups were assessed in terms of three psychological traits that have been associated with entrepreneurship, namely 'need for achievement', 'locus of control' and 'risk-taking propensity'. Generally, very limited differences were observed between the three household groups in terms of psychological traits, though when grouped, Thulamela scored higher than Greater Tzaneen. The Thulamela group's high scores conform to the qualitative data collected from selected cases. The group wants to be perceived, socially/traditionally/culturally, as a farming community dedicated to hard work and as a disciplined and determined unit that values labour and frowns upon displays of laziness, particularly in the domain of agriculture as a way of provisioning food. It is of interest that their low (self-assessed) scores for uniqueness of their farm enterprise reflect the tendency to downplay any features that suggests individualism. In this way, downplaying of uniqueness (innovation) expresses the avoidance of being the object of community talk of overachievement and "making oneself better".

The aspiration of the large majority of farmers was to grow their farm enterprise, irrespective of the group they belonged to or the study site. Home gardeners aspired to expand garden production to raise their food production, while irrigators aspired to grow their 'farming businesses' by expansion, acquisition of farm assets and gaining access to new markets. The primary goal of home gardening at both sites was to obtain food for home consumption. By contrast, the primary goal of irrigated cropping on scheme plots and independently irrigated plots was to generate monetary income by marketing what was being produced.

The results of the cluster analysis, which made use of seven variables, all of which signified different aspects of entrepreneurship, yielded useful household categories, seven at Thulamela and three at Greater Tzaneen. At both sites, the majority of households demonstrated low to very low levels of entrepreneurship based on the indicators used. There were also a minority of households who appeared to be engaged in entrepreneurial activity that appeared to be motivated by opportunity. At both sites, the largest number of such households were found in the cluster labelled entrepreneurial smallholders. This label reflected that these households were primarily engaged in 'the business of farming' in its broadest sense. In Thulamela three more household categories represented what looked like entrepreneurs motivated by opportunity. The first two were labelled petty portfolio entrepreneurs and portfolio entrepreneurs. Both of these categories were involved in multiple enterprises, usually including market-oriented farming. The last category, labelled small-scale capitalist farmers, only had a single representative and stood out for very high entrepreneurship indicator values. Of importance also was the finding that irrigated farming was associated with raised levels of entrepreneurship, but the overlap between irrigated farming and entrepreneurship motivated by opportunity was far from complete.

It can be concluded that rural entrepreneurship, which included the production of crops and livestock for markets and also any other local business activity, made a significant contribution to the livelihoods of between 30% (Greater Tzaneen) and 40% (Thulamela) of the samples of households that participated in the

study. In households where entrepreneurship was significant for livelihood outcomes, necessity appeared to be the motivating factor for most, but there was also a minority that appeared to be motivated by opportunity. This pattern resembles that described for the informal business sector found in the cities of South Africa, where also only about one out of ten informal enterprises was motivated by opportunity and the rest by necessity.

10.2.4 Emerging themes

Households and relationships of production and consumption: Households consist of people who relate to each other and from a livelihood perspective, relationships of production and consumption are central. The research suggest that the ability of parents to claim farm labour from their children in the household contributes to profitability and livelihood outcomes, with the reverse being equally true. For this reason, the inability of some parents to secure labour from their unemployed children who rely on them for most of their consumption needs must be seen as a social constraint to sustainable agrarian livelihoods. Young people, who were members of rural households, focused their attention on individual social and economic pursuits rather than on the reproduction of their parental home. As observed by Hull (2014), this is a phenomenon which explains the apparent paradox in rural areas of extremely high unemployment levels coexisting with the lack of labour in farming. *These findings lead to the conclusion that it is erroneous to view rural households as cohesive productive units, and the household is characterised more by relationships of consumption than relationships of production.*

Youth and agriculture: The household case studies suggest that young unemployed people often reject farming as a livelihood option, even when farming is the most obvious livelihood option available to them and joining their parents on the farm would most likely improve the livelihood outcomes of their social units. ILO (2010) explained that a lack of decent work, if experienced as an early age, threatens to compromise a person's future employment prospects and often leads to unsuitable labour behaviour patterns that last a lifetime. Growing urban poverty has resulted from an inability to absorb growing populations in cities, a scenario predicted by Brooks *et al*. (2013) who argued that jobs would not be available as the manufacturing of goods was now largely located in Asia. Other sectors of the economy, such as the service sector, would also not be able to absorb the full cohorts of new people entering the labour force in Africa's rural areas. *Consequently, enabling young people to enter farming for a living will have to remain at the centre of rural development thinking. This draws attention to the urgent need to address the factors that have been and continue to drive young people away from farming*.

Age, gender and land: Access to land is a necessary condition for people to take up farming as a livelihood option. The case studies provide evidence that accessing (irrigation) land is not easy, especially for young people and young women in particular. Important from an age perspective is that when access to land is through inheritance, a young person would have to wait a long time before he can obtain access. In the past, when irrigator sons went to work in the city and then returned home when middle-aged (Mohamed, 2006), taking over the farm was less problematic than at present, because the migrancy phase in the life cycle of rural men has been severely interrupted due to the lack of jobs in the cities (see also Hull, 2014). In addition, the evidence from Dzindi indicates that inheritance of land is associated with farm size reduction leaving new generations of farmers with even smaller holdings than their parents. *Access to (irrigated) land at a young enough age, especially for women, was one of the factors that stood out in the study and contributes to the growing disinterest of young people in farming.*

Profitability of irrigation: Measured as gross income, farming contributed significantly to the total income of the households of irrigators, but the gross incomes tell only part of the story. Profitability as expressed by net operating income is sometimes small or even completely absent. Profitable irrigation is dependent on the value of production (gross income) and on the costs incurred to realise this value. *The case studies showed that strategies to increase profitability include both raising the value of production by optimising agronomic factors and marketing, and strategies to minimize costs. Across the various irrigation enterprises, employment of family labour instead of hired labour was one of the main ways in which operating expenses could be minimised.*

Entrepreneurship and local agrarian economies: The economic development of South Africa's rural areas is dependent on the creation of rural employment. Whilst subject to debate, and perhaps dependent on locality, it would appear that farming remains the most likely locomotive of this process. At present, South Africa's macro-economic policy is aligned to the free-market economy. State-owned farm enterprises, which once existed during the homeland era, have been completely dismantled. This leaves the development of local rural economies to private enterprise. *The information gained at the two study sites demonstrates that (irrigated) farming can play an important role in the economic development of South Africa's rural areas. Farming, particularly market-oriented farming, and enterprises that are linked backwardly (e.g. tractor services) or forwardly to farming (e.g. small-scale milling and the informal trade of produce) to market-oriented farm enterprises were shown to contribute significantly to the incomes of households engaged in these business activities.* Whilst several rural households were able to accumulate wealth by engaging in rural business activity, others were less successful. However, even for them, engagement in (survivalist) enterprises enabled them to escape poverty.

10.3 Irrigation development pathways

It is evident that there are diverse pathways that irrigation farmers have followed, but it is the destination that is more important than the route by which they arrived there. The project pathways framework showed 12 possible development trajectories that different farmers follow to end up practising small holder irrigated farming in some or other way (Figure 10.1). The cases show that all of these trajectories were present in reality but it is *mainly the location of the final farming activity that dictates the challenges.*

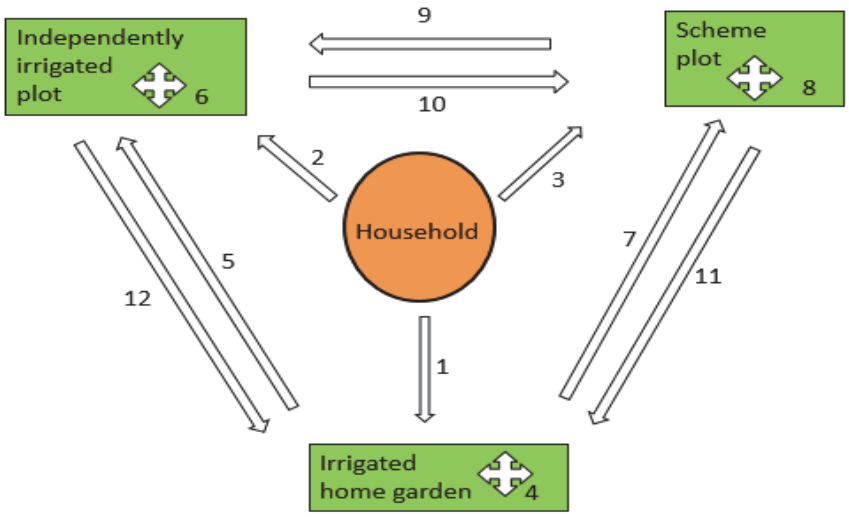

FIGURE 10.1 Development pathways of smallholder irrigation farmers

The research found that the pathways leading to scheme plots and home-gardens are, on the evidence obtained, easier to pursue but on schemes, lack of land combined with completely inadequate informal and semi-formal land-leasing arrangements, limit new entrants accessing scheme plots. The pathways leading to the independent farmer have greater hurdles in the need for higher finance requirements to establish the irrigation system.

Lower-risk pathways: The most immediately accessible development routes are those centred on home gardening and irrigation-scheme farming (i.e. pathways 1,3,7,11,12), with these locations of farming characterised by hereditary land access. On schemes, informal and semi-formal (written but not enforceable) land-leasing allows some, but very limited, new entry. The home-gardeners and scheme-irrigators generally have fewer challenges and lower risks than independent irrigators. The preference for intensification or expansion in home-gardens and schemes is evident despite i) the cost to the individual to install water-systems in the homestead; ii) the reality that there are high transaction costs in getting water due to failed or weak water management institutions on schemes; and iii) difficulty accessing plots and widespread tenure insecurity in rental arrangements. In the case of home gardening, the investments to bring additional water (boreholes, water-tanks or 'unlawful' pipeline connections drawing from an adjacent irrigation scheme are almost always for dual purpose applications, i.e. these are multiple use systems (MUS) (van Koppen et.al, 2009). The substantial evidence of organic growth of MUS systems, despite individual cost, warrants further attention as a strategy. Although the scheme plots are farmed at a much larger scale than the home-gardens, farmers have the advantage of both land and irrigation water in one locality and there are generally no irrigation or service fees payable on schemes which is an incentive, albeit an unsustainable one.

