
AN INVESTIGATION OF WATER CONSERVATION IN FOOD VALUE CHAINS BY BENEFICIARIES OF WATER ALLOCATION REFORM AND LAND REFORM PROGRAMMES IN SOUTH AFRICA

Volume 1: Technical report

by

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This report is supplemented by three guidebooks on water conservation in food value chains. The reports are:

Part 1: Guidebook for emerging farmers in the Maruleng municipal area (WRC Report TT 607/1/14);

Part 2: Guidebook for extension officers in the Maruleng municipal area (WRC Report TT 607/2/14)

Part 3: Guidebook on different types of emerging farmers and the everyday challenges they face: Insights for policy advisors (WRC Report TT 607/3/14)

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EXECUTIVE SUMMARY

AN INVESTIGATION OF WATER CONSERVATION IN FOOD VALUE CHAINS BY BENEFICIARIES OF WATER ALLOCATION REFORM AND LAND REFORM PROGRAMMES IN SOUTH AFRICA

BACKGROUND AND INTRODUCTION

South Africa has an evident 'dual-economy' type agricultural sector; consisting of large-scale mechanised commercial farmers at one extreme and small-scale, resource poor subsistence farmers at the other. Currently, approximately 95% of the agricultural output traded in formal markets is produced by only 5% of South African farmers, who can be characterised as "large-scale commercial". Since 1994, the government has been implementing its land reform policy aimed at alleviating the political and economic inequalities that are a legacy of South Africa's past. One of the major challenges associated with the government's objective to transfer land has been to minimise productivity losses during the land reform process and thus avoid possible food security risks to the country. This has however proved to be quite challenging as beneficiaries of the land reform process have struggled to maintain the comparatively high productivity levels of commercial agriculture. Although several support programmes have been rolled out to support these productivity-related challenges, these have been largely unsuccessful, and it seems that insufficient attention has been paid to address challenges related to water utilisation in agriculture. In parallel to the land reform process, the water reform process has also been underway, as operationalised by the Water Allocation Reform Strategy of 2008. The strategy aims to provide water for subsistence farming or for sustaining basic livelihoods, and to start a development path of commercial and competitive water use in support of Broad Based Black Economic Empowerment (BBBEE). According to the strategy, all commercial water users must register their water use and will have to apply for a water use licences. Compulsory licensing is a key component of the reform programme to allow for the re-allocation of water to historically disadvantaged individuals.

The alignment of the land and water reform processes has however not run smoothly, with only a weak link between land reform, agricultural support and water resource provision (Greenberg, 2010). This stands in contrast to several trans-sectoral programmes. The synchronisation between water allocation and land reform programmes in irrigation areas therefore has to be improved. This challenge falls against a background where the scarcity of water resources in South Africa is on the increase due to various socio-economic and climate change related factors.

OBJECTIVES OF THE RESEARCH

In an attempt to engage with the need to improve the alignment of water and land reform initiatives, the Water Research Commission (WRC) conceptualised a research project entitled: "An Investigation of Water Conservation in Food Value Chains by Beneficiaries of

Water Allocation Reform and Land Reform Programs in South Africa". The Council for Scientific and Industrial Research (CSIR) was contracted to undertake the four year research study following external review. The objectives of the project were:

- To review the social, cultural, institutional, economic and political variables influencing water allocation reform and land reform programmes and projects, with particular reference to apportionment and/or transfer of water use entitlements in relation to land use rights;
- To assess the efficient development and use of water within the broad framework of food value chains for selected water and land reform projects;
- To analyse alternative opportunities for including the beneficiaries of selected water and land reform projects in the food value chain;
- To evaluate the economic and social costs and benefits of efficient development and use of water in food value chains;
- To develop guidelines for the sustainable development and use of water in food value chains within water allocation reform projects.

APPROACH AND METHODOLOGY

The research team integrated and consolidated the research needs derived from the objectives and as identified within the scoping phase of the project into 5 consolidated research questions (see table below).

Research questions

Research question	Hypotheses	Rationale for question
1. "What characteristics should be used to categorise beneficiaries in the study area for the purpose of assessing water use efficiencies and developing suitable, target-audience specific guidelines?" <i>This research question relates to specific objective 1.</i>	A broad spectrum of characteristics could be used for the development of a typology suitable for the purposes of assessing water use behaviour. We suspect that the relative position of farmers on the value chain could be used for the purposes of this project. However, differences in perceptions, aspirations and farming objectives affect the relative position on the value chain which thus affect water use behaviour (efficiency). Fieldwork data will be used to identify the set of characteristics that will confirm the characteristics for the typology (one could therefore argue that the typology will emerge from the fieldwork data and will not be assumed prior to the assessment).	Beneficiaries in any particular study differ in terms of aspirations, objectives, and needs. For example, not all beneficiaries of land and water reform in the study area have commercial farming aspirations. They also have different record keeping systems and different ways of interpreting and measuring productivity and efficiency. Water use efficiencies cannot therefore be assessed and interpreted in the same way for different groupings of beneficiaries. Typologies make these differences more explicit, which then serve as a context to assess water use efficiency and will form the basis for guideline development.
2. How do the different types of farmers (groupings) interpret	We suspect that significant differences exist in the	The development of guidelines necessitates explicit statements in

Research question	Hypotheses	Rationale for question
(perceive) key concepts such as: water use efficiency, water conservation, productivity, land and water use rights, and irrigation? (list not exhaustive). How do these interpretations differ from Government's / policy-makers' interpretations? This research question relates to specific objective 1.	interpretation of these key terms, which create confusion; unrealistic expectations; and misinformed and unrealistic policies. Failure to acknowledge and understand these differences will inhibit the development of suitable guidelines.	terms of the meaning of these concepts for each type of farmer to allow the development of said guidelines. Government acknowledgment of these differences is pivotal.
3. What indicators can be used to assess water use efficiency for farmers where formal recordkeeping is inadequate to assess water use efficiency by conventional means? This research question relates to specific objective 2 and 3.	We suspect that operations-based indicators (i.e. indicators based on the way in which water is used by this category of farmers); as opposed to output-based indicators, can be used to assess water utilisation efficiency. This is likely to apply to small-scale/subsistence farmers; where record-keeping is likely to be lacking.	Output-based indicators for water use efficiency as used for commercial farmers, i.e. indicators based on the value of output per unit of water use, are unsuitable to assess farmers where record keeping is inadequate to serve the data requirements for output based water use efficiency assessments.
4. What is the water use efficiency of farmers in the study area (where record-keeping is adequate to permit the use of conventional WUE assessment methods)? This research question relates to specific objective 2 and 3.	Output-based indicators for water use efficiency as used for conventional commercial farming enterprises could be used to calculate the water use efficiency of commercial farmers in the study area; as well as those with realistic commercial farming aspirations, provided that record-keeping is sufficient such that the required data can be obtained.	Farmers with commercial aspirations should be assessed along commercial interpretations of efficiency.
5. How should the guidelines developed as an outcome of this project differ for different target audiences? This research question relates to specific objective 4 and 5.	The guidelines should differ according to the farmer groupings. Target audiences for the guidelines include: farmers Other role players in the value chain Extension officers Policy makers	It is necessary to differentiate between different groupings of farmers – as they will each need different types of guidelines. Guidelines will be focused on irrigation practice and water management (dryland soil moisture retention)

The scoping phase of the project re-emphasized several important points which need to be accounted for in the project:

- i. The research needs to re-emphasise the diversity of contexts, objectives and aspirations found across beneficiaries of reform programmes and highlight the fact that different support strategies are needed for different types of beneficiaries.
- ii. Support programmes should aim to change human behaviour (i.e. to increase water use efficiency). It is therefore essential to systematically account for the

- culture, norms and traditions of target groupings within the target community and study area (i.e. within which this behaviour change is supposed to occur), during the design phase of the support programme.
- iii. The scoping phase revealed the need for the development of a detailed typology to be used as a working vehicle for the project. Categorising beneficiaries, i.e. creating a typology (classification framework) enabled the team to work with groups of beneficiaries with shared characteristics and to assess their water use accordingly. It was expected that water use strategies (as well as other characteristics, such as record-keeping) would differ across these categories, which necessitates the use of different methods and strategies to assess and improve water use efficiency within each category. The specific characteristics which form the distinctive attributes of the different groups are presented in detail in this report.
 - iv. In-depth knowledge on water use efficiency and farming styles was required, where the context in which water is used is observed as an integrated system. The fieldwork also needed to verify different opinions and perceptions around people's current water use efficiency. For example
 - a. What is the farmers' perception of land and water use rights, and how does it influence the way in which they use land and water?
 - b. How do farmers interpret and measure water use efficiency?
 - c. Do beneficiaries agree that they need to improve on the way they utilise water?
 - v. The project team needed to reflect on how these views differ from the views of policy-makers and debate the consequences of these different interpretations – misinterpretations can easily lead to misinformed and unrealistic policies.
 - vi. The scoping phase of the project revealed that some beneficiaries have unrealistic expectations and aspirations regarding commercial farming. This was tested by adopting a realistic-sceptical approach; i.e. by asking these individuals to explain their pathway to achieve their envisaged aspirations. They need to be assisted to reflect on how they operate, and this process needs to be skilfully and sensitively handled. For many beneficiaries with unrealistic expectations (particularly with regard to the 'riches' to be derived from commercial agriculture), the realities of commercial agriculture will become more apparent within their specific context as they are challenged to 'design' their pathway to success, leaving the ideal of commercial agriculture possibly less attractive. It should be mentioned that these unrealistic expectations are seemingly rooted in a reality that supports these expectations in a way that does not make them seem unrealistic to beneficiaries themselves.
 - vii. Guideline development needs to appreciate and take cognisance of the diversity of contexts between different groupings if it aims to have an effect. The insights derived from this study were captured in the guideline development phase of the project. This implies that the objective of each of the groupings was used to derive their unique indicators of 'success.' Guidelines emphasise the critical importance of human capital development and were driven by the expectations and aspirations of the beneficiaries, while being grounded in technical and financial boundaries.

The scoping phase of the study clearly indicated that farmers employ a range of livelihood activities, both on-farm and off-farm (including state allowances), with agriculture mostly employed in an important social safety net role, which is used whilst exploring other livelihood options. Farmers therefore have different farming objectives (i.e. to feed their families and maintain their livelihoods), which are often different as compared to the objectives from the perspective of Government, which has directed and aligned its support towards the objectives of commercial agriculture (*i.e. based on the production of marketable surplus, with profit as the main objective*).

This report is a compendium of the deliverables which were generated over the timespan of the project, presented in two volumes (a technical report and a guidance report). The report starts with a thorough literature review with specific reference to land and water reform in South Africa (Chapter 2). Chapter 3 presents the research design and the overarching methodological approach of the study including focus areas, the methods used, presentation of the case study, the main players and an overview of the fieldwork process. Chapter 4 presents the interactive stakeholder consultation process followed during the study in detail. This was considered an important aspect of the study in order to gain local support and buy-in for the project. Chapter 5 presents the agro-economic profiles which emerged from the field work phase of the project. This information fed into chapter 6, which goes into detail on typology development, which served as a system of categorisation of a particular phenomenon to better understand the phenomenon through comparison. Although there are various methods for creating typologies, all focus on building a framework where characteristics (aspects or attributes) of the phenomenon can be identified, given meaning through group structure and thus become comparable (as they can then be analysed within the same dimension). We first assessed current typologies already being found in the literature, before presenting a consolidated typology consisting of six different 'types' of farmers which emerged from the fieldwork. These types formed the basis for further analysis in the project. Chapter 7 focused on assessing the water use efficiency of the different types as per the different interpretations of efficiency as presented in chapter 6. First we analysed water use efficiency as per a traditional input-output based approach, whereby we calculate the marginal product value of water as used to irrigate several crops under different scenarios. Secondly, we analysed water use efficiency as per an operations-based approach, where the focus is not on outputs, but on the water utilisation process itself within each type. The assessment is done both in terms of water utilisation practice and on-farm production/agronomic/crop cultivation practice related to soil moisture management. We then critically reflect on the scope to improve water use efficiency according to the different interpretations and discuss possible incentives to put such measures in practice. Chapter 8 presents the value chains in which the respondents find themselves and presents the idea of clustering in order to improve the collective action and consequent scale-related benefits from such action. All of the above information is then drawn together in the development of guidebooks (described in Chapter 9) focusing on improving the integration of farmers via the improvement of water use efficiency (i.e. the drive towards water use efficiency is used as a vehicle to facilitate improved integration). The guidebooks emphasized the need for consensus on some ambiguous terms found in the study. The final chapter presents conclusions and main recommendations.

RESULTS AND CONCLUSIONS

This WRC project has resulted in a number of interesting findings and key messages that could potentially be valuable inputs to South Africa's land reform and water allocation reform initiatives. One of the key deliverables of this project is a set of three guidebooks aimed at emerging farmers, agricultural extension officers and policy advisors working in the Department of Rural Development and Land Reform (DRDLR) and Department of Agriculture Forestry and Fisheries (DAFF). Each of the guidebooks is aimed towards a different target audience and targets some of the perceived knowledge needs of that particular audience, as established during the course of the research. The contents of the guidebooks focus on the key themes of the research project: water allocation and land reform, water conservation and food value chains.

The guidebooks present three key messages: Firstly, it was found that not all beneficiaries of the land reform process aspire to be farmers, let alone commercial farmers. The research has revealed the existence of a diversity of contexts, objectives and aspirations across the range of individuals that have benefitted from the land reform process. As a result, different support strategies are needed for different types of beneficiaries. It should also be noted that given that support programmes related to water allocation reform and land reform aim to change human behaviour (e.g. to improve water conservation), the design phase of such programmes should systematically account for the culture, norms and traditions of target groupings within the target community within which this behaviour change is supposed to occur. Furthermore, and this is promising for the future of agriculture in South Africa, the project team found strong evidence of individual entrepreneurs with commercial aspirations who have the ability to do insightful planning and are determined to be self-reliant and financially sustainable, even in the face of adversity and harsh economic conditions. However, these individuals were in the minority, with most beneficiaries not displaying such characteristics. In fact, for many land reform beneficiaries, it is enough to have a garden that supports their day-to-day needs, or at most provides enough for them to sell a few vegetables at the local market.

In order to make sense of the different kinds of farmers that have been identified during the research, the project team developed a typology (classification framework) of emerging farmers for the case study area. The typology defines attributes according to which each type of emerging farmer can be discussed. The attributes chosen for this typology speak directly to the need to categorise farmers in a way that facilitates an assessment of their ability to conserve water and of their position on the value chain. The project team identified six basic types of emerging farmers in their typology. This typology has been included in the guidebook for policy advisors in order to illustrate the existence of different kinds of emerging farmers. An explanation of the different kinds of emerging farmers that were identified is followed by reflections on how these insights could be used by policy advisors in their day-to-day decision-making. It is clear from our research that not all beneficiaries of water allocation and land reform have the will, the determination, the resources or the ability to take on full scale commercial farming. Beneficiaries need to be made aware of what is required to successfully manage a commercial farming enterprise and need to be given the opportunity to decide whether they want to follow this

route. If beneficiaries do not want to become full-scale commercial farmers, they need to be given alternatives. These alternatives may involve commercial farming at a smaller scale, or they may involve activities other than farming. This is also an important message for policy advisors to take note of.

A second key message from the project emphasises the ambiguity of key terms and the danger associated with ignoring these differences while continuing to implement policies. This was one of the biggest problems that the project team identified, and it was clear that emerging farmers, extension officers and policy makers often have different interpretations of the same term – with disastrous results. This is also a major theme that was addressed in the guidebooks and ties in with the need for emerging farmers to use their water as effectively and efficiently as possible in order to not only maintain their position in existing food value chains, but also to migrate to new food value chains. For the purposes of this research, effective water use was interpreted as “doing the right thing” to conserve water, i.e. making use of the right kind of irrigation (e.g. furrow irrigation, drip irrigation, etc.) and agricultural practices (e.g. mulching, wind rows, tillage) for the specific kind of farming activities that beneficiaries are engaged in in order to use as little water possible. Furthermore, water efficiency is interpreted as “doing things the correct way”, i.e. if a farmer is using a specific kind of irrigation or agricultural technique, they need to make sure that they are applying the technique correctly and that water is not wasted when they do so. The guidebook for emerging farmers looks at why water conservation is important, how farmers can know if they are practicing water conservation, how they can become better at water conservation and how they can share their knowledge about water conservation with other farmers. The guidebook for extension officers is based on the same content, but focuses on how extension officers can assist emerging farmers in improving their water conservation practices.

A third key message from the project team’s research relates to the ability of emerging farmers to progress along the food value chain. Emerging farmers face a range of challenges in this regard. For instance, many of the farmers do not have record keeping systems, and therefore find it difficult to estimate how much water they use and whether they practice water conservation. Financial resources are also a big problem, with many farmers not being able to source the capital to invest in farming implements and irrigation infrastructure. Finally, many of the emerging farmers do not have the know-how and experience to run a farm and expressed a need for mentors and/or sustainable strategic partnership relationships.

The challenges listed above are often the reason why farmers find themselves “stuck” in a particular position within a food value chain and are not easily able to migrate to another. For the purpose of the guidebooks, the project team identified a food value chain that is representative of the Maruleng Municipal Area within which the research was conducted. In the guidebook for emerging farmers, the project team identifies how the current positions of most emerging farmers in this food value chain are problematic, and discusses some of the steps that could be taken to assist emerging farmers to participate more fully in the food value chain and also to move along it.

Lastly, this research has highlighted that much still has to be done to align land reform and water allocation reform. This has also been clear from the project’s case study area,

where water allocation reform has not been nearly as prominent or influential as the land reform process. In fact, water allocation reform has for the most part been non-existent, with the majority of beneficiaries not having any knowledge of water allocation reform processes in their area. The level of knowledge regarding the quantity of water used, licensing and water use authorisation, financial support for resource poor farmers and efficiency practices has also been found to be extremely low. During the project team's research, it became evident that not a single farmer from the irrigation schemes within the scope of the project study area had a water use licence in place. In the case of the CPAs, very few farmers knew about water use licensing, and it was only the management structure of the CPAs that was aware of water allocation and water use licensing.

In conclusion, this research has shown the importance of "thinking out of the box" when it comes to the future of South Africa's land reform and water allocation reform processes. It is critical to be aware of the fact that not all land reform beneficiaries are the same nor want the same things, and that beneficiaries are individuals with varying interests and ambitions. These are important nuances that need to be accounted for as the land reform process is interrogated and adapted in an attempt to improve its rate of success. It was also evident that it is important for this kind of research to take into account the needs of stakeholders and to address these as far as the project allows. This means doing a needs-analysis and, based on this, designing research outputs that are directly relevant to the needs expressed by the project's stakeholders. Introducing new insights into existing policy processes as well as focusing on the needs of stakeholders and addressing these as far as possible are key ways of achieving impact.

RECOMMENDATIONS

This project has implemented some components of a systems approach to engage the research questions. It started off by assessing how water use efficiency fits into the role of agriculture safeguarding food security in the absence of market structures, and whether it is part of the solution in uplifting South Africans. Given the emphasis on food security, it was argued that an improvement in water use efficiency for agricultural production should be part of an integrated process of improving food security in Africa. This formed the starting point for the design of solutions to observed challenges. With the help of social scientists, an approach was followed which allowed a richer interpretation of the context of emerging farmers in the study area. Field observations revealed several farming objectives, which were interpreted and used to design an alternative approach to assess the water use efficiency of emerging farmers. The approach was captured in dedicated guide books to different target audiences in an effort to assess and guide improvements in water use efficiency of beneficiaries of land claims and other smallholders. We differentiated between different groupings (6 types in total), since each requires different guidelines focusing on different challenges within each user's context. The differentiation and grouping of farmers for the guideline development process was firstly driven by the hopes and aspirations of farmers (but grounded by a set of technical and financial requirements), and secondly by the different farming styles found within the study area. The consequent development of guidelines for improving water use efficiency was based on farming styles within the study area. From a content perspective, the guidelines for farmers focused on water management in a broader sense as opposed to a narrow focus on irrigation management. The guidelines directed at government were structured in two

parts. The guidelines for extension officers focused on how best they can advise farmers and how they can overcome the challenges they face in this regard. The guidelines directed at policy-makers aimed to sensitize policy-makers in terms of the challenges farmers face in practice, and how decision-making based on current and future policy should take this complexity into account.