High risk – high return pathways: Independent irrigation farming is in general terms the trajectory pursued by the risk-takers, and represents some of the most vibrant and capable irrigation farmers (pathways 2, 5 and 9). While many scheme farmers at Julesburg, Dzindi and Tshiombo have demonstrated substantial success, the independent irrigators are generally a notch above in their marketing capability and their enterprise sophistication. As with scheme farmers, the independent farmers are dominated by a business outlook where markets are established or envisioned at the time of planting and the primary intention is to generate profit.

While they face uncertainties across numerous domains in the farming system the discussions with farmers showed priority challenges are: difficulty in accessing markets effectively; a high degree of land tenure uncertainty which limits their willingness to invest on-farm in the form of fencing and piping, etc.; and water uncertainty both in the form of licenses and the physical access to the resource and related infrastructure.

While the analytical framework does not talk of irrigator development from dryland farming through to irrigation farming, be it in home gardens or arable fields, prior farming experience is an important factor underpinning successful irrigation development trajectories. Both negative experiences, usually in regard to rainfall uncertainty, and positive experiences, in generating surplus for sale, underpin successful irrigation development outcomes. This supports the idea of incubator farms (FAO, 2010) where new agricultural entrants can learn basic skills before launching on their own development pathway.

The motivation for getting into irrigation farming were also identified from the life histories and throws some light on why people enter irrigation farming and how they evolve:

- *'born and bred': These* are farmers who have a family history of farming. Their inculcated knowledge, passion and historical dependence on farming for food, leads to irrigation investment, intensification, surplus and profit, leading to incremental growth.
- *'the desperates':* Irrigation farming for this group stems from unemployment, lack of options and typically, a time of desperation prior to irrigation startup. The priority need to survive and produce food for the household is the initial driver. Incremental production success and increased sale to markets leads to steady expansion and intensification, but given the origins of prevalent poverty which appear persistent, they seem to have difficulty launching to scale.
- *'the forward planners':* These farmers started irrigating after a period of careful planning and saving, and building on personal skills and financial resources obtained from years of employed work, established their farming enterprises. The initial financial leverage and workplace-skills and experience seem to set this group on a higher starting platform with a characteristic faster and more successful trajectory.

10.4 Obstacles to irrigation development pathways

Water tenure security, land tenure security and access to markets arose as critically limiting issues in relation to expansion, both within schemes and for those moving onto schemes, as well for independent irrigators. The confusing, conflicting and variable interpretations of land institutions, particularly the process to obtain and value of a PTO, are a major limitation to irrigation development pathways and a strong disincentive to irrigation development. Fear of losing land to lessees was a dominant theme limiting land-leasing transactions for scheme and independent irrigators. The prevalence of water stress compounds the institutional risks resulting from the widespread absence of formal mechanisms of access and control to both land and water. These challenges were assessed and solutions were developed in collaboration with farmers:

- **Incentives of secure land tenure, water use rights and leadership** in organisational structures are seen as a critical condition (pull factor) for the expansion from homestead food gardening to smallholder irrigation farming, increased water use productivity of crop production and improved livelihoods. The research findings and feedback from home gardeners, scheme farmers and independent irrigators in both Thulamela and Greater Tzaneen, show that these incentives are largely absent.

- **Expansion in scale occurs in spite of the prevailing disincentives.** Accessing land is a confusing and high risk process with multiple gatekeepers, both governmental and traditional, all seeking to obtain some benefit from the transactions. While demands are made in the name of due-process, these are often not supported by any legislation or policy, but are given pseudo-legitimacy in the absence of legal clarity and formal institutions. Legislation has loopholes and is variously interpreted or ignored, and the resulting legislative vacuum leaves those wishing to make a living from the available land and water exposed to unacceptable uncertainties in regard to their land and water use rights, and very often exploited.

- **Use of own resources:** To obtain the equipment needed to irrigate, people largely depend on their own resources. There are, in effect, no financial institutions that provide financial support in the form of reasonable loans for this type of business development.

- **Irrigation farmers are on their own when it comes to marketing.** They learn from failures and get better as individuals, but not as a class. Farmers face barriers in understanding and benefitting from tight value chains, particularly fresh produce markets where they believe they are exploited. The government is absent when it comes to assisting small-scale irrigators with market access.

- **Government is primarily seen as a potential source of money**. This is not its primary function, but appears to be what people expect from Government. One example is the subsidised ploughing assistance which is valued by farmers at Greater Tzaneen but has had the effect of distorting the local mechanisation-contractor market and created dependency on an inadequate and unreliable service. As a knowledge service provider, the Government extension service is not viewed as a valuable source of information and solutions to take people's farming businesses forward.

- **Youth stay away from farming.** Farmers call the youth lazy, noting the reality that most of the independent irrigators are older than 50, though there are cases of young entrepreneurial irrigators. However, when one considers the circumstances of high risk, complexity of farming and difficulty achieving profits, it is difficult to blame the youth from staying away from farming.

10.5 Recommended strategies

Strategies were developed with multiple, in-depth consultations with different farmer groups at Thulamela and Greater Tzaneen. The writers propose that these mutually-formulated strategies will address the dominant challenges and provide both a launchpad for new entrants and accelerate development of existing smallholder irrigators.

10.5.1 Land tenure interventions

Identify and secure irrigation land for small-scale farmer settlement outside the former homeland areas (pathway 2): The most evident place to find irrigation land for small-scale farmer settlement is on existing white-owned irrigation schemes, as proposed and elaborated by Cousins (2014). Stipulating the conditions for implementing smallholder settlement should include private land ownership as one of the ultimate outcomes of the settlement process. Restricting land tenure to usufruct rights only will lead to parts of the scheme land not being used productively and to variable interest among members in the upkeep of the irrigation infrastructure.

Legislate individually-held title deeds on irrigation land under traditional-tenure (pathways 2 and 3). Land-leasing on communal schemes is limited by an absence of local institutions making entry, exit and exchange (rentals) uncertain at best, impossible at worst. A bold Government intervention that would enable a robust institutional basis for resolving issues of disincentives from insecure tenure (undermining investment and limiting exchange) would be to issue conditional title deeds on public irrigation schemes to the existing land-rights holders. The conditions would incentivise irrigation activity and disincentivise the practice of leaving land unused. This would need to be complemented by local educational and attitudinal change initiatives to promote well-understood, legally binding, effective land administration and exchange on schemes and on irrigation farms. Such an approach would require visionary leadership and support policy aiming to maximise economic gain from limited water resources. It would provide a sound institutional basis for increased soils, water and (existing) infrastructure use, and support operations and maintenance cost-recovery on schemes.

Interim land leasing protocols and local administration systems (pathway 3). Failing bold transformative measures to address the inherent weaknesses of communal tenure in relation to transfer and exchange the alternative is to accept the long-standing policy hiatus, and work within the inadequate prevailing land-tenure framework. This can be achieved by driving locally administered land-leasing arrangements. There are local land administration systems which can be established based on a combination of intensive awareness raising, social sanction, and a land-registration process. These can lead to better formalised leasing arrangements on schemes and involves the establishment and support of a local land-tribunal comprising farmer's committees, Tribal Authorities and the Department of Agriculture. Lease periods of up to 3, perhaps 5 years can be facilitated in a short time (but only if supported by Traditional Leaders) and along with concerted public outreach and education could address the present ubiquitous problems resulting from weak recourse mechanisms and fear of losing land to lessees. Local land leasing systems are well established in their justification and methodology in South Africa (Denison and Manona, 2007) and this prior work can inform the detail of local land-administration and leasing interventions using current (inadequate) land legislative provisions.

10.5.2 Market and knowledge interventions (pathways 2 and 3)

Reduce risk in market access through cooperative formation (pathways 2 and 3): The most obvious way in which to address the small scale of the production of individual farmers is through the formation of cooperatives. This intervention has been proposed by many, but implementation has lacked success. We argue that many smallholder cooperatives have been formed in response to the promise of getting access to state resources, a type of 'rent a crowd' approach. We argue that cooperative formation should instead be an organic process during which members develop and express mutual understanding and identify a common purpose, such as collective marketing. This common purpose should be the primary incentive for the formation of a farmers' coop. There is also the opportunity to optimise local procurement, by targeting various smallholder groupings to supply fresh produce (peri-urban groups) and semi-perishables (distant groupings).

Develop value-chain access with fresh produce markets (pathways 2 and 3): We are of the view that trusted links must be developed between small scale farmers and fresh produce markets. This will require the establishment of linkages in the value-chain and monitoring and evaluation thereof. The interests of small scale farmers must be considered and protected to the same extent as those of large commercial producers. Pilot studies of this nature are recommended and would focus specifically on: supply to local supermarkets; access to local government procurement tenders (hospitals, schools, etc.); and access to the national fresh produce markets (in Gauteng) used by many independent farmers already albeit it with great uncertainty and limited profitability. The initiative would have to address challenges of: DOH certification that produce pre- and post-harvest is not contaminated; costs of such certification; contracts between farmers and local supermarkets; sizing and pricing of produce (targeted packaging); payment delays from supermarkets; and local market saturation through better coordination of growers to align crop choices and target markets. Supply to bulk fresh produce markets would have to address: aggregation (to sell to markets in sufficiently large quantities); the prevalent exploitation by market agents given lack of farmer knowledge on requirements and processes; the establishment of monitoring delivery once crops leave for the markets; and the high cost and associated risk (of produce-loss) of packaging, transportation and storage.

10.5.3 Water Infrastructure Investment (pathways 1, 2 and 3)

Roofwater collection for home-garden supply (pathway 1): Rainwater harvesting technologies exist and have been documented and tested (see for example Stimie *et al*. (2010; 2010a; 2010b; 2010c); Denison et al. (2011), and Baiyegunhi (2014)). It is proposed that rainwater harvesting techniques suited to serve small gardens located close to the dwelling (roof) in a semi-arid to sub-humid climate with summer rainfall are identified and that their implementation is rolled out by appropriate agencies. Roof water harvesting and underground storage appears to be a suitable option for local conditions. This technique will provide water for supplementary irrigation in summer as well as for water to practise winter cropping on small parcels of land in the home garden.