This study emphasized the fact that increasing water use efficiency of the farmers is only part of an integrated problem of general smallholder upliftment, including improved access to markets and credit, a focus on higher value crops, improved extension services and technical support, investments in innovative smallholder technologies, clarifying land tenure arrangements, encouragement of farm equity schemes, and providing necessary support through mentoring. These require interventions extending beyond the irrigation sector, and the success of these initiatives depends on human and social capacity developmental levels of smallholder irrigators, and is thus considered a pre-condition for effective support strategies. However, a basic education underlies all of these requirements, and given our failing educational system, this is seemingly the root cause of challenges related to water efficiency improvement initiatives. The provisioning of these training services became the mandate of public extension services more than 15 years ago (after provincial departments of agriculture withdrew from this function). Basic education of farmers, as well as renewed training in basic cultivation and irrigation support practice, is needed. The need for support services is universal, even though it varies between farmers and schemes. To date, tertiary education responsible for the training of extension staff and managers, agricultural research organisations responsible for innovation in smallholder irrigation, and public extension responsible to guide and support farmer development, have all fallen short of fulfilling their mandates. The guidelines as developed in this project aim to support these extension personnel in training activities specifically associated with water use efficiency. Thus far, it has been shown that improving water use efficiency of the beneficiaries of land claims requires an integrated approach because of the high case specificity and complexity associated with the socio-biophysical entity known as the “emerging farmer”. It has hopefully been shown that a focus on the improvement of the physical infrastructure of the farm entity does not guarantee increases in water use efficiency in the medium and longer term. Clearly there is a need for a more comprehensive approach, which harnesses the potential of social capital to improve water use efficiency.

RECOMMENDATIONS IN TERMS OF THE PROJECT OBJECTIVES

The following recommendations were made in terms of the specific objectives of the project:

The overall objective of the project was “to support efficient and sustainable conservation of water as a production input in food value chains following equitable allocation of water resources in irrigated agriculture” which was broken down into five specific objectives, which were assessed by means of five research questions, which in effect have directed the research. Hereunder we present each of these five specific objectives and discuss

the project findings in terms of each, while presenting some recommendations within the context of each specific objective.

Specific objective 1

This objective was *“to review the social, cultural, institutional, economic and political variables influencing water allocation reform and land reform programmes and projects, with particular reference to apportionment and/or transfer of water use entitlements in relation to land use rights”*.

The project has uncovered substantial variety in the social, cultural, institutional, economic and political variables influencing water conservation in food value chains. For example it was observed that few farmers have genuine commercial aspirations. Consequently, it was evident that the current institutional framework on water and land reform does not adequately accommodate this observed variety, which pointed towards the need for increased customization in the institutions governing the land and water reform process and water conservation in food value chains.

It is recommended that a certain level of customization in communication strategies will greatly improve the uptake of institutions to diverse audiences. A typology development protocol could assist in this process. This project has illustrated that it is possible to use such a protocol to allow the emergence of types or groupings representing different stakeholder groups within a target area, and then customize essentially the same message in different terms, in order to improve accessibility and uptake.

A remaining challenge is to assess the generalisability of such types or groupings from one target area to another. Here, the similarities between contexts would be an important determining factor.

Specific objective 2

This objective was *“to assess the efficient development and use of water within the framework of food value chains for selected water and land reform projects”*.

The study uncovered a spectrum of interpretations of water use efficiency. This pointed towards the need to assess water use efficiency from different perspectives, but in such a way that any such assessment of water use efficiency remains comparable with another. The study used a meta-analysis based approach in an attempt to identify alternative indicators of water use efficiency. Efficiency was assessed both in terms of second best estimates of the required variables for input-output based approaches, and an operations-based approach where the study team employed interviews, observations and photographs to assess efficiencies. Here the typology development process facilitated the creation of an alternative common language in which to translate the relative performance of water use efficiency of different types of users. This seems to be the only way which will allow a fair comparison of the water use efficiency across a spectrum of farmers.

It is recommended that the operations-based approach as developed in this project needs to be refined in terms of the development of standardized performance indicators which could be used to assess the performance as recorded in this approach in a quantitative fashion.

Specific objective 3

This objective was “*to analyse alternative opportunities for including the beneficiaries of selected water and land reform projects in the food value chain*”.

Cooperative governance seems to be one of the few options for emerging small holders to gain economies of scale in agriculture. However, this study found little evidence of this level of collaboration. Possible reasons for this could be mutual distrust, which again is grounded in the diversity of farmers. Cooperative governance could be facilitated via the current communal property associations. However, the efficiency of these associations varies greatly and is prone to empire building and internal corruption. An appropriate constitution for each association is the first necessary (but not sufficient) step for cooperative governance.

It is recommended that such associations are supported in terms of designing and drafting such a document that will provide the legal ground which will support the levels of mutual trust required for improved cooperative governance.

Specific objective 4

This objective was “*to evaluate the economic and social costs and benefits of efficient development and use of water in food value chains*”.

While the terms of reference for this study anticipated a quantitative assessment of the socio-economic benefits and costs of improved water use efficiency, the study soon revealed serious data limitations in the form of limited (or a complete absence of) record keeping systems. This implied that a traditional quantitative assessment with field data was not possible, since such an assessment requires detailed quantitative information as derived from farm record keeping systems. Instead of using “guestimates,” the study made use of second best estimates employing SAPWAT (Crosby, 1999) to assess direct costs and benefits. However, it did not satisfy the requirements of a quantitative field evaluation of the economic and social costs of the study area, and thus from this point of view, this objective was not achieved. These data limitations were however the main reason for the development of the operations-based approach as discussed previously, which included a qualitative discussion of the benefits and costs of improved water use efficiency.

It is recommended that a dedicated study is launched focusing on the creation of baseline information in order to quantify the benefits and costs of efficient development and use of water in food value chains. In practise this comes down to a longitudinal study where the researchers record the farming operations and practice of emerging farmers in detail – something which has not been done before. These records will form the basis to calibrate

non-standardised input and output quantities (for example a “bakkie” load of fertilizer) with standardised measures (i.e. 800kg of fertilizer) and will form the basis to compare such farming practices with best management practices.

Specific objective 5

This objective was “*to develop guidelines for the sustainable development and use of water in food value chains with water allocation reform projects*”.

This study has reemphasized the importance of effective communication as a determinant of water use efficiency. The study has illustrated this finding by communicating essentially the same message with regard to water resource management and utilization in three different ‘languages’ to three different target audiences. During feedback sessions it was clear that the finer nuances of communication should not be underestimated in the development and communication of guidelines and recommendations. This implies that the way in which a message is communicated is as important as the content of the message.

It is recommended that a renewed effort is made towards repackaging the guidelines and recommendations of studies which have focused on the effective and efficient use of water in agriculture and rural development. It is argued that a significant amount of knowledge is not communicated because it is not accessible / understandable by the intended user. A renewed effort is required to effectively communicate scientific knowledge to the intended users.

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CHAPTER 1: INTRODUCTION

1.1 Background and rationale for the research

South Africa has an evident 'dual-economy' agricultural sector; consisting of large-scale mechanised commercial farmers at one extreme and small-scale, resource poor subsistence farmers at the other. Currently, approximately 95% of the national agricultural output (traded in formal markets) is produced by 5% of South African farmers, who can be characterised as large-scale commercial farmers (Lyne and Darroch, 2003).

Since democratisation in 1994, the government has been implementing its land reform policy aimed at alleviating the political and economic inequalities that are a legacy of South Africa's past. One of the major challenges associated with the objective of transferring land to black farmers, has been to minimise productivity losses during the land reform process in order to minimise possible food security risks to the country. This has however proved to be quite challenging, as beneficiaries of the land reform process have been unable to maintain the comparatively high productivity levels of commercial agriculture. Consequently, several support programmes have been rolled out to support productivity-related challenges in the agricultural sector, yet insufficient attention seems to have been paid to addressing the challenges related to effective water utilisation in agriculture.

In parallel to the land reform process, the water reform process has also been underway, with one of its central pillars being the Water Allocation Reform Strategy of 2008. Water Allocation Reform (WAR) aims to address past inequalities by improving the access to water of subsistence and emerging farmers, and to initiate (along with other measures) a development path for commercial and competitive water use in support of Broad Based Black Economic Empowerment (BBBEE). Compulsory licensing is considered to be an important aspect of the WAR programme, and allows for water currently lawfully allocated to users to be re-allocated to historically disadvantaged individuals.

Unfortunately, the alignment of these two reform processes has been poor, and there is still a weak link between land reform, agricultural support and water services provision (Greenberg, 2010), despite several trans-sectoral programmes that are in place. Many land reform farms have consequently failed because of inappropriate timing between these processes, most notably water not being available for production (Groenewald, 2004). The synchronisation between water allocation and land reform programmes in irrigation areas therefore has to be improved. This challenge falls against a background where the scarcity of water resources in South Africa is on the increase due to various socio-economic and climate change related pressures (Nieuwoudt et al., 2004; Maharaj and Pietersen, 2004; Department of Water Affairs and Forestry, 2004; Basson et al., 2010; De Lange et al., 2009; Dabrowski et al., 2009; Van Heerden et al., 2008a; Department of Water Affairs and Forestry, 2005).

While the social, economic and political rationale for water and land reform in South Africa is well understood, there is a lack of knowledge on how to translate these goals and objectives into specific projects on the ground. A wide-ranging programme of land and water reform is certainly a necessary (but not sufficient) condition for the resolution of the deep-seated inequities in the ownership of the means of production. It is argued that the core component of agrarian reform is more equitable access to the assets of land, water, markets, capital, technologies and skills (Van Koppen et al. (2009). However, knowledge about opportunities and constraints facing implementation of the reform programmes is crucial, because it can provide information towards better policy and strategic decisions. A better understanding of the opportunities and constraints facing implementation of the reform programmes will thus support clarification of why the reform process fails to achieve systematic outcomes, and may also enable the formulation of interventions that counter poor implementation.

In an attempt to engage with the need to improve the alignment between water and land reform initiatives in irrigated areas, the Water Research Commission (WRC) conceptualised a research project entitled: “An Investigation of Water Conservation in Food Value Chains by Beneficiaries of Water Allocation Reform and Land Reform Programs in South Africa” (WRC, 2011). The overarching objective of the project was to support efficient and sustainable conservation of water as a production input in food value chains following equitable allocation of water resources in irrigated agriculture. Specific aims included:

- To review the social, cultural, institutional, economic and political variables influencing water allocation reform and land reform programmes and projects, with particular reference to apportionment and/or transfer of water use entitlements in relation to land use rights;
- To assess the efficient development and use of water within the framework of food value chains for selected water and land reform projects;
- To analyse alternative opportunities for including the beneficiaries of selected water and land reform projects in the food value chain;
- To evaluate the economic and social costs and benefits of efficient development and use of water in food value chains;
- To develop guidelines for the sustainable development and use of water in food value chains with water allocation reform projects.

The Council for Scientific and Industrial Research (CSIR) was contracted to undertake the four year research study following external review. A key feature of the project was to incorporate multiple levels of stakeholder input to underpin the project’s findings. These stakeholders were mostly located within the Maruleng Local Municipal Area, and included emerging farmers who are beneficiaries of the land reform process; strategic partners to these emerging farmers; and organisational representatives from the Maruleng Local Municipality, the Lower Blyde Water User Association (WUA), the Moletete Communal Property Association (CPA), the Makhutswe CPA, the Department of Agriculture and Forestry (DAFF) extension officers and Lepelle Northern Water.

Presently most existing lawful use of irrigation water is located within commercial farming. The Water Allocation Reform Strategy of the Department of Water Affairs and Forestry (2008) states that by 2014, 30% of allocable water should be to the benefit of black people. By 2024 the target is 60%, of which half should be under control of black women

specifically. Indications are, however, that not only were these targets ambitious, evidence is also increasing that many water allocation reform and land reform projects are failing. One of the key challenges lies in improving the synchronisation of reform programmes to ensure that beneficiaries hold secure land and water use entitlements. This along with effective support services, including improved access to finance and markets, and, most importantly, improved mentorship from experienced farmers and extension services, are considered requirements for successful reform.

It has been argued that the integration of subsistence, emerging and commercial farmers will improve the synchronisation and hence relative efficiency of the reform process. This project tests this argument within a suitable case study area and within the context of food value chains. The latter is often considered to be an appropriate context for dealing with the requirements of integration of these types of farmers. However, the structure, conduct and performance of value chains are normally analysed within a particular social context consisting of specific institutional arrangements, governance systems and resource allocation regimes (Jordaan and Grove, 2012). It is also acknowledged that value chains vary in complexity and that there are different approaches towards analysing them. This project tests these claims within the South African context of water allocation reform. Specific reference is made to progress underway in terms of current integration processes and progress in terms of water reform within the case study area. Value chains are used in part to present differences between types of farmers.

1.2 Structure of the report

This report is a compendium of all the deliverables which were generated over the timespan of the project presented in two volumes (a technical report and a guidance report). The report starts with a thorough literature review with specific reference to land and water reform in South Africa (Chapter 2). Chapter 3 then presents the research design and the overarching methodological approach of the study including focus areas, the methods used, presentation of the case study, the main players and an overview of the fieldwork process. Chapter 4 presents the stakeholder consultation process in detail. This was considered an important aspect of the study in order to gain local support and buy-in for the project. Chapter 5 presents the agro-economic profiles which emerged from the field work phase of the project. This information fed into Chapter 6, which presents the method followed to group the respondents, which was then used to assess water use efficiency in Chapter 7 according to both an input-output based approach as well as a so-called operations-based approach. Chapter 8 presents the value chains in which the respondents find themselves and presents the idea of clustering in order to improve the collective action and consequent scale-related benefits from such action. All of the above information is then drawn together in the development of guidebooks (described in Chapter 9) focussing on improving the integration of farmers via the improvement of water use efficiency (i.e. the drive towards water use efficiency is used as a vehicle to facilitate improved integration). The guidebooks emphasized the need for consensus on some ambiguous terms found in the study. The final chapter presents a conclusion and recommendations for further study.

CHAPTER 2: LITERATURE REVIEW

2.1 *Background and introduction*

This chapter reviews the social, cultural, institutional, economic and political variables influencing water allocation reform and land reform programmes and projects, with particular reference to apportionment and/or transfer of water use entitlements in relation to land use rights in South Africa.

Since 1994, the Government of South Africa has been involved in the design and implementation of two separate but closely related reform programmes in the land and water sectors. The two programmes have both re-distributive as well as socio-economic objectives, and are intended to address the racial imbalances in ownership of land and access to water while stimulating economic development among the historically disadvantaged black communities. The land reform programme is intended to lead to the transfer of approximately 30% of the white-owned commercial farms to newly established black commercial farmers by 2014 in an effective and sustainable manner (Cousins and Scoones, 2009). The Water Allocation Reform Strategy of 2008 states that by 2014, 30% of allocable water should be to the benefit of black people. By 2024 the target is 60%, of which half should be under control of black women. Parallel to the process of land and water sector reform, agricultural policy reform has also been initiated, with particular attention being paid to irrigation policy. The overall objective of agricultural-policy reform is to create more opportunities for resource-poor farmers so that they can improve productivity and contribute more to the mainstream economy.

Water and land reform are meant to empower previously disadvantaged groups, with considerable economic gains envisaged to spill over into the mainstream economy. The Water Act (1998) of the Republic of South Africa identifies water as a critical tool for transforming society towards equitable poverty eradication. However, preliminary assessments indicate that the land and water reform targets have not been matched by meaningful implementation on the ground, and very few water-use licenses have actually been awarded and taken up by emerging black commercial farmers. It also came to light that many water and land reform projects do not increase (and may in fact diminish) the productive use of land and water resources on the 'new' black-owned irrigated farms. These findings point towards the challenge of synchronising reform programmes in irrigation areas with land reform programmes and improved extension services to ensure that beneficiaries hold secure land and water use entitlements while increasing their productivity levels.

Relying on published literature and government departmental reports and documents, this review examines the major factors influencing land and water reform and the constraints and opportunities facing the 'emerging' farmers on irrigation schemes.

2.2 *International perspectives*

Resource ownership in most countries of Southern Africa has been characterized by profound and long-lasting inequities that emerged during the colonial era. In South Africa,

apartheid has sharpened class and racial differences resulting in serious economic disparities. According to Kambudzi (1997: 60), “the indigenous population has remained, not only denied of arable land, but of essential productive water.” For instance, at the end of Apartheid in 1994, 86% of South Africa’s farmland was in the hands of the white minority, while over 13 million black people lived in crowded former homelands under extreme poverty (Cousins et al., 1999). After the first democratic elections in 1994, this situation did not change much and remained a source of tension and conflict. Therefore, most discussions about access to water and land in South Africa invariably make reference to the need to correct these historical imbalances in ownership of the means of production.

Roth (2002) provides a summary of the salient land issues in Southern Africa. This summary presents a picture of the situation prevailing in the water and land sectors before the reform processes were initiated in South Africa. While the summary mainly pertains to land reform, it is also relevant to water because access to water for irrigation has been closely related to land ownership in the past (however, it should be noted that the 1998 Water Act distinguish between land and water use rights, effectively facilitating separate trade of these). Roth (2002) summarises the salient land and water issues as follows:

- Highly unequal land distribution both in terms of area and land quality;
- Severe land shortages and problems of landlessness in communal areas and/ former homelands;
- Dual economies characterized by historically segmented access to resources and markets between “white and black”, rich and poor, socially advantaged and disadvantaged;
- Severely eroded land and water resources in communal areas caused by overcrowding, pass laws, inadequate infrastructure and lack of knowledge in terms of soil retention;
- Weak and uncertain rights of tenants operating under permits on resettlement schemes.

Most of the fresh water available was allocated to irrigated agriculture, a sector dominated by large-scale commercial farming (Derman, 2003). Having realized the prevailing skewed nature of land and water property rights, South Africa instituted land and water reform programmes designed to address past inequalities in land and water allocation.

2.3 Land reform policy and institutional dimensions

Land reform in South Africa refers to the implementation of the post-1994 land reform policy, which was first publicized in the Reconstruction and Development Plan in 1994, enshrined in the new Constitution of 1996 and then articulated in some detail in the 1997 White Paper on South African Land Policy (DLA, 1997). According to Cousins et al. (2009), the objectives and scope of post-apartheid land reform are set out clearly in the 1997 White Paper on South African Land Policy, summarising the goals of land reform as: ‘to redress the injustices of apartheid; to foster national reconciliation and stability; to underpin economic growth; and to improve household welfare and alleviate poverty’ (DLA 1997: v). Land reform and its aims are also supported by the South African Constitution,

but the Constitution also recognizes existing property rights. In practice this means that land transactions are carried out on the basis of the 'willing-buyer-willing-seller' principle.

The FAO (2002) divides the land reform programme in the country into three different dimensions namely, land restitution, land redistribution and tenure reform. Land restitution aims to return land that was taken away forcibly from people during apartheid, or to provide those affected with financial compensation. It targets both rural and urban land. Land redistribution aims to improve equitable land ownership by increasing the proportion of ownership of previous disadvantaged people in South Africa. Finally, land tenure reform aims to enhance the security of tenure in vulnerable groups, such as workers and their families residing on private commercial farms as well as people living in the former homelands.

The set target for the combined effort of land restitution and redistribution was to transfer 30% of South Africa's land over a period of five years. This was however stretched to ten years to 2014 (Lyne and Darroch, 2003). The outcome of this process was a diverse agrarian landscape characterized by small, medium and large farms held by means of various tenure arrangements (South Africa, 1997). In the long-run, the programme also sought to facilitate structural change in the agricultural sector by assisting formerly disadvantaged groups to establish themselves and produce crops on small and medium-sized farms. The intention was to stimulate rural economic growth via agriculture.

A market-based approach to land acquisition and transfer was adopted, relying on voluntary transactions between willing sellers and willing buyers (Lyne and Darroch, 2003: 37). Grants were to be made available to historically disadvantaged applicants in order to provide them some purchasing power – the poor and marginalized, as well as women, were targeted specifically. It is clear that the design of the programme mixed new institutional economics perspectives with livelihoods and welfare priorities; however, targets were enthusiastically set and performance remained far off (Cousins, 2000; Versfeld, 2003).

There are however isolated examples around the globe of interventions that have been effective in reversing the continuing downward spiral of poverty and hopelessness in rural area contexts, with positive impacts on land-use, water-use, and crop yields. These are often termed bright spots in the published literature and are characterized by individuals or communities that have made significant changes and managed to effectively utilize land and water resources (Van Koppen et al., 2009). This has been seen as the goal for 'new' black-owned farms engaging in irrigated agriculture. But despite the fact that actual land transfers began from 1995, and based on past performance, there remains great uncertainty as to what land reform can potentially accomplish (and how), especially in terms of livelihoods and broader economic impacts (Van Koppen et al., 2009). The uncertainty spans predominantly from factors including political, policy and institutional dimensions, planning and operational issues, and socio-economic and cultural aspects.

The land reform programme in South Africa is generally criticized for its slow performance rate and the failure to impact significantly on the land tenure systems prevailing on

commercial farms and in communal areas (Hall, 2008). It is also becoming increasingly clear that the 'willing-buyer-willing-seller' approach, which provides the fundamental character of a market-based land reform programme in South Africa, is only able to generate modest amounts of land for a small minority of the rural population, but leaves the underlying structure of the agrarian economy largely intact (Walker, 2005).

However, the issue of the pace (or lack thereof) of reform was beyond the scope of the current project. Instead, this project focused on the existence of a widespread perception that most of the land that has already been redistributed is not being used as "productively" as originally envisaged, and also that there have not been significant livelihood benefits for the majority of the beneficiaries (Cousins and Scoones, 2009; Lahiff, 2008). An examination of reports by various analysts has shown that the weaknesses of the land redistribution process clearly extend well beyond the 'willing-seller-willing-buyer' principle, and include things such as the types of beneficiaries accessing the programme, inappropriate land-use models being imposed on beneficiaries, the general failure of post-settlement support and, ultimately, the generally disappointing performance of land reform projects. According to DBSA (2009), government recently admitted that the failure rate of new land reform projects could be higher than 50%. We argue that one of the reasons for this is deep-seated structural and implementation shortcomings in the framework of the reform programme itself. The following sections discuss some of the prominent failures.

2.4 *Beneficiary selection and participation*

According to Lahiff (2008), a potentially worrying trend is for land to be purchased by the state without first identifying the intended owners of that land, implying that policy may be swinging from an entirely 'demand-led' approach to one that is increasingly 'supply-led'. This means that prospective beneficiaries may not be directly involved in the purchase decision or in the immediate post-purchase planning for the land, thereby opening up the possibility of a more top-down approach to both project implementation and beneficiary selection. Hall (2008) states that in some instances, the land is first identified and only then is an effort made to identify appropriate people to benefit from it in sufficient numbers to make up the asking price of the land. Here, the aggregate of the individual grants are used to pay for the land, resulting in a significant increase in the number of owners who can lay claim to the productive potential from the land. However, most of these owners have very limited experience and knowledge of farming, and as a result, one often finds 'new' farmers who are not fully prepared for their new responsibilities. Their commitment to and/or capacity for high productivity on the new farms is thus limited.

De Lange et al. (2004) point out that the successful beneficiaries either have had previous personal experience in small-scale commercial agriculture as managers and decision makers (i.e. not just as farm workers), have previously relied mainly on small-scale agriculture for their livelihoods, or have a good standing with an existing commercial farmer who acts as mentor. However, these cases are in the minority, as rarely have groups of land reform beneficiaries met this profile. Instead, project beneficiaries have tended to be rural dwellers with various livelihood strategies, in which agriculture is only

one. This places a burden on providing comprehensive skills training and increases the likelihood of inactivity and even defection among beneficiaries in group projects. Calls for the shift from the group approach to the individual approach in land reform must be understood in this context. South Africa largely lacks the type of beneficiaries who have been shown internationally to be ideally suited for participation in land and agrarian reform programmes. Beneficiary selection demands more rigorous attention to achieve increased success rates. However, this points towards the need for an explicit definition of what it means to be “productive and successful”.

2.5 Land reform models and enterprise planning

According to Hall (2008), the models of land reform being implemented have had a direct bearing on the performance of the new programme. What is striking from the South African experience is, on the one hand, the dominance of the group model of land ownership and use and, on the other hand, the marginalisation of individual or household options, except for those with substantial resources. Lahiff et al. (2008) state that while collective ownership of land is driven by a range of factors, the most important factor is the refusal of state agencies to contemplate the subdivision of existing agricultural units. Most land reform projects typically emphasise whole-farm commercial enterprises owned collectively by a group of beneficiaries. Most of these enterprises are costly, complex, take time to deliver benefits, are often high-risk and seldom allow for multiple uses of farmland other than those undertaken by the commercial enterprise. These are circumstances that emerging farmers are not capacitated to operate under.

Collective ownership of land and collective agricultural production are not in themselves problematic, and are undoubtedly favoured by many people. The trouble is that they are effectively imposed on people by the land reform programme, with little consideration of their appropriateness in particular circumstances, the actual wishes of participants, or possible alternatives. Anseeuw and Mathebula (2008) argue that this results in apathy among a large portion of the beneficiaries, as well as in opportunities for illegal practices and misuse of assets by those in power. In addition, groups typically struggle to make use of available resources and rarely receive the external support they require to function effectively (Lahiff et al., 2008). As a result, productivity suffers. According to Hall (2008), land reform in South Africa has typically entailed the securing of private ownership of an outer boundary of land by a legal entity, leaving the complicated internal social arrangements and allocation of use rights to be sorted out by members of the group, and administration of this to a community property association committee or trustees.

Van Koppen et al. (2009) argue that, by and large, implementation of land reform has not remained true to the original idea of subdividing large farms into smaller units, nor has there been any conscious attempt to encourage technologies that are more labour intensive. The possibility of small-scale production by poor households on their own land, whether held in common or not, has not been sufficiently explored, and this is viewed as a crucial gap. The absence of a proactive mechanism to subdivide land means that in most instances, farms must be bought in their entirety, thereby forcing people who might have

wanted a small amount of land for themselves to take on a whole farm with a group of co-applicants, with whom they may have little in common, leading to problems of defining rights and of cooperation in use. This also has a negative effect on productivity.

A number of reviews have raised questions related to planning for the new farms (Cousins and Scoones, 2009; De Lange et al., 2004; Movik, 2009; Walker, 2005). These reviews have shown that best-practice in enterprise planning to achieve productive use of the land requires the use of a systematic process that follows a series of steps and a significant level of follow-up evaluations. This includes assessment of farming systems surrounding the project which reflect adaptation to socio-economic, cultural, agro-ecological and market conditions; land suitability assessments; identification of opportunities to modify elements in the farming systems if need be; assessment of economic viability in relation to variable markets; evaluation of infrastructure resources and related funding; assessment of existing technical and managerial capability of the new farmer; access to training and technical support needed; and a proposed farm plan that provides the new farmer with a benefit stream within a short period of time and is appropriate to the beneficiary farmer's capacity (both skills and resources). International and South African experience show that access to land must result in tangible improvements in the livelihood of beneficiaries within a fairly short period of time to avoid beneficiary defection. To achieve this, the enterprise plan must present a rational and explicit system of individual economic incentives instead of the hazy set-up that one often finds in enterprises run by groups on the new farms in South Africa.

Land restitution and redistribution is often embroiled in highly capitalized business environments. For example, in the sugar-cane growing areas of the Lower Crocodile River, the reallocation of land occurs where the land is restored to the community which laid claim to it, but is then leased by a production company jointly owned by the community and the Transvaal Sugar Company (TBS) (Woodhouse, 2008). The land-owning community then receives a lease income in addition to a share of the profits of production. A consequence of this is that the restitution of land does not bring the ownership of land in its 'natural form' nor the ownership of infrastructure such as irrigation equipment, farm machinery, vehicles, etc. (Woodhouse, 2008). However, land is maintained in its productive capacity in a highly capitalized business, which forms part of a larger supply chain (Woodhouse, 2008).

2.6 *Post-transfer support*

Another major shortcoming of the land redistribution process often articulated by various analysts is the lack of resources made available for post-transfer support and adequate resources to beneficiaries (Turner and Ibsen, 2000; Cousins, 2005). Various studies have shown that beneficiaries experience severe problems accessing services such as credit, training, extension advice, transport and ploughing services, veterinary services, and access to input and produce markets (HSRC 2003; Hall 2004; Bradstock 2005; Lahiff 2007). This has been attributed to many factors, but the most widely cited are inadequate or inappropriate planning, a general lack of capital and skills among intended beneficiaries, a lack of post-settlement support from state agencies, most notably local

municipalities and provincial departments of agriculture, and poor dynamics within beneficiary groups (Lahiff, 2008). Greenberg (2010) points out that until 2003, the National Department of Agriculture provided limited support to new farmers for agricultural production; however, the dismantling of agricultural development corporations and the decline of extension services meant that while farmers received support in accessing land, they were then left more or less on their own thereafter. Production inputs were left to the 'free market', with some basic state regulation on standards. According to Van Koppen et al. (2009), the general pattern of redistribution policy development over the past decade has been to observe that beneficiaries are not succeeding, then to adjust policy in order to increase the resources available to applicants (thereby reducing group size and increasing working capital), and then to repeat the process. This approach is not proactive and tends to limit the impact of the reforms on livelihoods, while wasting precious resources.

Greenberg (2010) argues that while various initiatives have been undertaken to address the challenge of post-settlement support, such as the introduction of the Comprehensive Agricultural Support Programme and the provision of micro-credit under the Micro-Agricultural Finance Initiative of South Africa programme, it would appear that many land reform beneficiaries remain without the adequate support they need to use their land productively. The Department of Agriculture's chief strategic plan, which serves as the government's primary official statement on agrarian reform, also does not satisfactorily address the need for specific measures to support smallholders. Rather, it speaks broadly of allowing and promoting the entire spectrum of enterprises and farm sizes. In particular, it focuses on the theme of ensuring more equitable access in the sector. One interpretation of the strategic plan is that it promotes racial equality in an agricultural sector whose structure has remained effectively unchanged (Cousins and Scoones, 2009). Although most provincial farmer support programmes have expanded in real terms since 2007, implementation is patchy, with lack of capacity at provincial level blamed for an inability to use available resources. Lack of capacity could be just another way of saying that there are insufficient people possessing the skills that may be considered as appropriate at various scales under the circumstances (Lahiff, 2008).

Van Koppen et al. (2009) state that in recent years, the government has introduced a number of initiatives to improve the performance of emerging farmers. These include the Comprehensive Agricultural Support Programme; the Micro-Agricultural Finance Initiative of South Africa, which is a rural-oriented microcredit scheme; Landcare; AgriBEE and so on. Overall, various initiatives are ongoing, but to date it is difficult to discern any significant impact on the ground. Greenberg (2010) states that South Africa's public extension service has been in gradual decline over the past 15 to 20 years, as the resources of the Department of Agriculture, Forestry and Fisheries have shrunk and extension services for commercial farmers have been privatized. DBSA (2009) contends that much of the earlier success of extension services was related to the relative homogeneity of the approximately 60 000 commercial clients, and extension agents knew their clients and what they were trying to achieve. This service was focused, well-resourced and staffed by well-trained officials. In contrast, extension workers in the former homelands were generally not well trained, and were required to serve a large, diverse

client base including subsistence, emerging and commercial farmers. This legacy continues to undermine the quality of extension service provision even for the emerging farmers.

The scope of work for extension officers has also expanded significantly since 1994. Instead of servicing a relatively small number of large-scale commercial farmers, there has been a significant shift in client focus, which requires officers to play new roles, including institutional development for smallholders, assisting them to get access finance and other production requirements, to market their produce, and to access second-economy government support projects, such as cooperatives, land reform, food security and land-care. The ratio of extension officers to farmers is 1:878, which is comparable with other countries with similar agricultural issues, such as India, Zambia and Zimbabwe (Greenberg, 2010). Extension officers are also expected to assist with the administration, implementation and monitoring and evaluation of such initiatives. Farmers are generally very critical of the extension capacity of provincial agriculture departments. This partly explains the poor performance of the emerging farmers (DBSA, 2009).

2.6.1 Capacity of the emerging farmers

Cousins and Scoones (2009) highlight that the past political regime of apartheid has prevented black people in South Africa from engaging in commercial farming for a long period of time. Catching up on the knowledge and experience will take a very long time, especially given the low educational levels of most beneficiaries. For the large majority of black people who still practise agriculture, its importance in their livelihoods has been reduced to the level of a secondary activity to produce food for their own consumption and as a way of building a rural asset base (livestock) to be used for bartering (livestock is seen as a valuable asset and currency for trading). Consequently, 'emerging' black farmers often lack the knowledge and skills required for commercial farming. This assertion is supported by Hart (2006), who used Labour Force Survey Data and established that about 4 million black households practised some form of agriculture during 2005. This represented only 44% of the 9.1 million black households that were resident in South Africa in 2005. For the large majority (77%) of these households engaged in agriculture (3.08 million households), agriculture was an extra source of food for the household. For 600,000 of the remaining 920,000 households, agriculture was reported to be the main source of food for the household, and for 120,000 households, agriculture was considered as a leisure activity. This left 200,000 households that listed agriculture as a source of monetary income. For 120,000 of these households it was an extra source of income and for only 80,000 households agriculture was the main source of income.

The general absence of a peasant tradition among contemporary black people in South Africa is an important constraint to achieving the desired outcome of establishing a new class of black commercial farmers. A study carried out by Rukuni (1994) demonstrates that in cases where the majority of the rural poor who are targeted by land and agrarian reform initiatives have a peasant tradition, the beneficiaries are able to quickly adjust and

participate meaningfully in the agricultural market economy of that country. In most parts of the world, productive farming occurs within the confines of certain socio-cultural networks in which agricultural knowledge is produced and reproduced. If people withdraw from or are forced out of farming (as occurred during apartheid in South Africa), local skills and knowledge of farming are lost (Bundy, 1988). When the South African land and agrarian reform policies were being crafted and tested, McIntosh and Vaughan (1996) argued that previous efforts to address rural poverty through the establishment of market-oriented smallholders in the former homelands had achieved very limited success. They indicated that these initiatives had been successful only under very specific conditions, namely, when structured as out-grower schemes underpinned by a comprehensive private-sector support system, as in the case of sugar cane and timber, and in the form of fresh produce gardening in close proximity to urban centres. Thus the absence of a strong and vibrant peasant tradition is identified as one of the root causes of the limited success of the land and agrarian reform process in South Africa.

2.6.2 Capacity of the implementing agencies

According to Umhlaba et al. (2010), global experience shows that land and agrarian reform programmes are very complex and demand a high degree of competency and capacity among the agencies that implement them. Capacity determines what is feasible, and governments should not pass legislation when there is insufficient capacity or resources to implement the legislation. Two broad domains of capacity are critical in providing support to land and agrarian reform: the capacity to administer land; and the capacity to support the establishment of new farmers.

De Jager (2008) argues that South Africa's problem is one of implementation, and the major tragedy is that the country does not have officials in the DLA who are capable of turning the legal framework, structures, plans and dreams into reality. Rather, their involvement had been destructive and has become an important source of conflict, polarisation, frustration and mistrust. Dedicated land reform units at the district level is one mechanism that could improve coordination and support to emerging farmers in South Africa. The capacity to administer land includes land surveying, titling and registration and land-use planning, land valuation and land taxation. The capacity to support the establishment of new farmers encompasses a wide range of support services that are needed to enhance the competitiveness and viability of the new farms that are being established. Walker (2005) recommends a broad basket of farm production support services that underpins success. These include extension, training, credit/finance, marketing, inputs, infrastructure, management labour, capital equipment and provision of facilitation and strategic services appropriate to emerging farmers. Most of these services have been privatised since the downscaling of agricultural extension services.

Walker (2005) argues that while clearly there are serious problems in the organisational capacity of the state to drive a major programme of land reform, many critics consistently underestimate the complexity of the task and, of greater concern, apply criteria for judging success that are themselves limited and may even be counter-productive. The most

common indicators of progress, across the board, are the total numbers of hectares transferred and people counted as beneficiaries – criteria that flow from the national discourse about land reform and transformation, rather than local project requirements. This discourse puts pressure on departmental officials at the project level to speed up land transfer in the interests of national results. This works to the detriment of actual projects, by rushing the pre-transfer process and undermining prospects for strong beneficiary organisations, capable not simply of holding title deeds but of managing ownership of their land effectively after transfer. Rushed transfer processes may have particularly negative consequences for women, who are unlikely to be adequately represented in community leadership structures or to play an active part in the formal decision-making process unless the state pays special attention to supporting that.

Anseeuw and Mathebula (2008) point out that the administrative burden of the process has negatively affected the performance of land redistribution projects. All procedures are perceived by the beneficiaries as long, difficult and often costly. The time lapses between the demands for land and the actual acquisition are a good example: the average time lapse for a restitution/redistribution claim to be settled is 7.8 years. But even after this lengthy process, some of the beneficiaries still do not have title deeds, thus limiting their access to bank loans. Aliber and Mokoena (2000) argue that this does not only make government a second hand negotiator, but also leads to an important demotivation of the potential beneficiaries and a deterioration of the production infrastructure (e.g. lack of maintenance of implements, land and perennial crops). The activities of local government administrations are also not transparent. Several activities are implemented without consultations or agreement with the beneficiaries. Furthermore, some of their engagement and practices can be unlawful. This raises questions regarding the land reform process from a structural point of view, since the implementers of certain activities, projects and programmes are the same individuals who monitor the entire process.

Greenberg (2010) views the Comprehensive Rural Development Programme as the latest manifestation of government attempts to integrate agricultural support, land reform and broader rural development without actually putting more money into rural areas. Early indications are that the programme is likely to run into difficulties. It relies on the already weak institutions of the former Department of Land Affairs (now the Department of Rural Development and Land Reform). The approach to planning and implementation is rushed, signifying a continuation of the need for instant results and the 'immediate delivery at all costs' mentality so prevalent in government, which leads to poor quality and lack of sustainability. In addition, people remain bystanders in their own development, except for the select few who will be chosen to sit on advisory groups with poorly defined purposes (Lahiff, 2008). Policy-making structures remain dominated by agribusiness, which is able to wield a strong influence on the direction of government support to both land reform and agriculture.

2.7 Theoretical underpinnings and inappropriate perceptions

The initial implementation of the land reform programme focused primarily on the transfer of land to the target population, and paid little attention to what beneficiaries intended to

do with the land they had acquired (Hall, 2008). Five years into the land and agrarian reform programme, the focus of programme implementation was revised from the focus on transfer of land to poor people to transfer of land for purposes of providing beneficiaries with livelihoods based on productive use of the land (Vink and Van Rooyen, 2009; Greenberg, 2010). In 1999 a review of the programme was commissioned, and a new policy framework called Land Redistribution for Agricultural Development (LRAD) was announced in 2000. Under LRAD, the previous focus on targeting land redistribution toward the poor gave way to an emphasis on promoting black commercial farming, with a separate food security programme aimed at the poor (Jacobs, 2003). Larger grants together with loan finance were offered to applicants, on a sliding scale, and an income ceiling was removed to encourage black entrepreneurs to apply. 'Commercial viability' now became a key criterion for approving the business plans required for all land reform projects. Agricultural support programmes for land reform beneficiaries were announced, to be implemented by provincial departments of agriculture, but these have been underfunded, poorly planned and ineffective to date (Lahiff, 2008; Vink and Van Rooyen, 2009). According to Lahiff (2007), the official emphasis on commercial 'viability' has increased considerably since the beginning of the land reform programme and the commercial logic of LRAD has now been applied to all land reform applicants regardless of their resources, abilities, or stated objectives.