Grant and/or loan funding for bulk and infield irrigation infrastructure (pathway 2 and 3): Irrigation in the homestead or on irrigation farms requires significant infrastructure investment, except for the simplest of riverside systems. In homesteads, storage tanks installed will cost approximately R1000/cu.m, Irrigation systems range between R40,000 and R150,000 per ha including bulk water transfer infrastructure, but excluding storage in the form of dams, etc. In the absence of direct support from Government, expansion of this sector through private investment will be limited by the very high capital costs beyond the reach of most smallholders. The DWS Resource Poor Farmers Subsidy is one highly suitable instrument to provide funding for

water-infrastructure feasibility studies, bulk water investment and operational subsidies, water-harvesting tanks and reservoirs, among other categories of support. The funding administration and the amount of funding is however far short of what is needed to transform the smallholder irrigation sector. Alignment of increased funding with proposed irrigation settlement scheme interventions such as land and water management, is essential.

10.5.4 Water regulations and irrigation management (pathways 2 and 3)

Dedicated support to acquire water-use licenses (pathways 2 and 3): The absence of water-use licenses and the widespread insecurity in relation to both the legal right of use, and the quantity that can be used, presents a high risk to smallholders and is a critically limiting factor. Active institutional support is needed for HDI irrigation farmers to register their use, or to secure water-use licenses. The majority of participating farmers have been unable to secure water use licences or get written information on allocations. The water administration bureaucracy is complex terrain for smallholder farmers with confusing terminology, legal differentiations (licenses versus General Authorisations), and high levels of literacy demanded by farmers who often have limited formal education. Active and dedicated support to drive a process to achieve secure water use licenses for smallholder irrigators is a high priority need.

Scheme irrigation management organisational development (pathway 3): Intensive effort is needed to establish self-financed, farmer managed irrigation institutions on schemes. While somewhat valiant attempts have been made in the past by DWS, these were isolated from other essential interventions such as: investment to ensure a functioning irrigation scheme (i.e. water infrastructure); alignment of agricultural support to ensure profitability and thereby a basis for irrigation service fee payment; and development support for the acquisition of scheme water-use rights (Denison and Manona, 2007; Pegasys, 2012). Irrigation services provision is practical and achievable in the smallholder scheme context by use of farmer-centred, participatory irrigation management (PIM) approaches based on institutional development of water-management organisations (WUAs or otherwise). The development approaches for these are widely published internationally and there is strong precedent in the principles of WUA functioning in the historically white-owned irrigation schemes in South Africa, but which need significant institutional re-design for the smallholder context (Denison *et al.*, 2015). Irrigation-water services based on affordable fee recovery must be tied to a hydraulic component that is a practical point of enforcement (i.e. closure of supply for non-payment), with investment in enforcement capability, and with intensive awareness raising to achieve consensus across all scheme users on issues of operations, fee payment, maintenance and enforcement. The de-facto present waiver of irrigation fees is of assistance to struggling irrigators, but does not address the critical need for effective management and maintenance. Unless these organisational, institutional and attitudinal-change development investments are made to achieve secure water supply on-farm, and equity of access across the schemes, underpinned by formalised conflict resolution mechanisms, water-chaos will continue to prevail, seriously undermining farmer and scheme productivity.

10.6 Areas for further research

10.6.1 The independent irrigator phenomenon

Independent irrigation presents an alternative to smallholder irrigation scheme development. Whilst it has long been known that there are independent smallholder irrigators operating in South Africa (de Lange, 1994), the current study was the first of its kind to describe this group of agricultural water users in considerable

detail. One of the shortcomings of the current study was the very limited spatial cover, and there is a need to obtain a comprehensive picture of the distribution and characteristics of independent smallholder irrigators in South Africa. The evidence obtained in Thulamela indicated that independent irrigation was often associated with the use of marginal land that was not capable of sustainably supporting irrigated agriculture. To what extent concerns about sustainable natural resource use also apply elsewhere in the country is but one of the important questions that needs to be answered.

10.6.2 Tenure and land administration on existing smallholder irrigation schemes

The issue of tenure reform in Africa remains at the centre of development debates. There are two main schools of thought on the matter. The first school, represented by Hernando de Soto (2000), adopts a neo-liberal perspective and advocates the formalisation of informal tenure by privatisation, i.e. through the issue of freehold title. The school's central argument is that formalising land rights by privatisation creates wealth among the poor, not by increasing their asset base but also by creating new opportunities for them to make use of assets such as land to improve their livelihoods[1]. The second school does not favour privatisation. Instead it proposes that socially legitimate occupation and user rights, as they are currently held and practised, be recognised by in law, and be used as the point of departure for the design of institutional frameworks for mediating competing claims and administering land[2]. Irrigation tenure is a special case, as it does not only involve land but also water (Meinzen-Dick, 2014). Detailed research is needed to identify what kind of land and water tenure and administration system by plot holders on existing and future irrigation schemes would prefer.

10.6.3 Settlement of (entrepreneurial) smallholder irrigators on existing large-scale irrigation schemes

Settling new farmers is a complex development problem, and history tells us that many of the ideas proposed by experts had unexpected consequences, which proved detrimental during implementation. Key considerations are the societal costs and benefits of resettlement projects, the sustainability of these projects, which is associated closely with successful development of individual farm enterprises, as well as with the sustainability of institutional arrangements governing land and water, including the distribution system. Whilst history provides guidance, important also are the aspirations of the settlers. Would they be prepared to settle on schemes in the same manner as their parents and grandparents did? Another important question is where to find the settlers. The current study shows that a small pool of existing smallholders, mostly young, is keen on the idea of moving to take up such an opportunity. Other pools could be graduates from agricultural colleges and universities who seek to establish farm enterprises of their own. To guide the implementation of the rural development strategy of the National Development Plan, answers to questions on settler selection criteria and re-settlement modalities and challenges are urgently needed.

[1] For a succinct analysis of the ideas of Hernando de Sotho and a critique on these ideas with specific reference to South Africa, the reader is referred to COUSINS, B., COUSINS T, HORNBY, D, KINGWILL, R., ROYSTON, L. & SMIT, W. 2005. *Will formalising property rights reduce poverty in South Africa's 'second economy*'? PLAAS Policy Brief No 18, October 2015. Bellville: PLAAS, University of the Western Cape.

[2] In South Africa this school of thought is best represented by PLAAS researchers but elsewhere in Africa the school has many representatives.

10.6.4 Linking smallholder farmers to fresh-produce markets outside the locale

The current project demonstrated that smallholder irrigators compete effectively on local markets but experience difficulties with up-scaling as a result of the 'smallness' of local markets. Accessing 'larger' markets, typically done by the most entrepreneurial of smallholder irrigators, was shown to be too risky. Yet, there is no reason why some of the risk could not be removed. The findings show that accessing these markets, particularly outlets of the National Fresh Produce Market, is a shot in the dark, some time you hit the target, sometimes you do not. Among smallholders this leads to feelings of distrust and perceptions of corruption in the system. Finding suitable ways to set up smallholder-friendly knowledge systems aimed at removing some of the uncertainty of doing business is therefore a priority for research and development.

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Appendices

Appendix 1: Students and capacity building.

Appendix 2: Knowledge dissemination and publications. Details the conference and journal papers resulting from the project.

Appendix 3: Sample questionnaires and additional data.

Appendix 4: Maps of the research sites

Appendix 1

Students and capacity building

Team member	Position and Organisation
Jonathan Denison	Director: Umhlaba Consulting Group PhD Student (co-supervised by Prof van Averbeke)
Wim van Averbeke	Professor: Tshwane University of Technology, Centre for Organic and Smallholder Agriculture
Chenai Murata	Senior Researcher, Umhlaba Consulting Group
Lerato van Averbeke	Masters: University of Pretoria
Judith Mpanyana	Masters: Tshwane University of Technology
Snethemba Dube	Masters: Tshwane University of Technology
Thapelo Masiya	Masters: Tshwane University of Technology
Thinah Moyo	PhD: University of Pretoria (supervised by Prof C Machete)

Summary data on conference and journal papers arising from the project

Description	No.	Authors
Journal Papers published to date	1	T Moyo and C Machete
Journal papers prepared – pending submission	3	L van Averbeke T Moyo and C Machete C Murata and P Hebink
Conference papers presented/published	1	W van Averbeke
Conference papers prepared – pending presentation	2	T Moyo and C Machete

Appendix 2

Knowledge Dissemination and publications

1 Journal Article and Conference Presentation – Thinah Moyo (Team member)

Journal:
Journal of Sustainable Development (published)

Conference:
This publication will be presented at the 54th conference of the Agricultural Economics Association of South Africa: 14-16 September 2016, Misty Hills Country Hotel, Conference Centre and Spa, Johannesburg, South Africa.

Citation:
Moyo T and Machethe CL. 2016. The Relationship between Smallholder Irrigation and Household Food Availability and Dietary Diversity in Greater Tzaneen Municipality of Limpopo Province, South Africa. *Journal of Sustainable Development*, Vol. 9(4):165-178.'

Title: The Relationship between Smallholder Irrigation and Household Food Availability and Dietary Diversity in Greater Tzaneen Municipality of Limpopo Province, South Africa

Abstract: Irrigation farming has the potential to address household food security challenges in developing countries. This paper examines household food availability, consumption and dietary diversity for irrigating and non-irrigating households in Greater Tzaneen municipality of Limpopo Province of South Africa. The paper uses primary data collected from 180 households comprising of irrigation scheme irrigators, independent (non-scheme) irrigators, and non-irrigating households. Data analysis employed descriptive analysis and analysis of variance to compare food security components of the different types of households. Results provide sufficient evidence that smallholder irrigation farming contributes significantly to household food security through improved food availability and dietary diversity. However, since most households are net food buyers, it is essential to have policies that are formulated with an understanding that household food security is not only a function of the food that farming households produce for their own consumption but more so a function of total household income. The results inform agrarian reform debates on whether South Africa should continue investing in smallholder irrigation farming for improved household welfare. An integration of smallholder irrigation farming in strategies for growing the rural economy and contributing to improved livelihoods and poverty reduction is therefore, recommended.