The reasoning of some radical changes in the agrarian structure has also been promoting the commercial viability orientation, and argues strongly for the establishment of 'viable and sustainable upcoming commercial farmers' (Doyer, 2004:8). The orientation towards commercial viability resonates soundly with colonial and neo-liberal discourses that emphasize farm modernization and profitability. These discourses, however, do not sufficiently capture and address the historical inequities in land and water ownership, nor the rural poverty accompanying those inequities. And despite the new focus on commercial viability, high rates of failure in land reform continue to make headlines (Vink and Van Rooyen, 2009; Walker, 2005). In 2005, a National Land Summit involving a wide range of stakeholders called for a fundamental review of land reform policy, including the willing-seller-willing-buyer principle. Following the Summit, the idea that land redistribution should be embedded within a wider agrarian reform process focusing on poverty reduction and creating opportunities for smallholder farmers, became common in policy and public debates. However, there has been little clarity on what this might mean for beneficiary selection, programme design, post-transfer support and agricultural policy more generally (Lahiff, 2008). Thus, land reform and appropriateness of redistribution models remain unresolved challenges in the country (Greenberg, 2010).

2.8 Water allocation reform policy and institutional dimensions

South Africa is a water-scarce country with an average rainfall of 450 mm per annum and a total flow from all rivers of less than 50,000 million m³ per annum. To put this in perspective, the latter figure is approximately half of the mean annual runoff of the Zambezi river (DWA, 2004). The inequities that prevail in land ownership in South Africa are also reflected in the allocation of water for productive purposes (mainly because the

past tenure regime coupled water to land use rights). Versfeld (2003) states that gaps in access to water appear even wider than they are in access to land, with most of the irrigation water in South Africa being allocated for commercial purposes. This would not have been a problem if all water resources in South Africa had not already been allocated to dedicated uses like agriculture, mining, industry and urban areas. No “additional” water is available for reform purposes, which implies the need for redistribution. Given that agriculture utilises approximately 66% of the available water in South Africa, it is expected that the bulk of the water required for reallocation will come from commercial agricultural users. Water re-allocation reform has therefore become another component of a wider mandate to address the inequalities of the past (Anderson et al., 2008).

Essentially, water allocation reform is informed by a policy and institutional framework that prescribes, among other things, integrated water resources management, treating water as an economic good. Equity considerations are catered for through the correction of historical imbalances in ownership, while stakeholder participation is accounted for through decentralized water management structures at various scales. Water allocation reform is also intended to support the Government's poverty eradication and economic development strategic objectives, particularly among rural communities. South Africa completed the process of re-writing its water policy and legislation in 1998, culminating in the promulgation of the new National Water Act (NWA), and thereby setting the scene for redressing inequities of the previous political dispensation. Schreiner and Van Koppen (2001) argue that the Water Act (1998) of the Republic of South Africa is not only widely recognized as the most comprehensive water law in the world, but also stipulates, more clearly than elsewhere, that water is essentially a tool to transform society towards social and environmental justice and poverty eradication.

Greenberg (2010) states that the 1998 National Water Act forms the basis for current water policy with regard to agriculture. In essence, the Act separates ownership of land from ownership of water (riparian rights), and vests the latter in the state. This constituted a radical shift, but was accompanied by agreement that previous patterns of use could remain, within a system of registration of these uses. Backeberg (2005) states that considering the hierarchy of decisions on the policy, institutional and operational levels, it is apparent that constitutional change and political reforms have initiated a new water policy with the objectives of achieving equity, efficiency and sustainability goals in water resources allocation, use and management. Three key elements of the policy are the environmental reserve, water rights system and management decentralization. The former Department of Water Affairs and Forestry (DWAF), now Department of Water Affairs (DWA), and other water management organisations were tasked with the responsibility of facilitating the provision of the water required to meet these objectives. As the sector leader, the DWA has the responsibility to develop and implement a specific programme of action for water allocation redress. Consequently the National Water Resources Strategy (DWAF, 2004) highlights the challenges and opportunities that should be taken into account as the reforms unfold. Furthermore it provides a sector-wide basis for coherent action in support of a Water Allocation Reform Programme (DWAF, 2005). A key provision in the NWA is one that deals with compulsory licensing. It allows for water currently allocated to users to be re-allocated to previously disadvantaged people. All commercial

water users must now register their water use and will have to apply for a water use license. In principle, this is a noble idea as it creates room for better monitoring of water use. Catchment Management agencies (CMAs) and Water User associations (WUAs) are being established at the operational level, to enable increased user participation in water management.

While the objectives for historical redress in the water sector appear quite noble, the implementation of the reforms remains a complex challenge that influences access to water by the 'new' farmers. Van Koppen et al. (2009) argues that the need for the development of a coherent vision of equitable redistribution of water and sustainable economic transformation; with effective institutional mechanisms that link water management to agriculture, land, finance and other support systems; remains a critical gap in the land and water sector reforms. It is certainly true that water can and should be used to improve wealth creation for beneficiaries of the land redistribution programme. But previous efforts at better integration of land reform, agriculture, agrarian reform and water resources management, including water allocation reform, have been ad hoc, fragmented and hardly successful. Woodhouse (2008) points out that the use of water in agriculture, and the intensification of production, raised questions about property rights and income flows that are not straightforwardly addressed by the political discourse of restoring land to previously disadvantaged communities, and demands a more explicit treatment of the relationship of land and water use to the broader economy of South Africa.

2.8.1 Separation of land reform from water reform initiatives

It would be naive to assume that policy and legislative changes aimed at redressing historical imbalances in access to water are sufficient on their own to enable better access to water for the rural poor. There is a need to pay serious attention to several other factors of production that make the critical linkage between water use and poverty eradication more meaningful and possible. These factors include access to land and other support services for sustainable agricultural production. The view from Derman (2003) is quite persuasive in this regard. He argues that the conceptual division made between land and water in the reform programmes does not fit with local conceptions of livelihoods or the growing evidence of the importance of the land-water interface, which includes natural wetlands and irrigation systems. Unfortunately, in South Africa, the land and water sector reforms have been treated as two parallel processes, with the result that their link with poverty alleviation is missing. Greenberg (2010) states that there is recognition at the highest levels that the link between land reform, agricultural support and water resource provision is weak. There is, therefore, a need to invest in irrigation, both for commercial and for resource-poor farmers, and also to make the relationship between water provision and land transfer explicit.

From the foregoing, one can deduce that an integrated approach to land and water allocation reform is critical in promoting sustainable livelihoods of emerging farmers. Groenewald (2004) states that in relation to water allocation reform, an important gap is poor synchronization between the water and land reform programmes in irrigation areas to ensure that beneficiaries hold secure land and water use rights once they are allocated

these resources, since it does not make sense to successfully follow through with a land reform process for a particular piece of land while the water reform process lags behind for several years. The Surplus People Project (2007) strongly argues that the inability of local municipalities to take an integrated approach to land and water allocation reform and conceptualize the need for water in relation to sustainable production often puts emerging farmer groups in a crisis situation. For instance, there are many cases in which the emerging farmers obtain infrastructure or funding from other state organs without water licenses and end up having to put production on hold until such a time when the license is granted.

According to Van Koppen et al. (2009), in implementing land restitution and redistribution, there initially was little collaboration between the Department of Land Affairs (DLA) and the DWAF. For example, the expert panel put together to provide guidance on the design of the Water Allocation Reform (WAR) process consisted of lawyers, environmental advisers, representatives from DWAF, the Water Research Commission and NGOs. However, the presence of an agricultural or land expert was missing, with nobody on the panel having any competence on the land reform process (Movik, 2008: 91). Thus, the water reform process missed an early opportunity in its design phase to integrate with the land reform process and all its internal dynamics (Hall 2004).

Additionally, riparian water rights were not always completely registered as part of the land entitlement. Also, in a few cases, water rights tied to land under claim were sold, leaving an asset of lesser value. Without readily available registers of land under claim, the DWAF could not easily track this problem. In the late 1990s, however, it introduced a policy that the trading of water rights of land under claim should not be approved. Further coordination has since been established between the DWAF, the provincial Department of Agriculture (DoA) and the provincial government with the signing of a memorandum of understanding on collaboration on land and water reform in 2008.

2.8.2 The 'poverty-environmental-degradation' meta-narratives

Narratives around the need to ensure food security have had serious implications in terms of the transfer of water use entitlements to emerging farmers. These narratives argued that while it is critical to address equity needs, attempts to deal with this must be balanced with the consideration that many existing lawful water users are making productive, efficient and beneficial use and are contributing to socio-economic stability and economic growth (Forsyth, 2003; Adger et al., 2001; Movik, 2009). It was argued that if reallocations occur too quickly, the country is likely to suffer economic and environmental damage as emerging users struggle to establish productive uses of the reallocated water (Forsyth 2003; Movik, 2009). These narratives have influenced government thinking and policy making, and contributed significantly to the maintenance of the status quo instead of rapid allocation of water use entitlements to the 'new' farmers. Ntsebeza (2007) argues that the end result of a process informed by these narratives was that the existing users remained entrenched and the case for redistribution to historically disadvantaged individuals was closely tied to their potential for economic productivity.

2.8.3 From haves to have-nots

Due to the slow progress made with compulsory licensing and political demands to urgently address the remaining inequities, a “Framework for Water Allocation Reform” was produced (DWAF, 2006). The framework emphasizes that changing the water allocation protocol is critical to achieve equitable access to water, but also acknowledges that water allocation reform is profoundly a social, political, economic and legal process. The water allocation process must therefore not only aim at providing water for subsistence farming or for sustaining basic livelihoods, but start a development path of commercial and competitive water use in support of broad based black economic empowerment. Thus the water allocation process must be undertaken in a fair, reasonable and consistent manner and existing lawful uses will not be arbitrarily curtailed.

However, the necessary goal of redressing past inequalities means that South Africa’s water reform is expected to deliver on changes in process (holistic, decentralised, participatory and economically cost effective), social outcomes (Woodhouse, 2008) as well as ensuring higher environmental standards as stipulated in the 1998 National Water Act. According to Philip Woodhouse, “The prospect of redistribution from existing ‘haves’ to ‘have-nots’ raises considerably the political risks and expectations attached to the implementation of reform” (Woodhouse, 2008: 3).

2.8.4 Capacity of emerging farmers

The Surplus People Project (2007) concluded that one of the key factors affecting the uptake of water use entitlements is that many emerging farmers are not sufficiently capacitated to understand their water needs, the scales and rates of payment for water rights, use and management of water, or their roles and responsibilities on Water User Associations. On the other hand, large scale commercial farmers who have historically used water for productive purposes are more knowledgeable about administrative processes and can easily apply and obtain water licenses. It is therefore important that the capacity constraints experienced by emerging farmers be recognized and addressed. Van Koppen et al. (2009) argue that for administration-proficient, larger-scale users, new water uptake has become an easy matter that simply requires submitting an application. The DWAF appears to have very limited capacity to evaluate and judge each application on its own merits, let alone checking on-site. Ensuring enforcements is even more difficult. Administrative pressure, and the proven threat that vested applicants can report any delays to the Water Tribunal, pushes officials towards allocating whatever is being asked for. Licensing thus legally consolidates a highly inequitable water uptake. For instance, of the 1212 licenses for new water use that had been allocated by 2006, 98% were for non-historically disadvantaged individuals. The redistributive potential of water allocation reform risks fading away amid these legal complexities and to the detriment of small-scale users.

2.8.5 Lack of Information

A central issue confronting the redistribution of water is that little precise information exists as to the actual amount of water used by the main existing water users. Such information that exists is held by the irrigation boards and by individual farm operators. This creates a significant asymmetry of information favouring existing water users over 'emerging' or 'potential' water users such as residents in ex-homeland areas who seek water for agricultural or domestic use (Woodhouse, 2008). The negative effects of lack of information on water use can be addressed through invoking the provisions of the NWA on compulsory licensing. This requires all existing water users to register the quantity and source of their water use during a specified qualifying period, and all those seeking a water allocation to register a formal application. Registered water use is then verified by means of satellite images for both the qualifying period and current use. Following verification, a proposal of overall water use is made for specific sub-catchments, taking account of priorities to provide water for basic human needs and for ecosystem maintenance (together referred to as 'the reserve') and any international obligations. This proposal is then translated into allocations for individual farms, published as a 'preliminary allocation schedule', which is then finalised (subject to appeals heard by a water tribunal) in the form of licenses issued to water users.

2.8.6 Technical information and water licensing process

The process of obtaining water licenses is time-consuming. The time required reflects, to some extent, the fact that it was imposed on existing water users by a central government agency. However, the delays in establishing CMAs, the relatively sophisticated technical requirements of the exercise, and the ever-present threat of litigation from influential local commercial farming interests, make it almost inevitable that it should be implemented by a central government agency. The idea of licensing all users also raises serious questions and tensions around informal and small-scale water users. These questions have made licensing one of the most controversial aspects of the water reforms in the country. For those who already have water allocations in existing private and government irrigation schemes, it is not difficult to see the need to formalize that use (Derman, 2003). These users already have their hands on the bulk of the available water resources. It is those aspiring to access these water resources who face difficulties, because once all available water has been licensed, it will be difficult to re-allocate it during the lifespan of a particular license. The question therefore becomes, 'What is the aspiring water user to do'?

Another dimension to the controversy concerns the fact that whilst all significant users of water must register and license their use, it is conceptually neither possible nor desirable to register each and every water user in the country (Versfeld, 2003). It is also questionable whether licensing serves the cause of poverty alleviation or contradicts it. For instance, if a smallholder is irrigating one hectare of land using 9000 m³ (technically speaking not schedule 1 water use anymore), would that farmer need to get a license? It is highly unlikely that DWAF will be able to enforce the requirements for licensing

throughout the country. Enormous amounts of resources will be required to make this a reality.

2.8.7 Water development versus regulation

Van Koppen et al. (2009:5) argue that possibly the most uncertain aspect of agrarian reform in South Africa at this point is the “missing middle”, or black medium-scale commercial farmers. In current debates, the potential for this sector to become larger and more vibrant tends to be characterized by extremes. These range from the pessimistic conviction that small-scale farmers can never compete in an environment dominated by ever-larger, more sophisticated farm enterprises; to the view that small farms are inherently more efficient and thus both competitive and socially desirable. To ensure that the new farmers are given the opportunity to prove their capabilities, there is a need to develop water infrastructure that enhances the new farmers’ access to the resource. Currently, water services are still grossly underdeveloped among most rural and peri-urban black farmers, and development of new infrastructure to abstract water from its source and transport it to the farmers is imperative. This would improve their access to water, thus enabling and enhancing the productivity of their farms. Ironically, official documentation on water allocation reform hardly mentions the need for infrastructure development as a precondition for taking up water, but instead imposes burdensome license applications on those who are supposed to benefit from agrarian reform. As a result, DWAF’s role risks becoming more passive and regulatory than proactively developmental.

In its regulatory role, the DWAF has all the necessary powers to set aside more water to stimulate uptake by previously disadvantaged groups for agrarian reform. This is possible wherever infrastructure allows the emerging farmers to take up new water uses, whether in revitalized smallholder schemes, integrated in commercial irrigation or redistributed irrigated lands. Van Koppen et al. (2009) argue for the allocation of a portion of the ecological reserve to previously disadvantaged groups for agrarian reform, while reallocating a fraction of the investments in bulk water infrastructure to ensure access by rural and peri-urban micro, small, medium and large-scale farmers (e.g. through an infrastructure development fund).

Backeberg (2005) discusses the need to determine the development capacity of existing and new irrigation schemes as well as to establish effective organizations to implement policy and increased efficiency of water use on the irrigation schemes. Currently, the new farmers are proceeding to operate without properly determining the irrigation potential of the farms. Chances of under-utilization remain high. Joubert and Kruger (2005) attribute the high failure rates of the new farmers to inadequate appraisal of farm potential (e.g. marginal farms have been offered for sale) and unrealistic business plans designed by consultants who were generally more interested in maximising their commission paid by government. Those business plans are divorced from reality and do not provide sufficient guidance to the new farmers. Culture and customs in communities functioning under traditional authorities may also prevent licenses being apportioned to individuals, in

particular women, who are actually cultivating the land and using the water (Backeberg, 1997; Thompson, 2006).

2.8.8 Limited Stakeholder Involvement and reallocation still centralized?

Emerging farmers remain concerned about dependency on and the continued dominance of commercial farmers, who still retain the majority share of membership to irrigation boards. This problem of limited stakeholder involvement is compounded by existing finance structures that rely on member levies, which smaller farmers can ill afford (Turton et al., 2003). Reallocation is also likely to be impacted by the fact that land and water resources in ex-homeland areas are still formally under tribal authority. Since authorization for individuals to use water will not involve individual licenses but rather 'general authorization' applicable to a defined area; access to water, and, therefore, power, will still be in the hands of local chiefs and not at the individual level (Woodhouse, 2008).

2.9 *The water rights-land rights interface*

As previously noted, the interconnectedness of water and land is well known, yet policy and legislature managing both resources are still largely drafted and implemented in relative isolation from one another. Integrated policy, planning, and management of water resources and land can provide improved benefits and innovative opportunities to regional economic development. The relationship between land and water rights is therefore politically, economically and culturally complex. As stated in the FAO Legislative Study conducted by Hodgson (2004) on "Land and water – the rights interface;" water is necessary for most productive uses of land, particularly in arid climates, where the main constraint to agricultural growth is the availability of water rather than land. "Decisions regarding the use and allocation of one resource impact directly or indirectly on the use and allocation of the other" (Hodgson, 2004). Integrated approaches to the use and management of these resources are therefore necessary to ensure that both these resources are managed in a sustainable manner.

In terms of the South African context, a number of problems exist relating to the central government's perceived inability to effectively implement its policy on land reform and land restitution to people who were dispossessed as a result of past racially discriminatory laws (as set out in the Land Restitution and Reform Laws Act of 1997 and subsequent amendments) (Hendricks, 2001; Roodt, 2001). Problems in particular exist around the current backlog that characterises the land reform process and the lack of transfer of agricultural knowledge, equipment, business and management skills, and training to emerging black farmers. As a result, there have been several cases where farms that were transferred from established commercial to emerging farmers end up collapsing, which in turn has a detrimental effect on the sustainable livelihoods of the individual farmers and, more broadly speaking, the South African economy – already under severe pressure given continually rising fuel and food prices. Another important area that needs

to be examined is the sense of pride and belonging that land instils in those who own it, in the sense that it has often been passed down from father to son over many generations. What happens in a situation where people are told to leave the land they have lived on for centuries, and on which they depend for their livelihoods, as their skills and knowledge are so narrowly tied up in land ownership itself? Also, what is the role of access to water in land reform in South Africa, and does existing water legislation make provision for emerging new land owners having sufficient access to water to continue being productive? Further, what are the challenges and opportunities to viewing water reform and land reform in an integrated manner?

Administratively, land rights share little in common with the administration of water rights. In short, as a process, water rights administration is much more complex. This is because of the nature of both water resources and water rights themselves (Hodgson, 2004). For example, in contrast to land tenure rights, water rights are dependent on the active management of the resource. Water administration organisations are increasingly shifting towards taking a drainage basin approach to water resource management. In other words, water is managed according to the shape or form of the land that forms the catchment of a major river and its tributaries. While this approach may be logical from a hydrological perspective, it means that water resources management is often managed over a very large land area. Often, this does not accord with administrative boundaries, and can thus become a rather complex and expensive process.

In contrast to water resources management plans and decisions, which are made at the basin level, land use planning and decision-making take place at both regional and local levels, and within several administrative boundaries. Such boundaries often do not correspond with the boundaries of river basins or sub-basins. This is where the distinction between water resources planning and land use planning becomes sub-optimal. All uses of land have water resources implications and vice versa. Water is a basic human need, and as such, any land development for agricultural, residential, industrial, commercial or recreational purposes involves a diversion of water of suitable quality. Changes in the water regime, such as the construction of an impoundment for water supply, flood control and recreational purposes, have profound implications for land use in areas within the impoundment's zone of influence (Goldfarb, 1994). The integration of groundwater and its implications is also necessary. For instance, changes in land can have a huge influence on infiltration rates through the soil surface, on the water retention capability of soils, on sub-surface transmissibility, and, therefore, on the production effect of rainfall (FAO, 1995). Yet even if linked, the boundaries of aquifers frequently do not follow those of surface water basins, let alone those of the administrative sub-divisions of a state.

Finally, the objectives of land tenure reform versus water rights reform also vary substantially (Hodgson, 2004). While some land reform programmes may have secondary environmental benefits, such as reducing the population pressure on fragile land areas, the concerns of water rights reform, scarcity and sustainability, are quite absent from the land reform debate. This, in turn, influences implementation strategies. South Africa is in a fortunate position of having both land and water reform processes geared towards social redress, productive land use and socio-economic development. Despite this alignment of

broad policy objectives, reform processes have diverged in terms of how these objectives are to be met.

2.10 Synthesis

This review has explored and outlined a number of factors influencing the outcome of water allocation and land reform programmes in South Africa. The factors range from social, economic, political and administrative to policy and institutional efficacy issues. Analyses by various experts paint a generally negative picture regarding access to land and water use entitlements, as well as of productivity of the farms transferred to emerging black farmers. Current and ongoing efforts by government to address various constraints and shortcomings show that the reforms remain a highly contested and challenging terrain that requires more answers. The examination of key factors influencing the reforms reveals a number of possibilities that could be pursued in South Africa in order to make land and water allocation reform more effective for black commercial farmers. The first possibility relates to the need for systematic assessment of the beneficiaries' basic needs and deciding (together with them) how these can best be addressed as planning for the reform projects are crafted. Secondly, there is a need to assess the opportunities and constraints which the farmers face in the land and water allocation reforms, and then consider how to address these. There is also a need to develop a wider understanding and appreciation of the concept of "water for productive uses" at sustainable livelihoods levels and how this can impact on the quest for equity. In this regard, one option is to reallocate land and water simultaneously in a systematic and complementary fashion. This would ensure that the new landowners are also guaranteed a reliable supply of water for productive uses.

The review has demonstrated that land redistribution and water allocation reforms in South Africa should be regarded as part of a comprehensive programme of economic reconstruction in rural areas. Redistribution of land is certainly necessary, but not a sufficient requirement guarantee for the success of the emerging farmers. There is need for additional support services to be provided. These include secure land title deeds, secure water rights/ licenses, physical infrastructure such as water supply systems and roads, soft loans, markets, fertilizer, irrigation machinery, seeds, energy, information, training, extension, and research. Government departments and agencies have to shoulder the responsibility of creating an enabling and supportive environment for the new farmers in terms of both infrastructure and organisational development processes. Clearly, the greatest challenge in the reform processes is not how to design them but how best to follow through on the government's repeated promises and ensure that the stated objectives and targets are attained in a sustainable manner.

As advised by the FAO, farm-level efforts to improve and maintain productivity will be of limited value unless land tenure is secure for smallholders Faures and Santini (2008). Farmers must be able to count on the long-term benefits of near-term investments that reduce the rate of land degradation and maintain growth in productivity. In South Africa, the systems of land tenure and water-use rights have often become dysfunctional and

limit investment. Both land tenure and water rights issues must be addressed in a coordinated fashion in order to ensure optimal returns to public investments in irrigation and to motivate adequate investments at farm level.

Whilst a cautious approach is advisable, implementation of the programme should not be so slow as to render the reforms obsolete. South Africa has adopted a cautious and slow pace with limited results to show on the ground. The shortcomings of the market-based and viability-oriented approach to land redistribution are well documented and need not be repeated here. The same goes for the emphasis on compulsory licensing and recognition of existing lawful uses of water. These national policy and operational positions need to be carefully revisited if the new farmers are to access secure land and water and become more productive in the short to medium term. Though the reallocation of land and water resources was initially politically motivated and quite explicitly about realizing a more equitable distribution of resources, the process of re-allocation ended up expressing inherently political issues in innocuous sounding and neutralising terms such as existing lawful use and commercial viability. As a result, debates about land and water allocation reform in South Africa have ended up involving contested, overlapping and sometimes contradictory visions of viability as well as worrisome policy incoherence with no clear vision for the way forward. A substantial and informed deliberation on alternatives and combinations is clearly now needed.

Deliberations on alternative options should consider that the establishment of commercially-oriented black farmers certainly requires a comprehensive package of support services that ensure the farmers' productivity and subsequent participation in the food value chain. The support services they require include access to finance and markets, better local organisation, improved management training and provision of extension services. Following apportionment and transfer of secure land water licences to promote equity, options for the efficient use and sustainable development of water as a production input should be explored in most of the irrigation schemes. South Africa is now in the initial stages of building a black farming class, and many lessons can be drawn from the way the state supported farmers in the past. However, the intention should be to go a step further than merely reproducing the commercial agricultural model on a wider basis. The challenge is to think about which of the state institutions and interventions of the past can contribute to building a more equitable agricultural model which does not lead to radical dispossession and environmental degradation.

Complementary investments in education and training increase the value of investments in irrigation and water control because they equip farmers with appropriate knowledge and skills (Faures and Santini, 2008). Similarly, the returns to investments in education and training will be greater if farmers have opportunities to implement new production methods in irrigated settings (Ibid, 2008). It is therefore necessary to understand and recognize the important roles of women in irrigation, water harvesting, and other aspects of agricultural production. The concerns of women must be taken into account in the conceptual phase of water investment projects. Excluding women from the design phase may have unexpected adverse effects in terms of poverty reduction and equity.

At the same time, there is an urgent need to change particular narratives around land and water use rights that present continued use of water by existing users as pivotal for economic sustainability and redistribution of these resources to historically disadvantaged groups as highly risky. Continuation of such narratives can only hinder implementation of the reforms. As Hall (2008) points out, at present, there is no clear vision for agrarian reform. Government policies and practices are at worst conservative, resisting change in the agrarian structure, and at best agnostic about what this process is to achieve beyond the quantitative target of transferring 30% of white farmland into the hands of blacks. There is no specification, for instance, of whether reform is to alter the size distribution of land holdings, technologies of production or, indeed, what types of produce should be particularly supported. Future policy in this area will need to outline such a vision.

Land reform should be viewed as a means to an end, and in this case, the 'end' is agrarian restructuring that goes well beyond mere redistribution of land and actually restructures production significantly. Hall (2008) outlines some preliminary elements of such restructuring:

- Deliberately change the size distribution of landholdings in favour of smaller production units to cater for poor producers. This entails allowing for the subdivision of farms to make possible smallholder units suited to the needs of poor land users;
- Support secure land tenure and water rights of those acquiring land through land reform through ongoing land rights and water rights (licenses) administration;
- Support land uses for consumption as well as for sale, and promote low-risk production technologies through appropriate inputs and infrastructure;
- Provide opportunities for non-farm economic activities among small producers to strengthen diversified livelihood strategies and provide inputs into part-time farming;
- Involve the beneficiaries in the initial phases of planning for land and water allocation reform projects rather than dictating to them what should happen on their farms;
- Change the policy environment in favour of new land and water users by revisiting key areas of agriculture and water policy;
- Increase overall state support to the agricultural sector and, within this, a shift towards greater support for low-input, small-scale primary production;
- Subsidising inputs for production, including seeds and farming implements;
- Investing in transport and storage infrastructure to support this type of production, as well as irrigation infrastructure; and
- Subsidised interest rates for loans with a no-repayment window for the first few years.

There is a pertinent need to envision transformative and equitable rural redress as a comprehensive process in which key components such as land, water, irrigation policy, finance, extension, and local planning, are integrated. This concerns greater equity in all assets for all dimensions of livelihoods. More research is required to examine water reallocation options and inform the possibility of setting aside more water resources for agrarian reform. After several years of experience, it is increasingly being realized that the land and water allocation reform in their present form risk promoting existing inequities in land and water use entitlements. More focus should be shifted to transformation as opposed to maintenance of the status quo in the agricultural sector.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGICAL APPROACH OF THE STUDY

3.1 *Research methods applied in the project*

The research team integrated and consolidated the issues as identified within the scoping phase of the project into 5 consolidated research questions (see Table 1 for the questions, their hypotheses and rationale). All of these questions were aligned with the overall objective of the project and were designed to serve the data requirements of the specific objectives (in accordance with the terms of reference). The scoping phase of the project re-emphasized several important points which need to be accounted for in the project:

- i. The research needs to re-emphasise the diversity of contexts, objectives and aspirations found across beneficiaries of reform programmes and highlight the fact that different support strategies are needed for different types of beneficiaries.
- ii. It would be helpful if support programmes could specifically aim to change human behaviour (i.e. to improve the effectiveness and efficiency of water and land use management). It is therefore essential to systematically account for the culture, norms and traditions of target groupings within the target community and study area (i.e. within which this behaviour change is supposed to occur), during the design phase of the support programme. It was noted that the current project is well positioned (in terms of the project team and study area) to build on the findings of another WRC (Jordaan and Grove, 2012) by exploring these requirements in more detail.
- iii. The scoping phase revealed the need for the development of a detailed typology to be used as working vehicle for the project. Categorising beneficiaries, i.e. creating a typology (classification framework) will facilitate the work with groups of beneficiaries with shared characteristics and to assess their water use accordingly. It was expected that water use strategies (as well as other characteristics, such as record-keeping) would differ across these categories, which necessitates the use of different methods and strategies to assess and improve water use efficiency within each category. The specific characteristics which form the distinctive attributes of the different groups will be presented later.
- iv. In-depth knowledge on water use efficiency and farming styles was required, where the context in which water is used is observed as an integrated system. The fieldwork also needed to verify different opinions and perceptions around people's current water use efficiency. For example
 - a. What is the farmers' perception of land and water use rights, and how does it influence the way in which they use land and water?
 - b. How do farmers interpret and measure water use efficiency?

- c. Do beneficiaries agree that they need to improve on the way they utilise water?
- v. The project team needed to reflect on how these views differ from the views of policy-makers and debate the consequences of these different interpretations – misinterpretations can easily lead to misinformed and unrealistic policies.
- vi. The scoping phase of the project revealed that some beneficiaries have unrealistic expectations and aspirations regarding commercial farming. This was tested by adopting a realistic-sceptical approach; i.e. by asking these individuals to explain the required pathway to achieving their envisaged expectations. They need to be assisted to reflect on how they operate, and this process needs to be skilfully and sensitively handled. For many beneficiaries with unrealistic expectations (particularly with regard to the 'riches' to be derived from commercial agriculture), the realities of commercial agriculture will become more apparent within their specific context as they are challenged to 'design' their pathway to success, leaving the ideal of commercial agriculture possibly less attractive. It should be mentioned that these unrealistic expectations are seemingly rooted in a reality that supports these expectations in a way that does not make them seem unrealistic to beneficiaries.
- vii. Guideline development needs to appreciate and take cognisance of the diversity of contexts between different groupings if it aims to have an effect. The insights derived from this study were captured in the guideline development phase of the project. This implies that the objective of each of the groupings will be used to derive their unique indicators of 'success.' For example:
 - a. Guidelines for emerging farmers who aspire to full-on specialised commercial farming will affect developmental objectives such as increased production, economic viability, commercialisation, establishment of an African peasant or commercial farmer class, and Black Economic Empowerment (BEE).
 - b. Guidelines for diversified smallholder farmers with a main source of income in agriculture will affect developmental objectives such as employment creation, poverty alleviation, improved food security and the economic sustainability of rural areas.
 - c. Guidelines for subsistence/livelihood farmers who diversify outside of agriculture will affect developmental objectives such as poverty alleviation and improved food security.

Guidelines should emphasise the critical importance of human capital development and should be driven by the expectations and aspirations of the beneficiaries, but need to be grounded in technical and financial boundaries.

The scoping phase of the study have clearly indicated that farmers employ a range of livelihood activities, both on-farm and off-farm (including state allowances), with agriculture mostly employed in an important social safety net role, which is used whilst exploring other livelihood options. Farmers therefore have different farming objectives (i.e. to feed their families and maintain their livelihoods) as compared to Government interpretation, which has directed and aligned its support towards the objectives of

commercial agriculture (*i.e. based on the production of marketable surplus, with profit as the main objective*).

The integrated research questions are summarized in Table 1, while the methods that will be used to address each question are described in more detail in the sub-sections to follow.

Table 1: Proposed research questions

Research question	Hypotheses	Rationale for question
1. "What characteristics should be used to categorise beneficiaries in the study area for the purpose of assessing water use efficiencies and developing suitable, target-audience specific guidelines?" <i>This research question relates to specific objective 1 of the ToR.</i>	A broad spectrum of characteristics could be used for the development of a typology suitable for the purposes of assessing water use behaviour. We suspect that the relative position of farmers on the value chain could be used for the purposes of this project. However, differences in perceptions, aspirations and farming objectives affect the relative position on the value chain which thus affect water use behaviour (efficiency). Fieldwork data will be used to identify the set of characteristics that will confirm the characteristics for the typology (one could therefore argue that the typology will emerge from the fieldwork data and will not be assumed prior to the assessment).	Beneficiaries in any particular study differ in terms of aspirations, objectives, and needs. For example, not all beneficiaries of land and water reform in the study area have commercial farming aspirations. They also have different record keeping systems and different ways of interpreting and measuring productivity and efficiency. Water use efficiencies cannot therefore be assessed and interpreted in the same way for different groupings of beneficiaries. Typologies make these differences more explicit, which then serve as a context to assess water use efficiency and will form the basis for guideline development.
2. How do the different types of farmers (groupings) interpret (perceive) key concepts such as: water use efficiency, water conservation, productivity, land and water use rights, and irrigation? (list not exhaustive). How do these interpretations differ from Government's / policy-makers' interpretations? <i>This research question relates to specific objective 1 of the ToR.</i>	We suspect that significant differences exist in the interpretation of these key terms, which create confusion; unrealistic expectations; and misinformed and unrealistic policies. Failure to acknowledge and understand these differences will inhibit the development of suitable guidelines.	The development of guidelines necessitates explicit statements in terms of the meaning of these concepts for each type of farmer to allow the development of said guidelines. Government acknowledgment of these differences is pivotal.
3. What indicators can be used to assess water use efficiency for farmers where formal recordkeeping is inadequate to assess water use efficiency by	We suspect that operations-based indicators (<i>i.e.</i> indicators based on the way in which water is used by this category of farmers); as opposed to	Output-based indicators for water use efficiency as used for commercial farmers, <i>i.e.</i> indicators based on the value of output per unit of water use, are unsuitable to assess farmers

Research question	Hypotheses	Rationale for question
conventional means? This research question relates to specific objective 2 and 3 of the ToR.	output-based indicators, can be used to assess water utilisation efficiency. This is likely to apply to small-scale/subsistence farmers; where record-keeping is likely to be lacking.	where record keeping is inadequate to serve the data requirements for output based water use efficiency assessments.
4. What is the water use efficiency of farmers in the study area (where record-keeping is adequate to permit the use of conventional WUE assessment methods)? This research question relates to specific objective 2 and 3 of the ToR.	Output-based indicators for water use efficiency as used for conventional commercial farming enterprises could be used to calculate the water use efficiency of commercial farmers in the study area; as well as those with realistic commercial farming aspirations, provided that record-keeping is sufficient such that the required data can be obtained.	Farmers with commercial aspirations should be assessed along commercial interpretations of efficiency.
5. How should the guidelines developed as an outcome of this project differ for different target audiences? This research question relates to specific objective 4 and 5 of the ToR.	The guidelines should differ according to the farmer groupings. Target audiences for the guidelines include: farmers Other role players in the value chain Extension officers Policy makers	It is necessary to differentiate between different groupings of farmers – as they will each need different types of guidelines. Guidelines will be focused on irrigation practice and water management (dryland soil moisture retention)

3.1.1 Research question 1:

For this question, the project team aims to construct a suitable typology (our understanding of a “typology” is a classification framework which is used within the context of this project to improve the understanding of different categories/types of farmers and their characteristics) and to populate the typology with suitable field data that will form the basis for addressing the objectives of the project. This typology thus forms the basis for assessing water use efficiencies (different approaches and measurements might be applicable for different groups of farmers) and the development of the guidelines (again, different guidelines might be applicable for different groups).

An ‘emic’ approach was taken, involving the use of participant observation to develop and populate an “emergent” typology (typology emerging from the fieldwork). An emic approach emphasize empathy and an understanding from within the context (as opposed to imposed understanding from outside the context) to reach insight with regard to the construction of the typology. Emphasis was on open ended descriptive questions to provide the researchers with “thick” descriptions of the context (no “leading-questions”).

Basic methods include:

- keeping observation sheets where detailed information is captured with regard to specific key characteristics of the context
- group interactions to reveal different interpretations and social dynamics
- interviews (semi-structured) focusing on more detailed

It is important to note that the value chain account will draw its information from the typology. Qualitative data analysis (transcribe field data, code, analysis, write-up) will be used to address this research question. The project team identified several dimensions (not inclusive), based on the scoping phase, upon which the typology could be based:

- A. farmers in the study area differ in terms of the organisational arrangements under which their agricultural activities are governed:
 - farmers living on irrigation schemes
 - farmers forming part of CPAs
 - farmers in strategic partnerships
- B. farmers in the study area can be distinguished in terms of different aspirations:
 - Those with livelihood/subsistence farming aspirations only
 - Diversified smallholders, who employ labour to do their farming but do something else with their time
 - Profiteers or emerging farmers who aspire to commercial farming
- C. farmers in the study area are organized according to two land governance systems:
 - the legal system as per Government legislation
 - the traditional system (chief)

It is evident that a typology can be based on any of these dimensions; as well as other dimensions. See chapter 6 for the typologies.

3.1.2 Research question 2:

The development of a glossary which presents the different interpretations of key concepts is necessary to present the scope of different understandings of these concepts. The glossary was an important role in facilitating mutual understanding and consensus regarding these terms. The glossary was pivotal in determining the correct terms to be used during guideline development. The glossary made different interpretations of key terms explicit. Field work requirements for this question require a constant awareness and notification of controversial terms. The glossary took the form of a working document and will be edited throughout.

3.1.3 Research question 3:

Water use efficiency within the context of this study may be assessed from two perspectives. It is expected that both perspectives will be used to assess water use efficiency for farmers. The first could be from a conventional input-output perspective (i.e.

a ratio with regard to production inputs relative to the outputs which is then presented as an indicator of the relative efficiency of the inputs). This method relies on accurate record keeping of production data with regard to the farm activities and is commonly used in commercial agriculture. However, a major challenge with this approach comes to the fore when inadequate record keeping is evident. In these cases the re-calibration of non-standard input and output quantities with standard measures, is required to fill data gaps. The field work will need to source this data. Standard measuring instruments (scale and volume) thus need to be taken to the field to do on-site calibration during interviews. This re-calibrated data then forms the basis for assessing water use efficiency in the same way “commercial” water use is assessed.

However, we argue that it is also possible to assess water use efficiency from an *operations* perspective. This approach is less dependent on input-output data as it focuses on assessing the way (operations) in which water is managed and utilised by the farmer in a qualitative way. The efficiency of water utilization/management is therefore assessed from an operational perspective, which implies that the assessment is done without the need for production cost data and the associated record keeping. The assessment is done with irrigation and production process data, i.e. on-farm interviews with farmers are required. The emphasis lies on descriptive information and critical reflection (against best management practices) with regard to the way in which water is used in the production processes. The field work data will form the basis for this assessment. See chapter 7 for details.

3.1.4 Research question 4:

Water use efficiency was assessed from an input out perspective as per normal commercial assessments (i.e. from an input-output perspective). The analysis was done for specific commodities, and it was assumed that the focus will be on the main commercial commodities in the study area. A description of the water use profile of this typology (farmers with commercial aspirations) formed the basis for this work. The data for this research question was sourced from field work. The focus was on the following:

- Construction of crop enterprise budget
- Account of the markets to which commodities are delivered (including prices)
- The water supply infrastructure supplying these farmers.
- The operational procedures of the supply infrastructure.
- Systematic account of the distribution losses.