Keywords: dietary diversity, food availability, food security, irrigation, Limpopo, smallholder farmer

2 Journal Article and Conference Presentation – Thinah Moyo

Journal:
Agrekon (to be submitted).

Conference:
This publication will be presented at the 54th conference of the Agricultural Economics Association of South Africa: 14-16 September 2016, Misty Hills Country Hotel, Conference Centre and Spa, Johannesburg, South Africa.

Citation (draft):
Moyo T and Machethe CL. 2016. Smallholder Irrigation and Rural Livelihoods in Limpopo Province of South Africa: What is the Contribution to Household Food Security and Income? *Agrekon (to be submitted)*

Title: Smallholder Irrigation and Rural Livelihoods in Limpopo Province of South Africa: What is the Contribution to Household Food Security and Income?

Abstract: Smallholder irrigation farming is potentially transformative to poor communities. This paper examines the contribution of smallholder irrigation farming to household income and food security of rural households in Limpopo Province of South Africa. The study involved comparing livelihoods of irrigation and non-irrigation households. Data analysis employed semi-parametric propensity score matching methods. The results provide sufficient evidence that smallholder irrigation farming makes a significant contribution to rural livelihoods through its effect on household income and food security. This provides a strong motivation for continued investment in smallholder irrigation farming as part of a strategy to grow the rural economy and improve rural livelihoods, in support of the National Development Plan of South Africa. The contribution of smallholder irrigation farming to rural livelihoods can be further enhanced by implementing policies that promote female participation in irrigation farming, equip farmers with entrepreneurial skills, and facilitate farmers' membership of associations. The study contributes further knowledge on the importance of smallholder farming to rural livelihoods, which is at the core of the African development debate.

Key words: irrigation, household income, food security, rural livelihoods, smallholder farmer

3 Journal Article – Chenai Murata

Journal: (To be submitted; journal not yet defined).

Citation (draft):
Murata, C. & Hebinck, P. (forthcoming). Continuity of the Permission To Occupy system in post-apartheid South Africa: Perceptions of tenure security and farm investment in Greater Tzaneen. *Journal to be defined.*

Title: Continuity of the Permission To Occupy system in post-apartheid South Africa: Perceptions of tenure security and farm investment in Greater Tzaneen[1]

Abstract: The presence of security of land tenure is widely argued to be a critical precondition for farmers to feel a willingness to commit long-term investment in land. Land tenure is a bundle of rules and regulations that govern how land is accessed and used, and while this may differ from one context to another, there are at least two complementary scholarships that set benchmarks of determining tenure security. The first one argues that tenure needs to be (i) socially recognizable, (ii) legally recognizable and (iii) enforceable by external authorities. The second posits that tenure security is determined by the count of rights including right to, use, transfer, exclude others and enforce claims. This work uses phenomenological methods to investigate how the Permission To Occupy (PTO) system currently used in communal lands of the Nkuna Tribal community of Greater Tzaneen in the Limpopo Province of South Africa articulates with these two perspectives of viewing tenure security. The PTO system is a leftover from a package of racially based land policies that were abolished by the Land Reform Policy of 1991. But issuance of PTO certificates has continued till the present albeit under a heavy shadow of legal controversy and institutional uncertainty. It has thus been criticized as being one of the most unsecure and legally baseless tenure forms in post-apartheid times. The work uses ethnographic data collection techniques to tap into farmers' experiences when dealing in land in order to see how these encounters are influencing the farmers' willingness to invest in land. Because this is a case study work, its findings may not be representative of the broader South African land and agrarian universe. However, it unravels novel insights that can be applicable in similar settings. The findings demonstrate a wide caveat between what academic analysts and the rural users of the land understand about the concept of tenure security. Farmers are investing and the confusion that is being caused by the state's stance of policy-vacillation which is evidenced by among others; its undertaking to abolish but still continue with the PTO system has done little to deflate farmers' willingness to invest in the land.

Key words: PTO system, communal tenure, investment appetite/willingness, tenure security

[1] This is a journal paper but submission is still pending

4 Journal Article – Lerato van Averbeke

Journal: Historical Methods: A Journal of Quantitative and Interdisciplinary History
(To be submitted).

Citation (draft):
VAN AVERBEKE LL. (forthcoming) Practical Methodological Challenges of Field Research in South Africa: Experiences from a study on perspectives of change in tradition and expression of identity among three generations of women on a smallholder canal scheme in Venda. *Historical Methods (to be submitted)*

Title: Practical Methodological Challenges of Field Research in South Africa: Experiences from a study on perspectives of change in tradition and expression of identity among three generations of women on a smallholder canal scheme in Venda

Abstract:
Field research is the preferred research method amongst social science and humanities researchers to study phenomena such as historical trends, change, societies in transition or economic disparities, to name a few. The objective of this methodological article is to derive lessons from the challenges that I encountered as a field researcher because of my classical western training on research ethics and in conducting research, as well as the unique set of challenges I encountered as a young, unmarried "outsider" woman conducting her field research in South Africa where continued tribal stereotyping, often, plays a role in social behaviour and interaction. This article also draws attention to time and funding impositions placed on research studies, which make it difficult for the contemporary field researcher to conduct classical anthropological field research, which requires learning the language of the study population before commencing data collection..

Keywords: field research in South Africa, Venda, tribal stereotyping and young, unmarried women conducting field research, financing of and time given to conduct field research

5 Conference Paper – Wim van Averbeke

Conference: (presented and proceedings published)
Third Carnegie Enquiry Action Dialogue. Constraints And Innovative Approaches In Small-Scale Agriculture In South Africa. Held at Goedgedacht, 6-8 August 2014.

Citation:
VAN AVERBEKE, W. 2014. The potential of expanding smallholder irrigation as a contribution to rural development, employment creation and poverty reduction in post-apartheid South Africa. Framing Paper in Proceedings of the Third Carnegie Enquiry Action Dialogue. Constraints And Innovative Approaches In Small-Scale Agriculture In South Africa. Held at Goedgedacht, 6-8 August 2014.

Title: The potential of expanding smallholder irrigation as a contribution to rural development, employment creation and poverty reduction in post-apartheid South Africa.

Abstract: The short framing paper highlights important issues pertaining to the idea of expanding smallholder irrigation as an option to create livelihoods in rural and peri-urban areas of South Africa by means of an agrarian development pathway. The paper draws on the personal experiences of the author who has worked in smallholder irrigation contexts for two decades in the Eastern Cape and the Vhembe District of Limpopo Province. The paper highlights the key benefits of irrigation in agriculture and its implications for farming systems and farm enterprises. These benefits have been documented globally and generally apply to South Africa as well. The paper provides a synopsis of smallholder irrigation in South Africa at present in terms of extent and structure, and then points out the livelihood impacts of smallholder irrigation in relation on primary production (farming) and linked economic activity (forward and backward linkages). In the final part of the paper the central concern is addressed, namely the potential to expand smallholder irrigation in a dramatic way with a view of creating a substantial number of new livelihoods, and the important factors that constrain this sector from developing to its full potential. The paper draws heavily on experiences of what works well and not so well in practice, leading to a word of caution that food value chains are highly dynamic systems, implying that historical performance is no guarantee for the future.

Appendix 3

Sample questionnaires and additional data

Appendix 3.1: Livelihoods questionnaire

Appendix 3.2: Agriculture and entrepreneurship questionnaire

Appendix 3.3: Monetary value of selected farm assets (Limpopo, 2013-13)

Appendix 3.4: Monetary value of selected consumer durables (2013-13)

Appendix 3.5: Monetary value of selected means of personal transportation (2013-13)

Appendix 3.1: Livelihoods questionnaire

General Livelihood Survey

WRC Project K5/2179

Pretoria, August 2013

***Notes to enumerator**:*

- *Capture as much info as possible about the residence to enable follow-up visits. Note street name, house number of the residential site and in the case of irrigation schemes record the plot number of the irrigation plot.* ***Make all notes on this front cover***
- *The field interview number should consist of the initials of the enumerator followed by the interview number in the order it was conducted by the enumerator. For example SVD1 is the first interview conducted by Snethemba Veronica Dube, SVD2, the second interview by her, etc.*

1. **QUESTIONNAIRE INFORMATION**

Field Interview No.	Database Ref No.

Note: Ensure that for any particular homestead the same database reference number is used both the General Livelihood and the Agriculture & Entrepreneurship questionnaire data

Name(s) of interviewer(s)			
Date of interview			
Location of homestead			
• **District**			
• **Municipality**			
• **Village**			
• **GPS coordinates Home**	**S**	**E**	**(decimal degrees)**
• **GPS coordinates Plot (field)**	**S**	**E**	**(decimal degrees)**
Language spoken during interview			
Time of interview	**[:] to [:]**		

2. DEMOGRAPHIC DETAILS OF THE HOMESTEAD

Note to enumerator: first fill in columns 2 and 3 (first name and relation to HoH. Once these are completed, fill in each row in sequence.

2.1 Who is part of the homestead? Please can you provide information on your homestead composition?

No	First name	Relation to head of household (HoH)	Age	Gender	Marital status	Occupation[1]	Education level[2]	Place of usual residence
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								

Head of household first	Spouse Father Mother Grandfather Grandmother Child Grandchild Great-grandchild Other (specify)	Age in years	Female = F Male = M	Single Married Divorced Widowed Cohabit	Write occupation At school Unemployed[3] Retired	Grade no Tertiary qualification	Home Elsewhere (place)

[2] School grade + (no. of years in tertiary study i.e. if less than a degree equivalent then enter years in study, Degree/National Diploma = 3, Hons=4, Masters=5, PhD=6)

[3] When dealing with the unemployed under occupation, distinguish between those actively seeking work (A) and those who are not (N)

3. SOURCES OF INCOME

Note to enumerator: Consult information on homestead members provided in 2.1 to probe about possible sources of income

3.1 Income from employment (salaries, wages, private pensions, etc.)

For each of the members of your homestead who was employed during the period July 2012 to June 2013 and those receiving work-related pensions, could you please inform us of their gross earnings?