Crop enterprise data was used for this assessment. Gross margin analysis was done to present the financial viability of the enterprise. The marginal product value of irrigation water for these crops was determined by means of linear programming (Lindow) to allow the comparison of the productivity of irrigation water with other commodities and regions. (See chapter 7 for details.)

3.1.5 Research question 5:

Guidelines were structured and customized according to the typology (as per the first research question) which provides the context and assumptions for each set of guidelines. The need for this approach can be illustrated, for example, if one takes into consideration the observed differences between the traditional cultural governance systems vs the democratic governance system, e.g. women are not allowed to have ownership rights (land and water) under certain traditional governance systems, where it has been proved that ownership of at least use rights is a prerequisite for increasing water use productivity. These differences were accounted for in the development of guidelines. The guidelines were structured according to a needs assessment of the target audiences. The field work provided the platform for data acquisition.

Special attention was given to ensure that the guidelines remained normative and that the central message of the guidelines aims to inspire the kind of behavior that serve the overarching goal of this project. The style (and even language) of the guidelines was customized to the target audience.

3.2 *Presentation of the study area*

This section provides a summary of the project's case study area in which fieldwork was carried out, and a preliminary justification for its selection criteria, the first being those farms where water allocation reform and land reform programmes have been carried out. The objective of this exercise was to provide greater understanding of the productive use of water in food value chains by beneficiaries of land reform and water allocation reform programmes at the project, individual farmer or household level. While several studies have documented the performance of land reform or water allocation reform programmes at the aggregate level (i.e. money spent, number of beneficiaries, hectares transferred or volumetric allocation), less empirical evidence is available at a smaller scale that documents the socio-economic profile of beneficiaries, and how reform programmes have influenced their land productivity or water use efficiency (Lahiff et al., 2008). Additionally, no longitudinal studies have been recorded that provide insights into what happens once beneficiaries acquire land or water use entitlements, or what the impacts on livelihoods, productivity or poverty are over time (Lahiff et al., 2008). In so doing, it draws attention to the importance of investigating productivity at both the spatial scale (with an emphasis on the household/project) as well as the temporal scale (over time) once the both the land and water reform process has been completed. However, very few sites could be identified where land reform and water allocation reform coincided and only one study area could be found where the land and water reform process has been completed. This section therefore contributes to the descriptive diagnostic stage by providing a preliminary assessment of a specific area and lays the groundwork for the development of more detailed agro-economic profiles of the case study.

The identification of the study site was followed by an extensive two-stage ground-truthing approach to fieldwork, involving physical field visits to the study sites in order to observe and document specific irrigation projects and operations of new black-owned commercial

farms. The main focus was on the efficiency of water use and agricultural productivity. Detailed discussions were held with individual farmers to provide a full empirically grounded picture of the land and water allocation reforms. The two-stage ground-truthing approach to fieldwork involved extensive research in the study area allowing for detailed and concentrated data collection. The results of the first stage was used to develop agro-economic profiles of specific sites and to identify alternative opportunities for including the beneficiaries of water allocation reform and land reform projects in the food value chain, and examine the economic and social costs and benefits of efficient development and use of water in food value chains. Based on the findings and lessons learned from the first stage, the second stage of fieldwork involved in-depth analysis and guideline development. This staggered approach to fieldwork enabled the research framework to emerge 'organically' from the specific context and be adapted as the context requires. The Limpopo Province has been selected as the primary study site for the first stage of fieldwork, and within it, the local municipality of Maruleng located in the Mopani District Municipality.

Maruleng Local Municipality in the Hoedspruit area was identified as the most appropriate primary study site for several reasons. Firstly, it was critically important to identify those irrigation schemes where both water allocation reform (WAR) (in the form of compulsory licensing) *and* land reform have been or are being undertaken in parallel. Since WAR in the form of compulsory licensing has not been completed to date, it was decided to focus on irrigation schemes where land reform has been or is being done, and to then determine the legal status of water use rights on these schemes, which will be categorized according to the nature of its licensing arrangement, e.g. existing lawful use with ad hoc licensing. This already indicates a degree of insecurity, both for land and water use rights; however, the degree to which compulsory licensing provides greater water use security than other licensing arrangements (such as ad hoc licensing or existing lawful use) needs to be ascertained in this project.

Secondly, study sites needed to be engaged in some form of productive activity beyond subsistence farming. This may be identified as some evidence of a movement towards, or recent entry, into a market. Within the context of this project, these farmers are referred to as "emerging farmers," defined as previously disadvantaged farmers with relatively small farms and a partially developed link to the larger economic system. And thirdly, an additional requirement involves relating potential sites to ongoing or completed food value chain analyses or officially identified hubs. Once identified, the sites were then viewed within the context of the river, and the relevant farmers identified. Other important issues to be observed that relate to these criteria include the identification of appropriate research methods as well as the operationalization of water conservation as provided in the Water Conservation and Demand Strategy for Agriculture. It is also important to establish contact with the individuals in the study areas to get more specific information.

Maruleng was therefore identified as a suitable case study site because of the large number of irrigation schemes and land reform projects that have been established in the former homelands within the area for food security purposes. Because of the high unemployment rate and subsequent poverty in the area, there is a need to determine the

extent to which beneficiaries use land and water resources productively. Additionally, Maruleng provides an interesting contrast of some of the most successful Communal Property Associations (CPAs) in South Africa, such as the Moletale CPA, with others that face severe structural and internal weaknesses, such as the Makhutswe CPA. The study therefore seeks to understand what the differences are and how all emerging farmers can benefit from increased water productivity and access to markets.

3.2.1 The Limpopo Province

Located at the northern most tip of South Africa, the Limpopo province covers an area of 125 754 km² which represents 10.3% of the country's total area (Stats SA, 2010). This makes it the fifth largest of South Africa's nine provinces in terms of area. Limpopo borders Zimbabwe to the north, Mozambique to the east and Botswana to the west. It is divided into five municipal districts (Capricorn, Mopani, Sekhukhune, Vhembe and Waterberg Districts), and sub-divided in 25 local municipalities. Mopani District Municipality comprises of five local municipalities: Baphalaborwa, Greater Giyani, Greater Letaba, Maruleng, and Greater Tzaneen.

3.2.1.1 Socio-political and historical overview

Due to its distance so far north, Limpopo Province has historically been relatively isolated from the country's main urban and industrial centres. White settlers arrived in Limpopo Province much later than in other provinces due to the distance and the opposition they faced from the Pedi, Venda, and Tsonga kingdoms (Lahiff et al., 2008). In 1879, the Pedi led by Chief Sekhukhune were defeated by the British, while the Venda people led by King Makhado were able to withstand Afrikaner expansion due to the geographic shield provided by the surrounding mountains (Lahiff et al., 2008). As such early settlers led by Paul Kruger were forced to live in the area to the south in 1867. However, by the 1890's over 4000 Afrikaners, assisted by Tsonga and Swazi allies, managed to storm the Venda stronghold (Thompson, 2006).

According to Lahiff et al. (2008), late colonisation of Limpopo resulted in the allocation of land to white owners only towards the end of the nineteenth century and the beginning of the twentieth century. In 1913, the Native Land Act was introduced. With the passing of this act, black Africans were legally forbidden to hold title and were forced into marginal homelands. While the Apartheid government presented these as being run according to 'traditional' systems, in reality, they were in the service of the Apartheid state. The result was that black South Africans were relegated to a mere 13% of the land. This severely limited their economic options to such an extent that many were forced to sell their labour to either white farmers or to the mines in the cities (Bundy, 1979; Hendricks, 2001).

However, in many parts of Limpopo, the allocation of land to white South Africans only occurred after the 1913 date set as the cut off for land claims in terms of the Restitution of Land Rights Act, No 22 of 1994. Where land was already allocated under white ownership prior to 1913, black South Africans continued to live on the land as if they were the

owners, and remained there as labour tenants until the forced removals put in place under the Apartheid regime in the 1950s and 1960s (Lahiff et al., 2008). As a result of these land ownership developments, today large amounts of land in the province are under restitution claims.

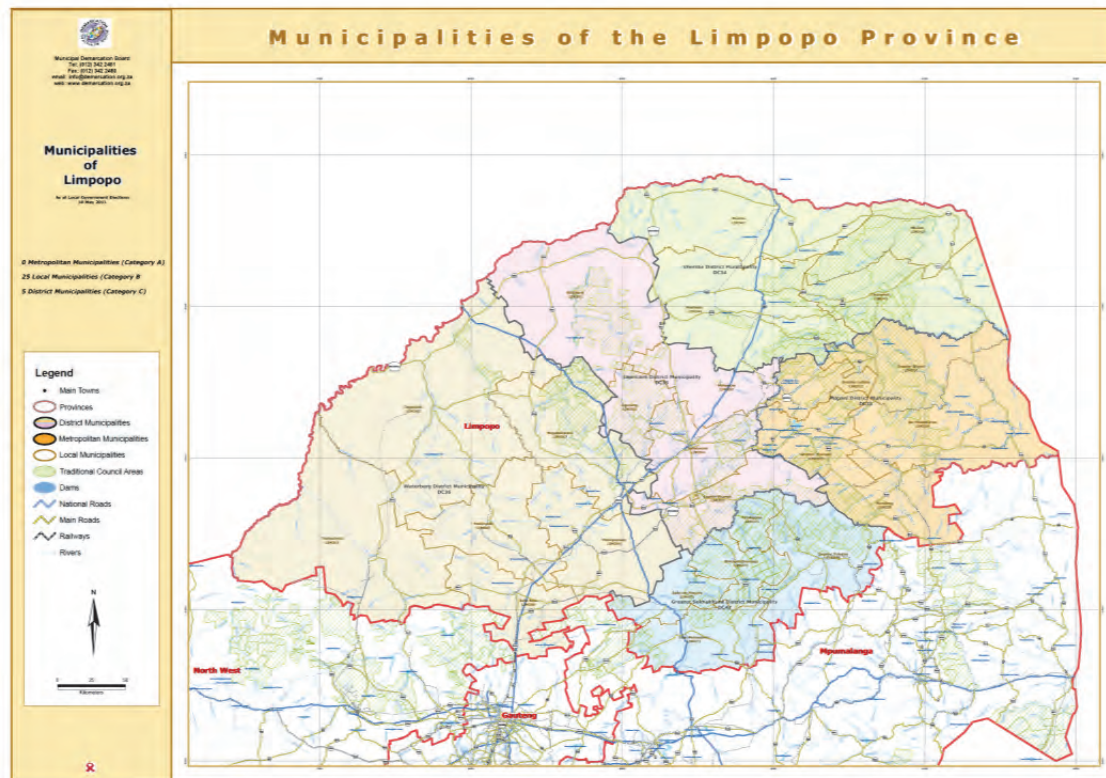


Figure 1: Municipalities of the Limpopo Province

The policy of prohibiting Black access to land (and particular agricultural land) was exacerbated in 1951 with the implementation of the Bantu Authorities Act (Act No 68 of 1951), which provided for the creation of territorial authorities in demarcated areas. These demarcated areas were called homelands or Bantustans, which were usually characterised by over-population and over-utilisation of the land due to the forced resettlement of large amounts of people to relatively small and concentrated areas. In Limpopo, native reserves and later Bantustans were established for three main ethnic groups namely the Pedi, Tsonga and Venda (Lahiff et al., 2008). Land in these areas remained largely state-owned, and under the authority of traditional leadership, who allocated land based on various methods of “permission to occupy” (PTO) (Lahiff et al., 2008).

Between 1960 and 1985, the apartheid policy of “separate development” then cemented previous policy strategies of divide and rule, millions of South Africans were forcibly moved to the homeland areas. This resulted in the inevitable, unsustainable use of land, and the degradation of the local resource base upon which their rural livelihoods depended.

Consolidation of these Bantustans took place right up until the 1980s, as the apartheid government still acquired land from white farmers for incorporation into these areas (Lahiff et al., 2008). This land was legally owned by the South African Development Trust (SADT), and large portions of it was leased to white farmers or black politicians, while some was managed under the various Bantustan state agricultural corporations. Indeed, many of these areas were still being incorporated into the Bantustans in a last attempt to consolidate the power of conservative forces in the Bantustan regimes and to garner political support in the run up to the first democratic elections (Lahiff et al., 2008).

After independence in 1994, the Commission on Restitution of Land Rights was established by the new government and the Restitution of Land Rights Act, Act 22 of 1994 was introduced. The act sought to provide restitution of rights in land to persons or communities dispossessed of such rights after 1913 as a result of past discriminatory laws (e.g. 1913 Native Land Act) or practices by giving victims or their descendant's residential and productive land where they had security of tenure. Restitution is a rights based programme implemented in terms of Section 25 (7) of the Constitution. The government further established the Reconstruction Development plan (1994) that states that "land is a basic need for rural communities". The full extent of claims has not yet been clearly mapped out in all parts of the province, but in areas like Makhado Municipality over 90% of the land is under restitution (Lahiff et al., 2006).

As a result, Limpopo's land use is a combination of formal and informal systems. A high percentage of land users relative to other parts of sub-Saharan Africa hold formal title, but at the same time a largely informal system remains. Additionally, land reform is progressing slowly and has failed to improve the living conditions of the poor. By 2008, only 3% of its land area had been transferred to land reform beneficiaries by the then Department of Land Affairs (DLA). The slow pace of land reform has impacted negatively on the agricultural sector as the uncertainty it has created has hampered the potential for long term investment. In terms of land use planning, a relatively large and powerful private sector with interests in land ranging from forestry, to large-scale crop production to urban residential development plays an important role. While in Limpopo, certain areas have relatively stable land uses, as reflected in corporate governance documents or other planning instruments, land use in former black homelands and areas in transition is much less stable and predictable. In addition, there are concerns that emerging farmers lack the commercial, know-how and skills to farm successfully, even though the government has put considerable resources into creating a black farming class. Despite many examples of failed land reform, there have been some examples of success – especially of relationships between Communal Property Associations (CPAs) and strategic agri-business partners.

3.2.1.2 Socio-economic conditions

Limpopo has an estimated population of 5.4 million, representing 10.9% of the total South African population, or the fourth most populated province in the country (Stats SA, 2010). The population distribution is 52% female and 48% male, with 35% of the total population

being children under the age of 15 years (Stats SA, 2010). The former Bantustans are the most populated areas, where more than 80% of the province's population still resides. Migration is a major characteristic of the livelihood of this province, as many of its inhabitants, mostly men, go to neighbouring Gauteng Province for work. This has resulted in a prevalence of female-headed households in the province.

People in Limpopo Province are highly dependent on subsistence agriculture, even though the province has a relatively low level of agricultural potential, partly due to unpredictable weather patterns. As a result, Limpopo Province is either the poorest or the second poorest province depending on the method used, with nearly 70% of the population classified as living below the poverty line. Additionally, it contributes only 4% to the country's Gross Domestic Product (GDP) (Stats SA, 2010). Only 16.5% of the province's population of working age (15-65 years of age) is actually in paid employment (Stats SA, 2010). The largest employment sector in the province is wholesale and retail, providing jobs for 245 000 employees; while the second largest employment sector goes to community, social and personal services providing 197 000 jobs (Stats SA, 2010). In comparison, the combined sectors of agriculture, hunting, forestry and fishing provide 53 000 employees with jobs. While the province has competitive advantage in the mining, agricultural and tourism sectors, there are developmental challenges of unemployment, high dependency ratios, poverty, skewed distribution of resources equity and illiteracy (Stats SA, 2010).

Limpopo is also the most rural population with approximately 89% of its population living in rural areas (Lahiff et al., 2008). In 2009, 57% of households in the province used wood as the primary source of energy for heating and 49% of households in the province used wood as the main energy source for cooking (Stats SA, 2010). According to 2009 data, slightly less than 13% of households in the province have piped (tap) water in their dwellings, while 33% rely on public taps for their water supply (Stats SA, 2010).

3.2.1.3 Socio-cultural conditions

In terms of demographic groupings, the predominant population group residing in the Limpopo Province is African/Black, with a population count of 96.98% (almost 5 million people). The next closest group is Whites, comprising of 2.65% of the population in Limpopo. The Coloured and Indian/Asian racial groups do not feature strongly in the province. These figures are supported by the historical context of the region relating to the fact that during the Apartheid era, the Limpopo Province housed the former "independent" homeland, namely Venda for the Venda people; as well as two Bantustans, namely Lebowa for the Pedi and Gazankulu for the Tsonga/Shangaan. The latter two were governed as "semi-governing" territories. As such the rural areas of the province, where land is communally owned through traditional governance systems, are dominated by an African/Black population.

The population of Limpopo Province consists of a variety of culture groups each with their own language. The most prominent culture groups found in the Limpopo Province are (Limpopo Provincial Government, 2011):

- The Northern Sotho
- The Tsonga
- The Venda
- The Afrikaners
- The English

The language that is spoken most frequently by people in the province is Sepedi which is linked to the Northern Sothos. The Northern Sothos are predominantly situated in the central and north western parts of the Limpopo Province (Figure 2). Sepedi is followed by two other prominent languages, namely Xitsonga and Tshivenda. The Tsongas (otherwise referred to as Shangaan) are situated mostly in the north eastern part of the province while the Vendas occupy the northern part of the province. Traditionally, Vatsonga (the Vatshonga and the Machangana make up what is today known as the Tsongas) were known to be agriculturalists and to a lesser degree, pastoralists (National African Language Resource Centre, n.d).

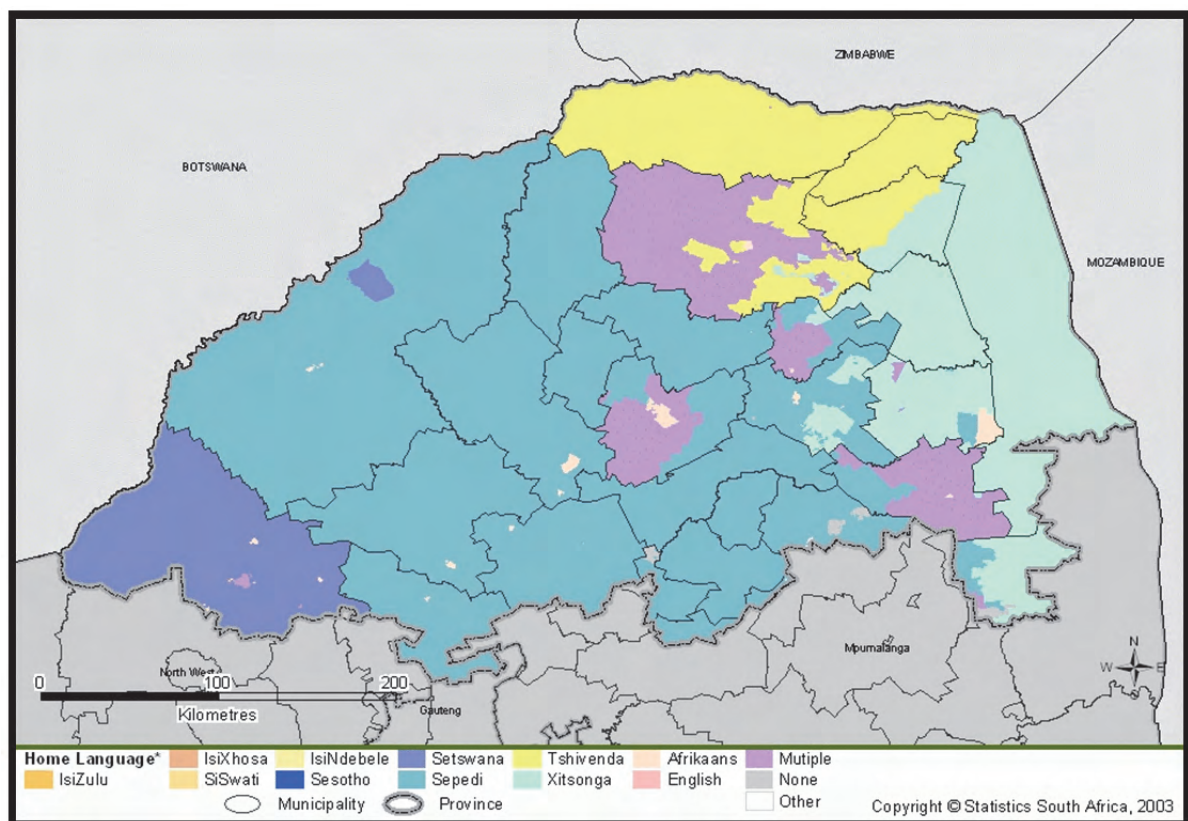


Figure 2: Spread of language across the Limpopo Province

The religious affiliation people have in the Limpopo Province is dominated by the Zion Christian Church who has the largest number of followers with 25.54% of the population. The Zion Christian Church has its headquarters about 30 kilometres east of Polokwane, the province's capital. In fact, this church also has a huge following in South Africa with more than 10 million followers across the country (Anderson, 1999). Overall however, Christianity seems to be most prevalent in the Province. This can be seen as a result of the influence of Christian missionaries in the area. For example, Christian missionaries were in contact with the Vhavenda since the 1800s (Jeannerat, 1997). The first mission station was established in the Soutpansberg area in 1863 by the Dutch Reformed Church, and was named Goedgedacht. Other missionaries who also had a major influence in the area were the Berlin Missionaries under the leadership of C. Beuster, E. Schwollenus and R. Koen (Jeannerat, 1997).

Despite the predominance of Christianity in the province, one should not ignore the fact that there are also a number of people who adhere to various other belief systems. These include, an animist or traditional African belief system, those who do not adhere to any religion, or those who do not adhere to only one religion i.e. adopt a belief system grounded in multiple religions and where oftentimes the co-existence of animist and Christian beliefs and practices are adhered to. Animist or traditional belief systems would include the belief in sorcery and witchcraft as well as the worship of ancestors. This kind of belief system also has an impact on the way in which people perceive natural disasters such as drought and floods, crop yields, water availability, as well as the climate. As such these occurrences can be seen to be the caused by human factors such as bad behaviour and the breaking of cultural taboos and not necessarily actions related to the use of the natural resource such as conservation or water use efficiency.

As in most provinces in South Africa, the Limpopo Province comprises of both contemporary governance systems as well as traditional leadership systems. Traditional leadership in Limpopo Province is regulated through the Limpopo Provincial House of Traditional Leaders (LPHTL). The position of the Chief is not merely ceremonial in the province; rather the Chief and the traditional councils play an important role in the day to day activities of people. Historically the traditional leadership is also responsible for the general well-being of their community, as well as the distribution of land and resources. Today, the traditional authority is, for the most part, still in operation and people generally still show reverence to them. The traditional leadership in Limpopo Province is mainly male dominated as it is a product of a patriarchal system however; recently women have also been allowed to become headman of villages.

The LPHTL is constituted as follows (Department of Communications, n.d):

The House is composed of thirty six (36) members elected by Traditional leaders in all five districts. The Management Committee (Executive Committee) is headed by the Chairperson of the House and is composed of the Chairperson, Deputy Chairperson and three Exco members. There are five local houses of traditional leadership in Limpopo Province including:

- i. *Capricorn*: The Capricorn Local House of Traditional Leaders consists of ten elected Senior Traditional Leaders occupying these positions in a part-time capacity. The management of the House is through the Chairperson and Deputy Chairperson.
- ii. *Mopani*: The Mopani local House is composed of ten Senior Traditional Leaders who are elected to serve on a part-time basis. The management of the House is through the Chairperson and the Deputy Chairperson. The seat of the Local House is at the Mopani District Municipality situated in Giyani.
- iii. *Sekhukhune*: The Local House is composed of twenty members, all of whom occupy these positions in a part-time capacity. The management of the Local House is through the chairperson and the Deputy Chairperson. The seat of the House is situated at Elias Motswaledi Local Municipality.
- iv. *Vhembe*: The Vhembe Local House is composed of 14 elected Senior Traditional Leaders working on a part-time basis. The seat of the Vhembe Local House is situated at the Vhembe District Municipality in Thohoyandou.
- v. *Waterberg*: The Local House consists of nine elected members and are all part time. The leadership of the House is through the Chairperson and Deputy Chairperson. The seat of the Local House is situated at the Waterberg District Municipality in Modimolle.

Traditionally, the main function of the tribal leaders with regard to resource management was to decide how resources, particularly land, were divided between members of the community for subsistence. Chiefs have an implicit duty to cater for all of their followers, although not necessarily equally, and have the right to retain the biggest share of resources for themselves. The chief selected land for him and his villages' according to their needs before allocating the rest of the land to the headman. The headman, in turn, allocated land to his people and the rest was used for grazing as part of communal land. Even in those days, there were certain rules that applied to control sustainable usage of land to benefit all the people within a particular village and in some areas. In addition to the traditional authority, since December 2000, local government is structured in a two-tiered system. This comprises of district municipalities and local municipalities, responsible for local development planning, infrastructural development and the delivery of services such as water and electricity, with the majority of such services administered through the local municipalities (Lahiff et al., 2008). According to Lahiff et al. (2008), rural communities in the province often exhibit a low degree of self-organisation, with weak and limited cooperative relations between traditional leadership and local government structures. With few exceptions, neither the traditional authorities nor the local government structures have engaged substantively in the land reform process, and have to a large degree been ineffective in providing adequate information to communities about the programmes and the various support systems available (Lahiff et al., 2008).

3.2.2 Land reform in Limpopo Province

Land reform in Limpopo has faced challenges similar to those experienced in the other parts of the country. The programme was slow to get off the ground in the years after 1994 when it was still in its infancy phase. Those projects that were implemented under the Settlement and Land Acquisition Grant (SLAG) programme in the period 1995-99 were often of a very poor standard, with reports of regular project collapse (Lahiff et al., 2008).

The land reform process has therefore proceeded slowly in Limpopo. By the end of 1998, only seven projects which were all on private land and appeared to have been initiated by the landowners had been implemented in the province (Lahiff et al., 2008). One of the many failures of these projects was that project designs were inappropriate and land did not fit the needs of the existing groups or individuals. The grouping of individuals was done in order to incorporate the R16 000 grants per family into a total amount that was enough to meet the price of the land (Lahiff et al., 2008). Generally, land was transferred to the ownership of a Communal Property Association (CPA), set in terms of the Communal Property Association Act 28 of 1996, or a trust (Lahiff et al., 2008). Additionally, the grouping of individuals was done without considering beneficiaries' skills and experience, or other strategic partners required for farmers to be productive.

The successful implementation of the willing buyer-willing seller approach was also problematic in that the government was a very poor buyer of land due to long delays and uncertainties, leading owners who were initially ready to sell their land to become weary and withdraw from deals (Lahiff et al., 2008). The government also put much emphasis on commercial farming without considering the goals, aspirations and technical knowhow of beneficiaries.

Due to the number crunch approach by government, there was a considerable increase in land redistributed under the SLAG programme in terms of hectares and amount of beneficiaries. A total of 71 SLAG projects were implemented that benefitted 6655 households (Lahiff et al., 2008). However, according to Lahiff et al. (2008), the majority of the members were not involved in actual production and saw little benefit from any project.

In 2000, the government replaced SLAG with the Land Restitution for Agricultural Development (LRAD) programme as the main instrument to advance redistribution. LRAD was designed as a market-driven programme, providing larger grants to emerging black farmers with the aim to create 70 000 black commercial farmers within 15 years. LRAD was seen as a vehicle for advancing the policy objective of distributing 30% of (white-owned) commercial agricultural land to black farmers. By 2003 over 2.3 million hectares had been transferred to emerging farmers (Cousins and Scoons, 2009).

However, by 2008, the then Department of Land Affairs (DLA) (now the Department of Rural Development and Land Reform) had transferred only 3% of the land area to land reform beneficiaries. Although the government has put considerable resources into creating a black farming class, there were concerns that these emerging farmers still lack the capacity, skills and know-how to farm commercially. Despite these set-backs, the reform programme has achieved some success, most notably in the public-private partnerships between CPAs and strategic agri-business partners. These ventures have been positively endorsed as a practical means to achieve the government's policy objectives (Charman, 2008).

3.2.2.1 Restitution

A total of 5 808 restitution claims were lodged in Limpopo in terms of the Restitution of Land Rights Act, a thousand of which were settled by 2004 with cash compensation to individuals' families (Lahiff et al., 2008). The land claims situation in Limpopo differs from that conducted in other provinces due to the large proportion of claims that are for rural land and the large area of land under claim (Lahiff et al., 2008). In 2007 it was recorded that even though the total outstanding rural claims in Limpopo was 1326 (less than Mpumalanga which had 2139 outstanding claims or KwaZulu-Natal's 1463 outstanding claims), Limpopo had the highest estimated outstanding claims by area i.e. 8 347 461 hectares, which represents a significant 48.5% of the total area (CRLR, 2007).

By 1999/2000, only two of the remaining claims had been settled, but this process accelerated dramatically thereafter. Between 1995 to 31 March 2007, a total of 2 789 claims had been settled that involved the restoration of 356 042 ha of land at a direct cost (land only) of R 1.3 billion rand and a total cost of (including development grant and cash compensation) of 1.6 billion (CRLR, 2007). This involved a total number of 196 434 beneficiaries (CRLR, 2007).

According to PLAAS (2006), some of this land has been returned to communities for their own use, and a variety of agricultural projects are underway, but these have suffered from many of the same problems as previous SLAG projects. The result has been under-utilisation, bankruptcy and little benefit to beneficiaries.

3.2.2.2 Post settlement support

A range of financial assistance packages are available to land reform beneficiaries, although most of these have not fallen under the responsibility of the DRDLR. In the province this responsibility falls under the jurisdiction of the Provincial Department of Agriculture, and specifically, the Post-settlement Unit (PSU) established by the Limpopo Regional Land Claims Commissioner (RLCC), the first of its kind in the country.

In 2004, the Provincial Department of Agriculture implemented the Comprehensive Agricultural Support Programme (CASP), the biggest support sub-programme at the provincial level in all provinces except Gauteng and the North West Province (Greenberg, 2010). CASP is designed to help black farmers to participate in a market that is dominated by white agri-business, but without altering the logic of the market or production system. The money that is awarded as part of CASP is used mainly for infrastructural development i.e. warehouses, access roads, irrigation systems. Money is also spent on training and capacity building and marketing. Farmers apply on a yearly basis and grants are awarded for a five year period. To date, the success of implementation of the CASP programme has been uneven, although most provincial farmer support programmes have been expanded (Greenberg, 2010). In Limpopo, the CASP funds are clearly inadequate to meet the needs of reform given the rate at which claims are settled.

A range of other post-settlement support grants have been developed including LRAD Grants, the Restitution Discretionary Grant (RDG) administered by the RLCC, the Settlement Planning Grant (SPG) managed by the DRDLR, the Development Assistance Grant (DAG) administered by the RLCC, the Agricultural Credit Scheme (ACS), the Micro-Agricultural Finance Schemes of South Africa (MAFISA) that provides funding to financial organisations such as the Land Bank for on-lending to beneficiaries of land reform, the Infrastructural Provincial Grant (IPG) and the Land and Agrarian Reform Project (LARP), both managed by the Limpopo Department of Agriculture.

3.2.3 Water allocation reform in Limpopo

Water allocation reform was meant to be closely linked to land re-distribution. However, the reform process in Limpopo reflects the challenges to progress in other provinces. The policy landscape is progressive and clear in promoting Water Allocation Reform (WAR). The major policy documents include the White Paper on Water Supply and Sanitation, Water Services Act of 1997, and the National Water Act of 1998. Additionally, the registration of water use has been facilitated through the Department of Water Affairs' Water use Authorisation Management System (WARMS), the establishment of Catchment Management Agencies, and Water User Associations. However, despite the set designed policy landscape, little evidence suggests that actual re-allocation of water resources is progressing successfully.

Research has already pointed out a number of causes why re-allocation of water has not taken place as anticipated. The fact that the registration process is by far not finished and delayed hampers re-allocation of water. Also that DWA at the same time is in a process of decentralisation and lacks financial resources for implementation.

Moreover, since water resources are allocated based on the country's 19 Water Management Areas (WMAs), water allocation processes do not operate completely synergistically with that of land reform processes, which are managed based on political boundaries. In the Limpopo Province, there are four WMAs: 1). Limpopo; 2). Luvuvhu and Letaba; 3). Crocodile West and Marico, and 4). Olifants. Study sites in the Maruleng Local Municipality form part of the Olifants WMA. The Olifants WMA is divided into four sub-areas: Upper Olifants, Middle Olifants, Steelpoort, and Lower Olifants Sub-Areas. In the Olifants WMA, the entire catchment is under severe stress, and no surplus water is available for allocation.

In terms of water allocations to macro-scale users versus small-scale water uses, several scholars allude to the point that in comparison to the redistributive target of 30% in the case of land reform, water reallocation remains without a target (Van Koppen, Sally, Aliber, Cousins, and Tapela, 2009). In essence, small-scale water uses are tolerated, as long as any new water uptake remains insignificant and does not affect the resource base (Van Koppen et al., 2009). However, studies conducted in the Olifants basin regarding the potential impact of doubling or tripling water quantities used by virtually all micro-scale users revealed that Schedule 1 use for everybody is estimated at 116 lpcd, while doubling this allocation to 277 lpcd (for 50 lpcd domestic water and 0.1ha irrigation per household) would require the few large-scale users to share only 6% of the volumes used (Cullis and

Van Koppen, 2007). This logic can be taken further to advocate for more regulatory mechanisms for macro-scale users, and less restrictive regulations on small-scale users. Simply put, licences intrinsically discriminate against small-scale users and distract the regulator's attention away from the relatively few large-scale users that need to be regulated most, and can be regulated realistically (Van Koppen et al., 2009).

3.3 The Maruleng local municipality as case study area

Maruleng Local Municipality was first established in 1997 under the name Hoedspruit / Makutswi Transitional Local Council (MLM, 2010). Historically, it comprised the Eastern Transvaal as well as the apartheid homeland of Lebowa which was designated for Pedi/Northern Sotho speaking people. Maruleng Municipality is described as a predominantly rural municipality. It has a solid economic base centred on agriculture and tourism, which is a key sector with significant potential for growth. The area is characterised by commercial farming of mango, citrus, tourism, game farming and subsistence and small-scale farming of maize (MLM, 2010).

In terms of location, the municipality borders the Greater Tzaneen and Ba-Phalaborwa municipalities in the north area and Bushbuckridge on its south area. It also borders Blyde River Canyon in the west and Timbavati Private Reserve and Kruger National Park in the east. Hoedspruit is the economic and political hub of MLM and is the main urban area in terms of business, infrastructure and organisational functions. However, it has limited economic development due to many land claims which have hampered investment in the area.

Maruleng has two residential features: urban residential which is well established, with formal housing and good service particularly access to water; and the rural residential areas in the former homeland areas which still face service delivery challenges. The population of Maruleng is concentrated in 33 rural communities (MLM, 2010).

The Hoedspruit (Maruleng) area lies within the Lower Olifants sub-area of the Olifants water management area (WMA), which is part of the Limpopo river basin. It is a high summer rainfall area, with significant surface water supply derived from the Blyde River catchment, which contributes significantly to the base flows of the lower reaches of the Olifants River passing through the Kruger National Park (KNP). The most prominent of these is the Blyde river canyon to the Blyderivierspoort dam, which is the biggest bulk surface water supply scheme in the area. It supplies water for irrigation, local industrial and domestic demands, and supports the supply of water from the Phalaborwa Barrage to the urban and industrial center at Phalaborwa.

A rapid draw-down of the Blyderivierspoort Dam during the dry 2003/2004 rainfall period suggested that the dam may not be able to supply the historic yield determined for the dam, which implied the water balance for the dam needed to be revised in terms of the dam operation and hydrology. Those who do not have access to the Blyderivierspoort scheme rely on groundwater, which is far more costly to extract. Borehole yields range between 0.5 and 2 liters per second (l/s), which is inadequate for any form of commercial scale irrigation. However, in some places (local areas around Phalaborwa and

Hoedspruit), yields of approximately 5 l/s have been recorded, which could be used for small scale commercial applications. However, the bulk of groundwater is normally used for domestic and livestock watering. Water quality is generally good, with some isolated areas having elevated nitrate concentrations.

The water use profile of the area is directly related to the economic profile of the Olifants WMA. Economic activity is diverse and ranges from irrigated agriculture, mining, electricity generation, and metallurgic industries to services and ecotourism. The WMA generates about 5% of the GDP of South Africa, which equates to approximately R1.09bn per year. The bulk (approximately 57%) of the water in the Olifants WMA is used by the irrigation sector; electricity generation uses a further 19%; and urban, industrial and mining together use a further 19%.

Water quality in the Lower Olifants Sub-area is heavily affected by the return flows from the mining industry situated upstream of the study area. The water emanating from the Blyde River together with the water from the adjacent Mohlapiitse River is of a good quality and has an important dilution effect on the poor quality water of the return flows from the mining complex around Phalaborwa in the Ga-Selati River, upstream. This dilution effect is pivotal to maintain the water quality in the Lower Olifants River in the KNP at an acceptable quality.

There a large number of irrigation schemes and land reform projects that have been established in the former homelands in Maruleng municipality for food security purposes. Most of the areas in Maruleng Municipality consist of agricultural land which has been restored to claimants under the land restitution programme. Because of the high unemployment rate and subsequent poverty in the area, there is a need to determine the extent to which beneficiaries use land and water resources productively.

This section will provide a municipal overview in the study area as well as a short synopsis of selected farms in which more detailed fieldwork will be carried out. These farms do not represent the expansive list of farms/reform projects to be investigated. A list of additional farms/land reform projects is provided in the Appendix. These sites will also be investigated.

3.3.1 Socio-economic indicators

Maruleng has a youthful Sepedi-speaking population. According to the Statistics South Africa 2001 census (dataset used to develop the Maruleng Local Municipality Integrated Development Plan 2010-2015), MLM has a total population of 94 383 and 19 668 households comprising of 45 953 males and 49 816 females (Stats SA, 2007). Females slightly outnumber males since they comprise 52% of the population. The youth between the ages of 0-35 years constitute a significant 73% of the total population of the municipality.

Despite a reasonable GDP, Maruleng is one of the poorer nodes in the Mopani District, where over 80% of households live below the households subsistence level, and only

28% of the adult population is employed (MLM, 2010). Additionally, a significant number of households are dependent on pension grants as their primary source of income (MLM, 2010). Growth in the Maruleng economy between 1996 and 2006 was volatile, and averaged at 3.1%, which is below the national (3.5%) and provincial (3.9%) average (MLM, 2010).

Table 2: Maruleng Local Municipality (MLM) monthly income levels (Source: Stats SA 2007 Census).

Income levels	Total
None	50245
R1-400	23034
R401-800	4231
R801-600	11 753
R1601-3200	2163
R3201-6400	1384
R6401-12800	905
R12801-25600	384
R25601-51600	57
R51601-102400	69
R102401-204800	-
Over R204800	-

More than one third of the adult population lacks any schooling. Roughly 67% of Maruleng's population between the ages 5 and 24 attend school, and 27% do not attend school. Additionally, roughly 10.8% of the population has some form of higher education according to the 2007 Stats SA Community Survey, which represents a 4% improvement from the 2001 Census (MLM, 2010).

Table 3: MLM Educational Level (Source: Stats SA 2007 Census)

Level	Figure
No schooling	14671
Grade 0	2200
Grade 1	3098
Grade 2	4044
Grade 12 (without university exemption)	1712
Grade 12 (with university exemption)	1264
Certificate with Grade 12	463
Diploma	414
Bachelors Degree	80
B.Tech	184
Post graduate diploma	281
Honours degree	176
Higher degree (masters/PhD)	0

Land ownership patterns in Maruleng are diverse due to the scattered location of communal villages, conservation areas and commercial farms. Considerable land is owned by the State and falls under custodianship of traditional authorities which accommodates some 90% of the residents of the municipal area. Large areas of land in private ownership are also used for Conservation/Tourism/game farming and commercial hunting (MLM, 2010).