Source	**Cycle (*e.g. week, month, year*)**	**Income per cycle (R)**	**Income per annum (R)[4]**	**Comments**
Salaries or wages				
Overtime payments				
Bonuses				
Allowances				
Private pensions				
Other (specify)				

[4] Income per annum – to be completed after the interview

3.2 Income from remittances

During the period July 2012 to June 2013, did your or other members of your homestead who are permanently residing here at home receive any income support, child support, durable goods or food from members of your homestead who are residing elsewhere or from friends or relatives?
Yes □ No □

If yes, could you provide details please?

Source	**Cycle (*e.g. week, month, year*)**	**Income per cycle (R)**	**Income per annum (R)**
Remittances (Cash)			
Remittances (in Kind)[5]			
Child support from parent outside household			
Other (specify)			

[5] Specify the broad group (e.g., furniture, food, clothing, etc.)

3.3 Income from social grants[6]

During the period July 2012 to June 2013, did you or other members of your homestead who are permanently residing here at home receive any income support in the form of old-age pension, disability grants, child support grants, bursaries or other social grants? Yes □ No □

If yes, could you provide details please?

Source	**Cycle (*e.g. week, month, year*)**	**Income per cycle (R)**	**Income per annum (R)**
Pensions (old age)			
Disability grant			
Child support grant			
Bursary			
Other government grants			
Other (specify)			

[6] Check pg 1 and compare if all who are eligible do in fact get grants. If not, enquire why and make a note).

3.4 Income from trading (buy and sell activity)

During the period July 2012 to June 2013, did your household earn any income by **trading?** Yes □ No □

If No, go to 3.5.

If Yes, what types of trade did you practise and what **net income** was derived from this activity? (*e.g. Vending (food, vegetables, other goods), Vending (other), Spaza shop, Shop, Shebeen, Tavern, Lending money).*

Type of trade	**Cycle** (***e.g. week, month, year***)	**Income per cycle (R)**	**Income per annum (R)**

3.5 Income from making goods for sale

During the period July 2012 to June 2013, did your household earn any income by **producing and selling goods?** Yes □ No □

If No, go to 3.6.

If Yes, what type of goods did your household produce and sell what **net income** was derived from this? (*e.g. Brick making, Sewing and selling clothing, Preparing and selling traditional medicines, Making shoes, Making glasses, Brooms and baskets, Furniture making, Plumbing, Arts and craft, Traditional beer, Making candles, etc.)*

Goods produced and sold	**Cycle** (***e.g. week, month,..***)	**Income per cycle (R)**	**Income per annum (R)**

3.6 Income from service provision[7]

During the period July 2012 to June 2013, did your household earn any income by **provision of services**? Yes □ No □

If No, go to 3.7.

If Yes, what type of services did your household provide, and what **net income** was derived from this activity? (*e.g. Tractor services, Building houses, Cleaning, Car wash, Day care, Making toilets, Renting of rooms, Repairs, Hair dressing, Electrical installation, ...*)

Type of service	**Cycle** (***e.g. week, month, year***)	**Income per cycle** **(R)**	**Income per annum** **(R)**

[7] Important to give examples and explain to people what you mean and are looking for information about

3.7 Income from farming

Did anyone in your household conduct **farming including home gardening** during the period July 2012 to June 2013? Yes □ No □

If Yes, go to 3.7.2.

3.7.1 If No, is there any reason why your household did not farm during that period?

……

……

.....

3.7.2 If **Yes**, which of the following choices best describes the purpose of the farming that was done during the period July 2012 to June 2013? (tick only one that predominates)

As an extra source of food □
As the main source of food □
As an extra source of monetary income □
As the main source of monetary income □
As a leisure activity or a hobby □

3.7.3 Please indicate the type of farming your household was practising during the period July 2012 to June 2013 and what the produce was used for (tick):

Type of farming	**Mostly home consumption**	**Mostly for sale**	**About half for sale and half for home consumption**	**Comment if needed**
Crop production in home garden				
Crop production on dryland plot				
Crop production on irrigation plot				
Animal production on residential site				
Animal production on commonage				
Other (specify)				

4. HOUSEHOLD EXPENDITURE

4.1. On average, how much does your household spend on the following items per month?

Expenditure item	**Average amount spent (Rand per month)**
1. Groceries (incl. all items)	
1.1 What proportion of groceries expenditure is for **food**	
2. Housing/Rent	
3. Electricity	
4. Water	
5. Transport (incl. all vehicle/fuel costs)	
6. Education (incl. fees, books, student support)	
7. Medical expenses	
8. Clothes	
9. Furniture	
10. Remittances	
11. Entertainment (includes liquor, tobacco)	

5. HOUSEHOLD WELLBEING

5.1. Please indicate the household source of energy for cooking (tick)

Source	Electricity	Gas	Coal/Paraffin	Dung	Wood

5.2. Please indicate the household source of water (tick)

Source	Piped in dwelling	Piped on premises	Public tap	Borehole	Open source (dam, river)	Roof water tanks
Other (specify)						

5.3. Please indicate the type of dwelling in which the household resides and write the number of rooms in the appropriate space

Dwelling type	Brick house (any roof type)	Soil brick and corrugated iron roof	Traditional house (mud walls and thatch or corrugated iron roof)	Zinc or wooden shack	Other (describe)
Number of rooms					

5.4. Please indicate the presence of outbuildings, their function and their number

Function of outbuilding	**Number**

5.5. Please indicate the type of toilet your household has (tick)

Toilet type	Water borne sewerage	French drain (Flushing toilet)	Enclosed pit latrine	Open pit	The veld

5.6. During the past year did you ever feel threatened by: (tick)

Threat	**Always**	**Most of the time**	**Some of the time**	**Mostly not**	**Never**
Theft of your belongings					
Assault on your person					
Harassment by officials (e.g. police)					
Harassment by community members					

5.7 Which statement best describes the food situation in your household? (tick)

Never enough	**Not enough most of the time**	**Enough half of the time**	**Enough most of the time**	**Always enough**

5.8 On average, how often **per week** does your household eat the following types of food?

Food type	**Frequency**
Legumes (beans, peanuts, etc.)	
Vegetables	
Fruits	
Meat	
Eggs	
Dairy (milk, amasi, yoghurt, cheese)	

6. ASSETS

Asset	Number
Bed room suite	
Dining room suite	
Lounge suite	
Refrigerator	
Kitchen units	
Stove (electric)	
Stove (gas)	
Stove (paraffin)	
Solar-electric panel/battery	
Generator	
Cell phone	
Computer or laptop	
TV	
DVD player	
Radio (hand-held radio)	
Music system	
Bicycle	
Motor bike	
Car	
Van (bakkie)	
Truck (>1.5 ton load capacity)	
Other (specify)	
Other specify	

7. SAVINGS AND LOANS

7.1 Savings

7.1.1 At present, how much money does your homestead save in formal and informal ways?

- *Formal institutions include all registered financial service providers, such as banks and insurance companies that sell policies and plans).*
- *Informal savings vehicles include local burial societies, stokvels and mgalelo's, even when these bank the money on behalf of members).*

Formal institution	**Amount per month (R)**	**Total amount per annum (R)**
Informal institution		

7.2. Loans and debt

7.2.1 During the period 01 July 2012 to 30 June 2013, did your household borrow any money from people or lending institutions? Yes □ No □

If Yes, please specify the institution that lent you the money, the reason for the loan, the interest rate, the duration of the repayment period and the instalment amount per cycle (e.g. Rand per week or Rand per month).

Formal sources (registered financial service provider)	**Loan amount (R)**	**Reason for loan**	**Interest rate (%)**	**Repayment period**	**Instalment amount per cycle (specify cycle)**
Informal sources (e.g. money lenders, savings clubs)					

7.2.2 During the period 01 July 2012 to 30 June 2013, did your household have accounts with furniture, clothing or other types of stores? Yes □ No □

If Yes, please specify the type of store, the type of goods purchased on account, and the monthly instalment amount that applied.

Type of store	**Type of good(s) purchased on account**	**Monthly instalment amount (Rand))**

8. MEMBERSHIP OF GROUPS/ORGANISATIONS/ASSOCIATIONS

8.1. What groups/organizations/associations are you either a member of, or know the existence of in your village? (tick)

Type of institution	Member	Exists (but not a member)	Comment
Farmers' association			
Farmers' cooperative			
Other farm-related group (specify)			
Water Users Association			
Professional organisation (specify)			
Trade or labour union			
Village committee			
Religious group			
Political party or movement			
Cultural association			
Burial society			
Credit or saving group			
NGOs or civic group			
Other group or association (specify)			

8.2 Please tick the appropriate box indicating the likelihood of receiving assistance in time of need.

8.2.1 When an emergency arises and I need money urgently, my family will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.2 When an emergency arises and I need money urgently, my friends will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.3 When an emergency arises and I need money urgently, my neighbours will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.4 When an emergency arises and I need money urgently, the group I am a member of will assist me.
(State the name of the group(s) in cases where the response is neutral to strongly agree)

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.5 When an emergency arises and I need food, my family will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.6 When an emergency arises and I need food, my friends will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.7 When an emergency arises and I need food, my neighbours will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.8 When an emergency arises and I need food, the group I am a member of will assist me.
(State the name of the group(s) in cases where the response is neutral to strongly agree)

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.9 When an emergency arises and I need additional labour, my family will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.10 When an emergency arises and I need additional labour, my friends will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.11 When an emergency arises and I need additional labour, my neighbours will assist me.

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

8.2.12 When an emergency arises and I need additional labour, the group I am a member of will assist me.
(State the name of the group(s) in cases where the response is neutral to strongly agree)

Strongly agree	Agree	Neutral	Disagree	Strongly disagree

For those households that did no farming at all, this is the end of the interview. For those who do any form of farming, request participant for a follow-up interview that will mostly be concerned with farming.

THANK YOU FOR YOUR TIME & CO-OPERATION

Appendix 3.2: Agriculture and entrepreneurship questionnaire

Agriculture & Entrepreneurship Survey

WRC Project K5/2179

Pretoria, August 2013

Notes to enumerator: *Before going to the field, transfer information to question 3.7.3 of the General Livelihood questionnaire to the table on page 2 of this document. Capture as much info as possible about the residence to enable follow-up visits. Note street name, house number of the residential site and in the case of irrigation schemes record the plot number of the irrigation plot.* ***Make all explanatory notes on this front cover****.*

1 QUESTIONNAIRE INFORMATION

Field Interview No.:	Database Ref No.:

Field Interview number of corresponding General Livelihood questionnaire:

Note to enumerator*: Ensure that for any particular homestead the* ***same database reference number*** *is used both the livelihood and the Agriculture & Entrepreneurship questionnaire data*

Name(s) of interviewer(s)			
Date of interview			
Location of homestead			
• **District**			
• **Municipality**			
• **Village**			
• **GPS coordinates Home**	**S**	**E**	**(decimal degrees)**
• **GPS coordinates Plot (field)**	**S**	**E**	**(decimal degrees)**
Language spoken during interview			
Time of interview	**[:] to [:]**		

Information to be extracted from question 3.7.3 in the General Livelihood questionnaire

***Note to enumerator**: The information in the table below should guide data collection on agriculture*

Type of farming the household was practising during the period July 2012 to June 2013

Type of farming	**Mostly home consumption**	**Mostly for sale**	**About half for sale and half for home consumption**
Crop production in home garden			
Crop production on dryland plot			
Crop production on irrigation plot			
Animal production on residential site			
Animal production on commonage			
Other (specify)			

2 MANAGEMENT AND LABOUR

2.1 In this household, who makes the decisions on farming? (in relation to head of household)

***Note to enumerator**: Conduct interview with the person identified in 2.1*

2.2 Who does the actual farming work:

***Note to enumerator**: Rank in order of contribution referring to relationship to head of household, include hired labour and indicate casual and full-time, and state the contribution of each as a percentage. The sum of all contributions must be 100%*

Relationship of the provider of farm labour to head of household	**Percentage contribution to total labour** (%)

3 GOALS AND ASPIRATIONS

3.1 For each of the different types of farming your household was involved in during the period July 2012 to June 2013, what was it you that you wanted to achieve during that period?

***Note to enumerator**: Refer to Type of farming table on page 2 to identify the different types of farming and ask the question for each type. This open-ended question will be coded once all responses are in. State the goals as communicated by the farmer. Use back of page for additional notes if necessary.*

Type of farming	**Goal**
Crop production in home garden	
Crop production on dryland plot(s)	
Crop production on irrigation plot(s)	
Animal production on residential site	
Animal production on commonage	
Other (specify)	

3.2 Considering your farming enterprise as it was during the period July 2012 to June 2013, which of the following statements best reflects your aspiration for your farming enterprise?

***Note to enumerator**: Place cross in option that was selected*

Option	Selection
I want to quit farming	
I want to scale down my farming enterprise	
I want to keep my farming enterprise the way it is now	
I want to grow my farming enterprise	

4 LAND AND WATER

4.1 Please provide us with the following information on the different types of land you have access to and the water you use for irrigation, if any:

Type of land	Type of access[1]	Total area of the land (m^2)	Area cultivated Jul 2012 to Jun 2013 (m^2)	Was any irrigation used? (Yes or No)	If yes, fill in the details in each column where applicable					
					Source(s) of water[2]	Distance to source(s) (m)	Method of collection or extraction[3]	Method of conveyance[4]	Application method[5]	Level of irrigation[6]
Residential plot										
Dryland plot 1										
Dryland plot 2										

Dryland plot 3										
Irrigation plot 1										
Irrigation plot 2										
Irrigation plot 3										
Other (specify)										

[1]Coding for access

1 = ownership (indicates that land is registered in the name of (someone in) the household irrespective of tenure system)

2 = unconditional usufruct (ownership lies with a person outside the household, who has given the household user rights without stipulating compensation)

3 = renting in of land (ownership is with a person outside the household and access to land is subject to the payment of a fee to that person)

4 = share cropping (ownership is with a person outside the household and access to land is subject to a sharing agreement)

[2] Record the source(s) of water, which could be the roof, standpipe, tap on site, river (direct extraction), canal, groundwater, etc.

[3] Record how water is obtained from the source (pumped, diverted, etc. Write 'collected' in case of roof water, tap water, small on-site storage structures and livestock dams)

[4] Record how water is brought from source to plot (carried, wheel barrow, piped, gravitated, etc.)

[5] Record how water is applied to the soil (bucket, watering can, hosepipe, surface irrigation, sprinkler, drip, micro-sprayer, etc.)

[6] Select one of three options: 1=only during sensitive stages (e.g. seedling establishment) and extreme water stress; 2 = full irrigation throughout the season; 3 = in between 1 and 2

4.2 During the period July 2012 to June 2013 did you give the right to use any of your land to someone who is not part of your household?

Yes □ No □

4.3 If yes, provide details on this transfer of user rights

Type of land	**Type of access[1]**	**Proportion of plot for which user right was transferred (%)**	**Comments[2]**
Residential plot			
Dryland plot 1			
Dryland plot 2			
Dryland plot 3			
Irrigation plot 1			
Irrigation plot 2			
Irrigation plot 3			
Other (specify)			

[1]Coding for access

1 = unconditional usufruct (person can use the land without compensation)

2 = renting out (use of the land is subject to the payment of a fee to the household)

3 = share cropping (access to land is subject to a sharing agreement)

[2]***Note to enumerator****: Probe for information on rent paid or the particulars of the sharecropping arrangement and record these under comments*

4.4.1 How do you rate the adequacy of your current land holding (*tick the appropriate box*)

Way too small	Somewhat small	Exactly right	Somewhat big	Way too big

4.4.2 How do you rate the adequacy of your access to water? (*tick the appropriate box*)

Never enough	Rarely enough	Mostly enough	Always enough

5 PHYSICAL ASSETS USED IN AGRICULTURE

5.1 How many of each of the following farm implements/farm equipment does your household own?

Implement/equipment/fixed assets	**Number**	**Fixed assets**	**Number**
Hand hoe		Poultry production facility	
Spade		Farm shed (used to store farm-related assets)	
Rake		Grain storage facility (describe)	
Knapsack sprayer		Grain mill	
Wheelbarrow		Water storage facility (specify)	
Cattle		Other (Specify)……	
Horses		Other (Specify)……	
Donkeys			
Animal-drawn plough			
Animal-drawn harrow			
Animal-drawn ridger			
Animal-drawn planter			
Animal-drawn cultivator			
Animal-drawn cart			

Tractor			
Tractor-drawn plough			
Tractor-drawn disk			
Tractor-drawn ridger			
Tractor-drawn planter			
Tractor-drawn cultivator or tine implement			
Tractor-drawn trailer			
Irrigation pump			
Irrigation pipes			
Irrigation system (specify)			
Bakkie/truck			
Other (Specify)……			
Other (Specify)……			

5.2 How do you rate the adequacy of your farming implements, equipment and infrastructure (*tick the appropriate box*)

Inadequate (lacks what is needed)	Adequate (has what is needed but no excess)	Excessive (has more than is needed)

6 FARM ENTERPRISE INCOME STATEMENTS AND MARKETING

6.1 All animal enterprises

***Note to enumerator**: This part of the interview must be completed in a double-page carbon book. Write the field interview number that applies to the household being interviewed (see cover page) in the top-right corner of every page in the carbon book. At the end of the interview, the relevant main sheets are torn from the book and handed over to the participant for his or her use.*

6.1.1 Which types of livestock did you keep during the period July 2012 to June 2013? (*equines are excluded unless reared to generate income*)

Type of livestock	
Cattle	
Goats	
Chickens	
Pigs	
Other (specify)	
Other (specify)	
Other (specify)	

***Note to enumerator**: Guided by the responses to 6.1.1 compile an enterprise income statement for each livestock species. Start a new page in the carbon book for each statement. Record the livestock species at the top of the page and gather the required data (items 1 to 11). Then do the enterprise income statement.*

1 Number of animals in hand on 1 July 2012 and their value (**Rand**)
2 Number of animals added through reproduction and their value (**Rand**)
3 Number of animals bought between 1 July 2012 and 30 June 2013 and the total cost of the purchases (**Rand**)
4 Number of animals that died and their value (**Rand**)
5 Number of animals slaughtered and consumed entirely (includes gifts) and their value (**Rand**)

6 Number of animals slaughtered and partially consumed (estimate value), and partially sold (record income) (**Rand**)
7 Number of animals sold and income received (**Rand**)
8 Number of animals in hand on 30 June 2013 and their value (**Rand**)
9 Income received from the sale of products other than the animals themselves (sale of manure, milk, eggs, skins, etc.) (**Rand**)
10 Expenses on feed (**Rand**)
11 Expenses on health care (**Rand**)
12 Expenses on labour (**Rand**)
13 Any other expenses (**Rand**)

6.1.2 Compile each livestock enterprise income statement as follows:

I Change in inventory

Rand value of animals in hand on 30 June 2013 [item 8] – Rand value of animals in hand on 1 July 2012 [item 1] = ... Rand

II Cash receipts

Cash income from sales of animals [item 7] + sales of parts of animals [item 6] + income from animal products [item 9] = ... Rand

III Receipts in kind

Rand value of animals consumed [item 5] + Rand value of the consumed part of animals that were partial consumed [item 6] = ... Rand

IV Operating expenses

Cost of purchased animals [item 3] + Rand value of animals that died [item 4] + expenses [sum of items 10, 11, 12 and 13] = ... Rand

V Net cash enterprise income

Cash receipts [**II**] – operating expenses [**IV**] = ... Rand

VI Net enterprise income

Net cash enterprise income [**V**] + receipts in kind [**III**] + change in inventory [**I**] = ... Rand

6.1.3 For each livestock species that was sold, indicate the markets used in order of importance (1= most important market; 2 = second most important market etc. Cover all markets used accordingly).

Livestock species	**Direct to local consumers**	**Direct to consumers elsewhere (implies transportation)**	**Street traders (operate on foot)**	**Bakkie traders (operate using a van)**	**Shops or supermarkets**	**Other (specify)**

6.2 All crop enterprises

***Note to enumerator**: List all the crops grown during the period 1 July 2012 to 30 June 2013 on each type of land in the table below. Then for each type of land that was used to produce crops, do an enterprise budget for each crop that was produced on that land.*

6.2.1 Which crops did you grow during the period July 2012 to June 2013 on the different types of land you used for crop production?

Residential land	Dryland plot(s)	Irrigation plot(s)

***Note to enumerator**: Guided by the responses to 6.2.1 compile an enterprise income statement for each crop enterprise. Start a new page in the carbon book for each statement. Record type of land and crop name at the top of the page and gather the required data (items 1 to 11). Then do the enterprise income statement.*

1 Area planted to the crop (use m^2 or ha and clearly indicate units used)
2 Cost of all land preparation operations to prepare the seed bed (**Rand**)
3 Cost of fertilisers(**Rand**)
4 Cost of seed (**Rand**)
5 Cost of agro-chemicals (**Rand**)
6 Cost of water[8] (**Rand**)
7 Cost of labour[1] (**Rand**)
8 Other costs (specify) (**Rand**)
9 Rand value of crop harvest[9] (**Rand**)
10 Rand value of sales[10] (**Rand**)
11 Rand value of consumption[3] (**Rand**)

Compile each crop enterprise income statement as follows:

I Operating expenses
[sum of items 1 to 8} = ... Rand
II Net cash enterprise income
Rand value of sales [item 10] – operating expenses [**I**] = ... Rand
III Net enterprise income
Net cash enterprise income [**II**] + Rand value of consumption [item 11] = ... Rand

[8] Estimates of the cost of water and of labour may only be available for all the crops on the plot or even for all types of land combined. Record this accordingly and then allocate proportionally to each crop or crop x land combination on the basis of land area used for the crop
[9] To estimate the Rand value of the harvest, identify a suitable unit of quantity (e.g. bunch or 20L bucket or bag) of which the Rand value is known, and then obtain the number of these units that were harvested.
[10] Rand value of sales and Rand value of consumption must add up to Rand value of crop harvest

6.2.3 For each crop that was sold, indicate the markets used in order of importance (1= most important market; 2 = second most important market etc. Cover all the markets that were used accordingly).

Crop	Direct to local consumers	Direct to consumers elsewhere (implies transportation)	Street traders (operate on foot)	Bakkie traders (operate using a van)	Shops or supermarkets	Other (specify)

7 SUPPORT SERVICES

7.1 How many years have you been operating your farm? Years

7,2 Where applicable, how many years have you been using irrigation on your farm? Years

7.3 Have you ever received any of the following types of assistance in support of your farming enterprise?

Support service	YES or NO	If Yes, which agency provided the service	Were you satisfied with the service? (YES or NO)
Production advice			
Production training			
Irrigation advice			
Irrigation training			
Marketing advice			
Marketing training			
Business advice			
Business training			
Financial advice			
Financial training			
Farm equipment grant			
Farm equipment loan			
Farm production grant			
Farm production loan			
Farm inputs free of charge			

8 ENTREPRENEURSHIP AND RISK

8.1 How does your farming enterprise compare with those of farmers in your neighbourhood in terms of (*tick relevant box*):

Aspects of the enterprise	**Similar**	**Slightly different**	**Moderately different**	**Very different**
The crops/animals you farm with				
The system and practices you use to produce crops/animals				
The inputs you use to produce crops/animals				
The equipment you use to produce crops/animals				
The marketing of your crops/animals				

8.2 To what extent do the following statements apply to you

Statement	**Not at all**	**To a limited extent**	**To a moderate extent**	**To a large extent**	**Fully**
I am always looking for new ways to make money from my farm					
When things go wrong on the farm, I know they will get better					
If something can go wrong on my farm it always does					
I believe that my farm will grow and improve					

Things going wrong on the farm trouble me					
Problems on the farm can be solved in many ways					
My farm enterprise is a success					
I reach the goals I set for my farm enterprise					
I can solve all the problems I encounter on my farm					
My farm enterprise always recovers after setbacks					
The success of my farm enterprise depends on me					
I have enough energy to do what I have to do on my farm					
I do not mind if people do not like me					

8.3 How do you rate the importance of the following risk factors in relation to the goals you set for your farming enterprise?

Statement	**Not at all important**	**Minor importance**	**Moderate importance**	**Important**	**Extremely important**
Poor soil					
Rainfall (too little or too much)					
Temperature (too low or too high)					
Lack of money for inputs (land preparation, seed, fertilisers, etc.)					
Not enough water for irrigation					
Pests and diseases					
Lack of equipment					
Lack of land					
Lack of labour					
Theft of produce					
Post-harvest losses					
Low prices for produce					
No market for produce					
Buyers of produce not paying me					

Market agents cheating me					
Government regulations					
Health hazard posed by farming practices on me and my family					
Not meeting my contractual obligations with workers					
Not meeting my contractual obligations with clients					
What my neighbours will say when my farm is better than theirs					

8.4 Which of the following strategies do you follow to manage risk on your farm enterprise?

Strategy	Yes	No
Specialise in few crops only		
Cultivate only a portion of my land		
Grow many different crops		
Grow crops and rear animals		
Make money from other things than farming		
Practise sharecropping		
Rent-out land		
Rent-in land		
Use family labour whenever I can		
Build structures to store water		
Get contracts with shops		
Build relationships with specific traders		
Market my produce directly to consumers		
Night irrigation		
Keep money aside specifically for emergencies on the farm		
Other (specify)		

THANK YOU FOR YOUR TIME & CO-OPERATION

Appendix 3.3: Monetary value of selected farm assets (Limpopo, 2013-13)

Asset	Price
Tools	
Hand hoe	R100
Spade	R100
Rake	R100
Knapsack sprayer	R600
Wheelbarrow	R400
Large & small livestock	
Cattle (1 beast)	Prices as given by farmers
Goat	Prices as given by farmers
Animal-drawn cultivation implements	
Animal-drawn plough	R1000
Animal-drawn harrow	R1000
Animal-drawn ridger	R1000
Animal-drawn planter	R3000
Animal-drawn cultivator	R1000
Mechanised draught and tractor-drawn cultivation implements	
Tractor	R50000
Tractor-drawn plough	R2000
Tractor-drawn ridger	R2000
Tractor-drawn disk	R2500
Tractor-drawn planter	R20000
Tractor-drawn cultivator or tine implement	R2000
Physical assets for transportation	
Tractor-drawn trailer	R10000
Animal-drawn cart	R3000
Physical assets for irrigation	
Irrigation pump	R6000
Irrigation pipe	Excluded
Other farm assets	**Price**
Poultry production facility	
• Commercial facility	R15000
• Informal facility	R2000
Farm shed	R12000
Grain storage facility	R2500
Grain mill	R100 000

Appendix 3.4: Monetary value of selected consumer durables (2013-13)

Durable consumer good	Price (R)
Bedroom suite	5000
Bed	2000
Dining room suite	4300
Lounge suite	5000
Refrigerator	2000
Kitchen unit	2000
Four-plate electric stove with oven	2000
Two-plate table top hot plate	100
Stove (gas)	2000
Stove (paraffin)	500
Solar-electric panel/battery	3000
Generator	4500
Cell phone	600
Computer/laptop	4000
TV	1500
DVD Player	500
Radio (hand-held radio)	200
Music system	2 500

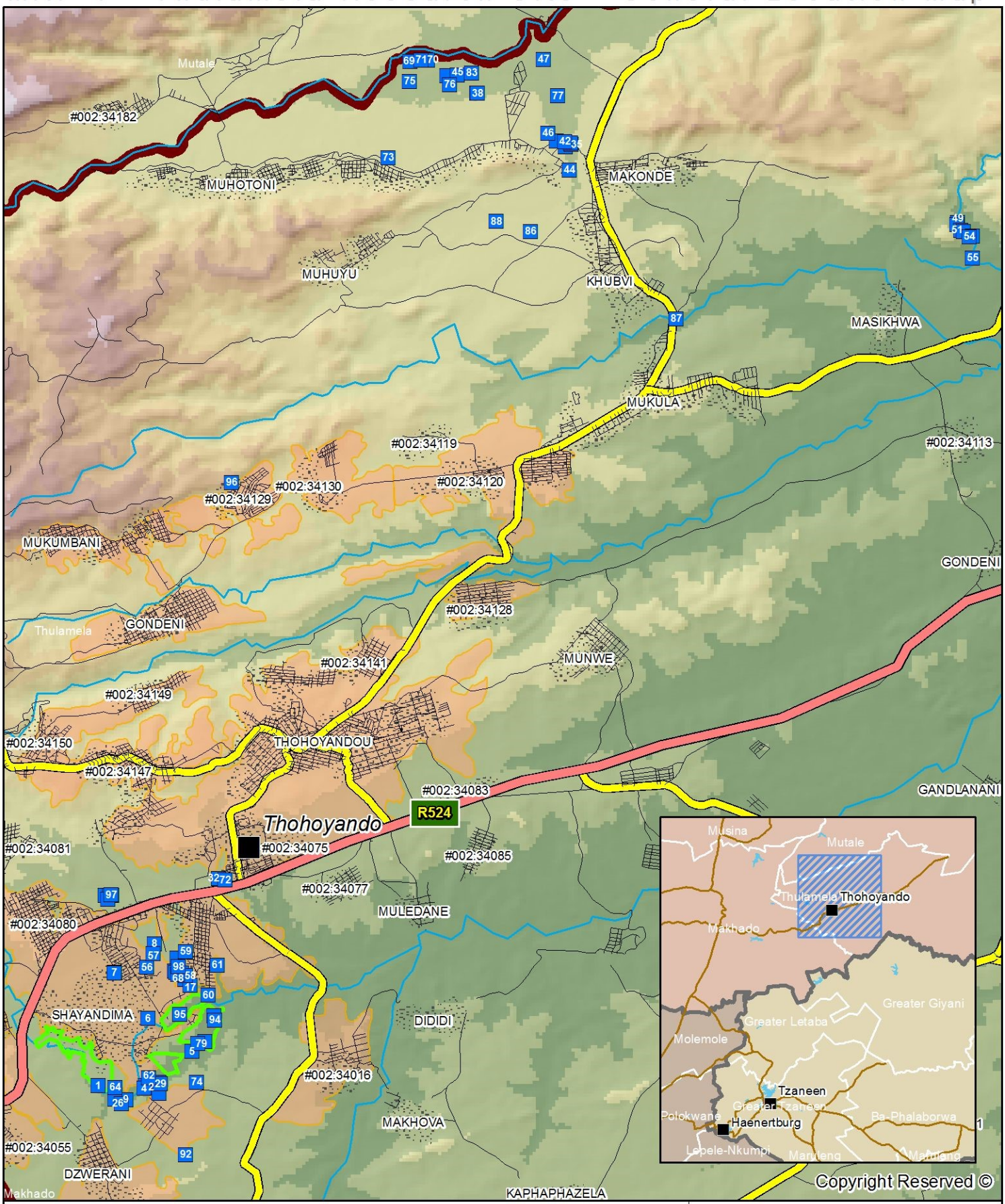
Appendix 3.5: Monetary value of selected means of personal transportation (2013-13)

Personal transportation assets	
Bicycle	1000
Motor bike	10000
Car	60000
Combi-taxi	80000

Appendix 4

Maps of the research sites

MAP 1 - Thulamela Research Site - General Location Map



LEGEND

- Dzindi scheme
- Independent irrigator fields
- Waterbodies
- Rivers

Road Network

- Arterial Route
- Secondary Road
- Street
- Other Access

- Thohoyandou
- Settlements
- Urban Areas
- Local Municipalities

0 0.5 1 2 3 4 5 Kilometers

Scale - 1:140 000

Proj. : SMS111
Date: 2016/04/27
Path: G:\GIS_Projects\SMS112_UCG_WRCProject_Tzaneen\Projects\2016\MAP 1.mxd

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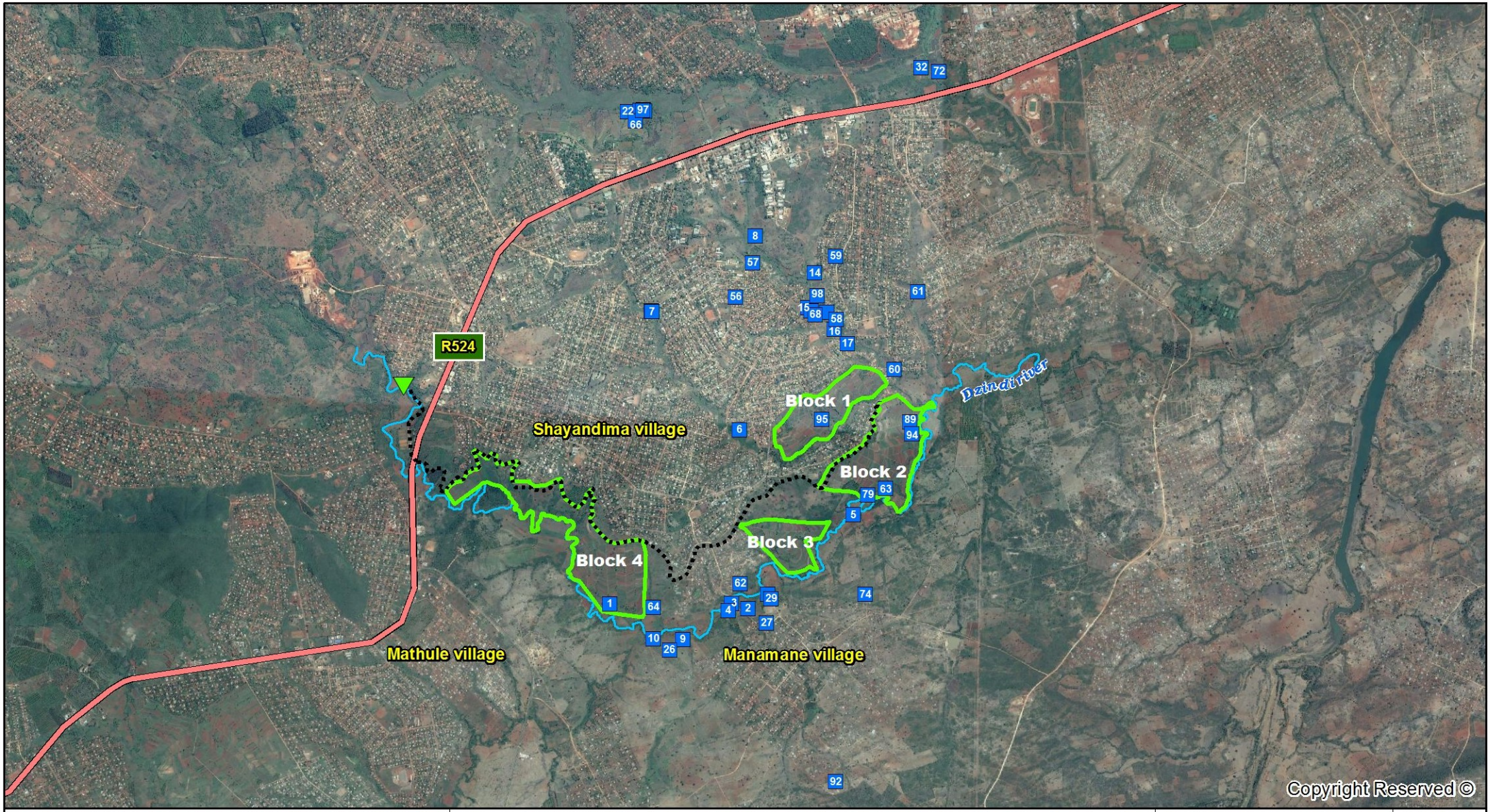
MAP 2 - Dzindi Scheme & Surrounds



LEGEND

- Dzindi scheme boundary
- Main cannal
- Independent irrigator fields
- River
- Diversion weir

0 750 1 500 3 000 4 500 6 000 Meters

Scale - 1:55 000

Proj. : SMS111
Date: 2016/04/27
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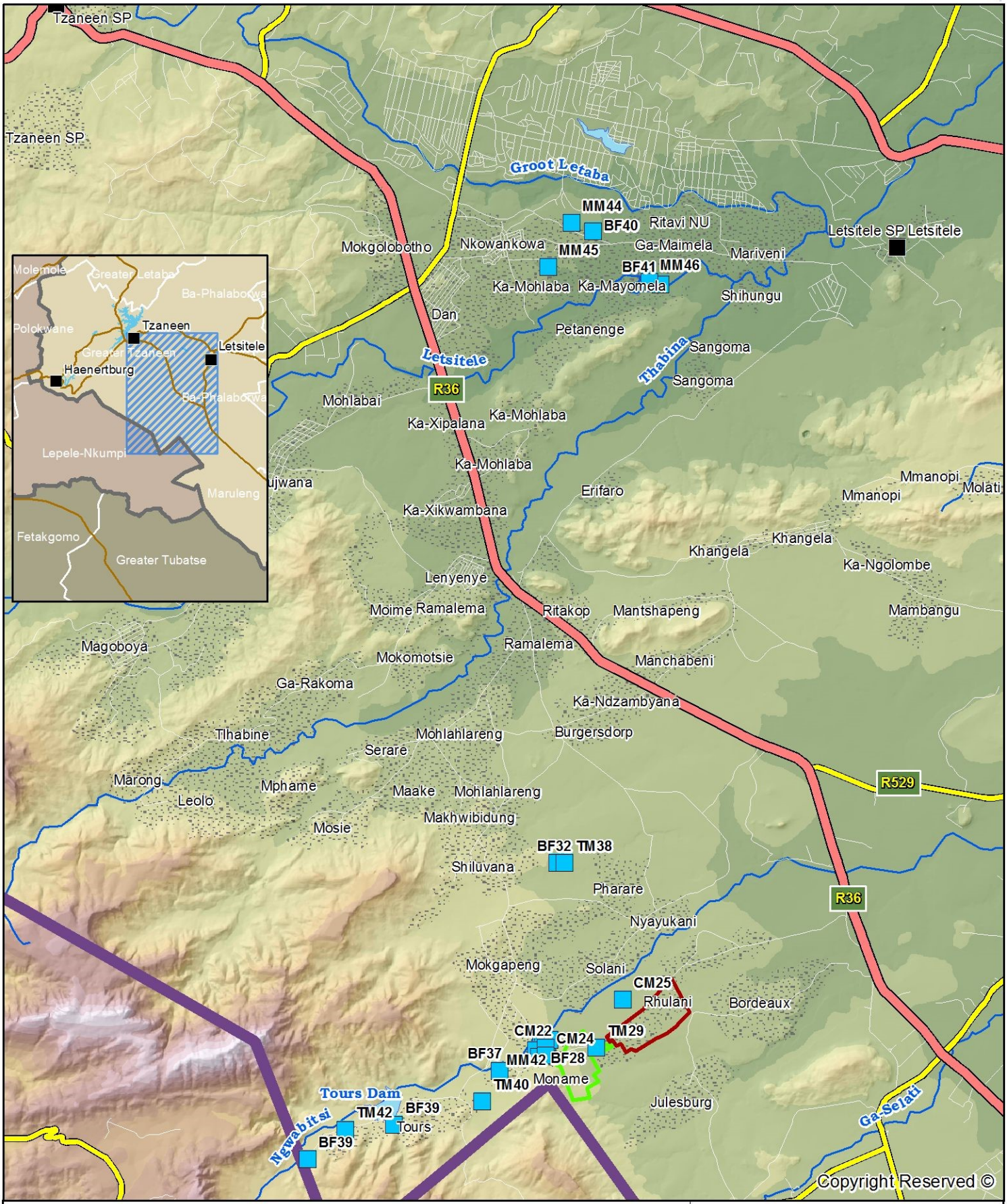
MAP 3 - Greater Tzaneen Research Site - General Location Map



LEGEND

- Independent irrigator fields
- Greater Tzaneen Towns
- District Municipalities
- Rhulani village
- Julesburg irrigation scheme
- Waterbodies
- Rivers
- Settlements

0 0.5 1 2 3 4 5 Kilometers

Scale - 1:140 000

N
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Date: 2016/04/28
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MAP 4 - Julesburg Irrigation Scheme & Surrounds

LEGEND

- Independent irrigator fields
- Julesburg irrigation scheme
- Rhulani village

Scheme Infrastructure

- Main inlet box
- Water treatment works
- Pipeline
- Tours Dam
- River

0 800 1 600 3 200 Meters

Scale - 1:40 000

Proj. : SMS111
Date: 2016/04/27
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