Ownership patterns are expected to change in the future, as the Sekororo Land Claim is settled and ownership of some of the land transferred to the Sekororo people (MLM, 2010). According to the Maruleng Local Municipality IDP Plan 2010-2015, 18.5% of the municipal area is subjected to 21 registered land claims (MLM, 2010). Most areas of the former Lebowa homeland are under communal land tenure with an active authority system in place. Areas of privately owned commercial farmland, mostly by white commercial farmers, will also be transferred to the Sekororo people as part of the land reform process.

The majority of commercial farms are located in the Harmony Block area where agricultural activities such as citrus and sub-tropical fruit production are concentrated. The Sekororo people have also logged land restitution claims on this land. Large areas of privately land are owned by mines located in, or close, to the town of Phalaborwa and are being evaluated for their mineral potential.

About five land claims have already settled in this area. One of which is Moletele CPA which entered in to a Private-Public-Partnership. This PPP is working well and is used by the municipality as a bench mark for further land settlements.

Table 4: Status of land claims in Maruleng Local Municipality

Total number lodged	21
Total after consolidation	20
Total settled	5
Hectares restored	16 702.2483
Households benefited	2820
Beneficiaries	19492
Money spent	R 276 300 478
Claims outstanding	16

Agriculture currently is, and is likely to remain, a key economic sector and the largest employer in the municipality. Maruleng is also the leading exporter in mango and one of South Africa's largest exporters in citrus. Other crops such as vegetables are becoming increasingly important particularly at the subsistence and emerging farmer levels. Since citrus and mango require large scale production levels in order to be profitable, there are concerns that these commodities are not viable options for small emerging farmers unless structured through cooperatives.

3.3.2 Description of water supply and use

Maruleng is characterised by low rainfall. This has resulted in limited water resources culminating in severe water shortages and drought conditions (MLM, 2010). There is also severe competition amongst different water users. Water in Maruleng is supplied by one of three sources: the Lepelle Northern Water Board (LNWB), the Department of Public Works and/or the Blyde River. LNWB is the biggest supplier to the area for industrial and domestic use supplying from the Phalaborwa Barrage, located on the Olifants River. Should the area experience a decrease in water levels in the Phalaborwa Barrage, water is released from the Blyderivierspoort Dam, located on the Blyde River. Other towns in the area rely on water from small water supply impoundments, bore holes, wells, or run-of-river abstraction points. A small amount of water is also transferred from other catchments i.e. the town of Gravelotte receives water that is transferred from the Letaba catchment area to the north. Small irrigation boards control the allocation of water for commercial irrigation in the upper reaches of the Selati River (Ashton et al., 2001).

3.4 Presenting the key players and organisations of the study area

The specific farms to be investigated in the Maruleng Municipality fell under the authority of two communities i.e. the Moletele community and the Sekororo community. The Moletele community has been lauded for the manner in which they have handled their land claims and the productivity experienced of their farms. The Sekororo community, on the other hand, has experienced a more turbulent level of progress in their land reform process, and less productivity on their farms.

In understanding the productive use of water for food production by beneficiaries of land reform, it also became clear that several players and organisations played important roles in determining the level of productive water use experienced. It was therefore important to present who the key players and organisations were and how they influenced emerging farmers' productive use of water.

3.4.1 Moletele Farms (Moletele CPA)

The Moletele Communal Property Association (CPA) was established 16 years ago and is a landholding comprising of about 1 615 families who have claimed land in and around the Hoedspruit area. The land claim involved over 13,000 beneficiaries who lodged a claim for 78000 hectares of land in a prime export-oriented subtropical zone (Moletele Bulletin, October 2008a; 2008b). Presently, a total of 7142ha of land has been restored to the community, which accounts for less than 10% of the total area under claim, at a cost for land alone of R183 million (Davis and Lahiff, 2011). The claimants are all members of the historical Moletele community, and are organised under the Moletele CPA, led by an elected community, which has taken ownership of the land in freehold title on behalf of the community (Davis and Lahiff, 2011). This CPA has been praised for its agricultural

productivity and the successful operation of its joint strategic partnerships. It would therefore be a useful case in terms of its successes.

The farms claimed by Moletele community is currently producing high value horticultural commodities i.e. sub-tropical fruits and vegetables with a combined turnover estimated at over R100 million per annum. Crops include mango, citrus and litchi orchards, while other activities are also undertaken such as cattle ranching, ecotourism ventures and production of vegetables under shade netting (Davis and Lahiff, 2011). Although rainfall in the area barely exceeds 500mm, the area is well-supplied with irrigation water from the nearby Blyde River Dam (Davis and Lahiff, 2011).

A qualitative group discussion was held with several Moletele CPA committee representatives to confirm secondary source information. It was confirmed that the Moletele CPA is a well-functioning model, and its success is strongly attributed to the organisational and government (DAFF extension officers) support that the CPA has received to date, the regulatory framework put in place by the CPA, effective support from a well-functioning WUA, as well as the Community Private Partnership (CPP) model of leases, which are longer-term leases with strategic partners. In its first 5 years, the CPA concentrated on developing a robust legal framework and management model to govern the CPA. It is envisaged that in the next 5 years the CPA will develop a set of conditions to directly integrate emerging farmers. During the first 5 years 12 000 people were employed. Training will be extended over the next five years; however, this has not been possible to date due to funding constraints.

After the Moletele land claim was finalised, the land was transferred to the CPA, with the Department of Agriculture designing the leases. The land was then divided into 4 capital intensive clusters (42 farms in total); namely Dinaledi, Batau, New Dawn and African Realty Trust (now known as Richmond). Each of the clusters involves a partnership between Moletele CPA and a privately owned company, and leases were signed.

These clusters have been very sensitive to a shortage of capital, and Batau has been liquidated. African Realty Trust (ART) has suffered from a shortage of capital and the initial lease has been cancelled. Now an enterprise with private capital (GFC) has been found and a different lease has been signed. This takes the form of a community private partnership lease over a 15-year term. The lease includes a stringent training clause, which is monitored by DAFF. Dinaledi has signed a 15-year lease which has been working well, due in large part to the fact that Dinaledi has been able to provide independent finance. Income has been generated since 2006 and has been growing steadily to R 7 million in 2011.

From respondent interviews it is apparent that while strategic partnerships are working well in comparison to other CPAs, there is still very little involvement by Moletele emerging farmers themselves. Moletele-owned land has however been earmarked for small-scale farming (240 ha), i.e. sugar cane production, which could employ 60 000 people, but this has not materialized to date.

In terms of water use, the Moletele CPA's water allocation is coordinated by the Lower Blyde WUA, an implementing extension of DWA. The CPA has also received a grant for infrastructure development from the Department of Water Affairs, which was used to secure an agreement between the Rand Merchant Bank and the CPA for infrastructure development (the construction of the pipeline system), a project to be paid over a period of 20 years.

The transfer of water rights has been problematic at times. ART claimed that 241 ha of water rights had not been purchased by the state. These were put on auction and were on the verge of being sold. This meant that the new partner GFC would have been short of water. The Moletele CPA managed to stop this in time and DWA issued a letter stating that these water rights are Moletele's own rights.

According to sentiments expressed by several Moletele CPA representatives, innovative models are needed to ensure the productive use of and. Land is a very valuable asset and high maintenance and highly technical skills are required.

3.4.2 Sekororo farms (Makhutswe CPA)

The Makhutswe CPA operates on a slightly different model to the Moletele CPA, with a lower degree of commercial strategic partnerships in place. The Sekororo land claim comprises of land restitution claims lodged by Sekororo people, some of which are still pending. These include claims to commercial farms located in the Harmony Block area where agricultural activities such as citrus and sub-tropical fruit production are concentrated. The total extent of the properties under claim in phase 1 is 5,016 hectares, and the total cost of settlement is estimated at R 67,174,700.

The Sekoro land claims fall in the upper Selati catchment. The Selati River falls within the Lower Olifants Sub-Area of the Olifants WMA. The catchment falls under the jurisdiction of three local municipalities: Maruleng Local Municipality (part of the Botshabelo Cross Boundary District Municipality), the Greater Tzaneen Local Municipality, and the Ba-Phalaborwa Local Municipality (both part of the Mopani District Municipality). However, the communal land in the upper catchment falls mainly under the jurisdiction of the Maruleng Municipality and the Greater Tzaneen Municipality. Villages of the Sekororo area include: Balloon, Bismark, Banareng Ba Sekororo, Calais, Enable, Finale, Ga-Sekororo, Lorraine, Madeira, Makgaung, Mametja and Metz.

For the purposes of this study, fieldwork will be conducted in several villages situated within the municipal boundaries of Maruleng including:

- Balloon
- Calais
- Lorraine
- Madeira
- Makgaung and
- Metz

Balloon is situated in an adjacent catchment, close to the border with the Selati catchment. Many residents of Balloon, however, make use of natural resources in the Selati catchment for their livelihood. For example, the majority of workers in the avocado plantation in the Lekgalameetse Nature Reserve are from Balloon

According to a study conducted by Liebrand (2007), the Makhutswe CPA, through which most of the agricultural production is managed has been granted by the property rights for several properties by government. As such, the MCPA has the right to access the land, withdraw water, make improvements on water utilisation (management right), is allowed to exclude other users and may lease land to private farmers for example (alienation right) (Liebrand, 2007). However, these rights are granted to the Makhutswe CPA, and *not* to individual claimants. In essence, individual claimants are still not allowed to access the land, withdraw water, make improvements, exclude other users and/or lease part of the land to other users, without permission from the CPA (Liebrand, 2007). In recent times, these rights have been given by the MCPA to strategic partners. Individual beneficiaries can only enact their land and water rights by being involved in CPA activities and by getting permission from the MCPA. It remains to be seen, how this issue will play out as more claims are awarded to Sekororo beneficiaries in the near future.

Additionally, despite having considerable property rights on paper, Liebrand (2007) also indicates that the authority of the Makhutswe CPA is contested because of selective portioning of land to key claimants by the government. Also, it is still not clear, what resources the CPA is entitled to, and whether the MCPA is able to really materialise the granted property rights. From Liebrand's initial study, it is evident that individual claimants do not have rights to use resources due to the use right been awarded to large beneficiary groupings in the form of CPAs that are granted property rights by the government. According to Liebrand (2007), it is not so much the difference in rights the two groups hold that makes the difference in agency, but rather that claimant action is dependent of collective decision-making. Unlike commercial farmers, individual claimants are dependent on collective action to pursue their goals, and a number of issues (e.g. authority) are highly contested within the claimants group, which constrains the effectiveness and outcome of collective action. In other words, the process of 'collective action' consumes more energy and 'receives' more attention than pursuing the goals of the group. These struggles limit the 'agency' of the claimants group, and of course, limit the productivity of individual claimants.

Several group discussions and qualitative interviews were conducted to confirm or refute secondary source findings. In an introductory meeting with the Makhutswe CPA Management Committee, one of the farmers present said that the water schemes are not functional and that water is not a problem in the area, but that there needs to be a plan to sustain the area to the fullest. There is a strong source of water from the Drakensberg Mountains. Currently, very few farmers pay a fixed monthly amount for water use, and when they do, they are not clear on how much water they use or how much they are paying for.

The maintenance of existing infrastructure was listed as a key challenge to water access. Farmers struggle to maintain canals because of a lack of cooperative management or adherence to water use schedules. Also, dams and canals have leakages that are not being repaired. Farmers complained that this was partly the fault of government (not providing the necessary support), but also an increase in vandalism on farms. In some instances infrastructure was non-existent with farmers not having access to water because of a lack of pipes. Several farmers also lamented that when previous owners left, they took the existing pipes with them, leaving farms with little or no piping.

Table 5: Summary of farming groups in the study area

Name	Catchment	Governance	Land reform?	Water License?	Orientation	Access to/Inclusion in Food Value Chains
Balloon Community Farm	Upper Selati	Sekororo Authority and Makhutswe CPA	Yes – land restitution	Yes, but owned by Makhutswe CPA	Emerging/Subsistence Mixed commodities (mangoes, litchi, veg, some agronomic crops)	Farmer supply only to the local community. Local community is accessed from roadside stalls and informal markets
Calais Community Farm	Upper Selati	Sekororo Authority and Makhutswe CPA	Yes – land restitution	Yes, but owned by Makhutswe CPA	Emerging/Subsistence Mixed commodities	Farmer supply only to the local community. Local community is accessed from roadside stalls and informal markets
Lorraine “Betterment” Scheme	Selati	Sekororo Authority and Makhutswe CPA	Yes – land restitution	Yes, but owned by Makhutswe CPA	Emerging/Subsistence Mixed commodities	Farmer supply only to the local community. Local community is accessed from roadside stalls and informal markets
Madeira “Betterment” Scheme	Selati	Sekororo Authority and Makhutswe CPA	Yes – land restitution	Yes, but owned by Makhutswe CPA	Emerging/Subsistence Mixed commodities	TBC
Makgaung Farms	Selati	Sekoro Authority and Makhutswe CPA	Yes – land restitution	Yes, but owned by Makhutswe CPA	Emerging/Subsistence Mixed commodities	TBC
Metz Farms	Selati	Sekororo Authority and Makhutswe CPA	Yes – land restitution	Yes, but owned by Makhutswe CPA	Emerging/Subsistence Mixed commodities	TBC
Richmond	Olifants/Blyde	Moletele CPA	Yes – land	Yes	Emerging	Yes

Name	Catchment	Governance	Land reform?	Water License?	Orientation	Access to/Inclusion in Food Value Chains
Estate			restitution		Highly mixed (mango, Valencias and grapefruit);	
Dinaledi Farming Enterprise	Olifants/Blyde	Moletele CPA, but managed by Dinaledi Farming Enterprise	Yes – land restitution (CPA owns the land and Dinaledi rents from them based on a 15-year lease agreement)	Yes	Emerging/commercial Highly mixed (grapefruit, Valencias and lemons)	Yes
New Dawn Farming Enterprise	Olifants/Blyde	Moletele CPA in partnership with Strategic Farm Management (SFM). The CPA holds 52% shares and the balance of 48% shares is held by SFM.			Emerging Highly mixed (citrus, mangoes, guavas and papayas)	Exports mangoes to African countries such as the Ivory Coast, Angola, Mauritius, etc.

3.4.3 Maruleng Municipality

Although the Maruleng Municipality is largely responsible for domestic water supply, municipal officials were also interviewed from the Operations and Maintenance Unit and the Infrastructure Services Unit, to examine the degree to which the municipality is able to coordinate water supply and access in the area.

According to municipal officers, Maruleng is currently a water user. The municipality therefore buys water from the Department of Public Works and supplies water to Hoedspruit and other surrounding towns. Public Works buys the water from the Rand Merchant Bank, who is largely responsible for water abstraction from the Blyde River and treatment. Mopani District Municipality is the Water Services Authority for the municipality. The rural areas within the municipality use boreholes and mountain springs as water sources. The Department of Water Affairs at Polokwane/Lydenburg monitors farmer's use of water.

Currently, there is no association that provides support to emerging farmers in terms of water access from the municipality. A number of NGOs are involved in assisting these farmers within the municipality, such as Enable ADP that tries to establish small farming projects to assist communities. The Local Economic Development Department is mainly responsible for emerging farmer support in the municipality.

A Water Conservation and Demand Management Strategy is currently being developed at the District level of the Municipality. In this project, the Department of Water Affairs is working together with Lepelle Northern Water and the Mopani District Municipality. Recent developments could alter the way in which water supply is coordinated in Maruleng. Talks are underway to develop a Memorandum of Understanding (MOU) that will see Maruleng becoming the primary water service provider within Mopani, responsible for bulk water supply. Better service delivery is envisaged by the municipality from this. However, this also poses a challenge for the Municipality to develop a new water services provider skill set.

3.4.4 Lower Blyde Water User Association

A qualitative interview was also conducted with a representative from the Lower Blyde Water User Association (LBWUA), a well-functioning and respected WUA in the area. The LBWUA is a legally recognised entity in terms of the National Water Act 36 of 1998 and has only the Lower Blyde River as its jurisdiction, and only focuses on irrigation farms in Hoedspruit. It therefore includes the Moletete CPA, but not the Makhutswe CPA. Additionally, LBWUA falls within the Olifants Water Management Area and aims to facilitate integrated resource management in the Blyde River Basin.

The LBWUA makes use of a pipeline system, supplying a total of 9000 ha. The WUA takes monthly measurements and regulates water usage by its users. The LBWUA is an

extension of DWA and charges users an administration fee and a water tax which is paid to DWA. All irrigation farmers in the area have to belong to the WUA, which manages the bulk supply infrastructure and monitors any unlawful water use. In all cases but one the WUA has managed to resolve issues of unlawful water use.

The Rand Merchant Bank-funded pipeline is also located within the LBWUA's jurisdiction. There is an unresolved court case on the ownership of this pipeline; however, Murray, Biesenbach and Badenhorst (MBB civil engineers) are currently responsible for maintenance, while farmers pay for the transportation of water through this pipeline. The pipeline system is regarded as very efficient with no significant loss of water from source to point of use.

The WUA has a healthy relationship with the Moletete CPA, with fees being paid on a regular basis. Of the 9000 ha of water rights that belong to the members of the LBWUA, 2800 ha belong to the Moletete farmers. Water rights are linked to the property that farmers own, and DWA ensures that the property and water rights are transferred at the same time.

3.5 Overview of the fieldwork process

The fieldwork stages of this project employed a range of research methods that operate at a range of levels from the individual farmer, to the household, to communal irrigation schemes or property organisations, to the national policy environment. The main focus of the investigation and analysis, however, was on individual case studies of farms, which necessitates an examination of the effect of land reform projects and water allocation reform programmes on individual (or household) participants. Apart from our focus on individual farms, we also undertook an assessment to understand the institutional context of the study area. This has entailed interviews and discussions with local traditional leaders, public representatives, representatives from private sector companies and non-governmental organizations (NGOs) in the area, as well as continuous engagement with local, provincial and national government agencies with actual or potential involvement in land reform and water allocation reform programmes.

The fieldwork process employed a multi-method and multi-stakeholder engagement process that involved consultations with several government departments, most notably, the Department of Agriculture Forestry and Fisheries' (DAFF) Sekororo office, and Maruleng Municipality; as well as a Water User Association, a utilities company, various types of farmers, strategic partners and CPAs. Several fieldwork visits were conducted, including a scoping visit to lay the foundation for more extensive fieldwork, to initiate contact with extension officers and CPA representatives, and to ascertain the types of commodities and farming arrangements in the area. The reconnaissance trip was critically important in providing easier access to respondents, adhering to protocol for fieldwork engagements in the area, obtaining buy-in and trust from farmers, as well as maintaining a positive reputation by all stakeholders in the area. This report combines the information obtained from two extensive fieldwork periods, which covered the bulk of the primary data

collection. Fieldwork was conducted in several communities situated within the municipal boundaries of Maruleng; including Balloon, Calais, Lorraine, Madeira, Makgaung, Metz, Sofaya, Hoedspruit, Paris, Nasional, The Oaks, The Willows, and Turkey. In terms of the farmers consulted, they fell into several different groupings:

- i. Emerging farmers living in irrigation schemes (e.g. Lorraine Irrigation Scheme, Madeira Irrigation Scheme, Metz Irrigation Scheme, Sofaya Irrigation Scheme, and Makgaung Irrigation Scheme). These irrigation schemes were predominantly restituted communal land, and some had ad hoc CPA committees in place but functioned differently to the bigger CPA structures. Emerging farmers on these schemes owned the land in a permission to occupy land (PTO) arrangement, inherited the land, or obtained a portion from the chief.
- ii. Emerging farmers forming part of CPAs such as Makhutswe CPA and Moletete CPA. These farmers either rented the land from the CPA or “owned” the land with the title deed resting in the custodianship of the CPA.
- iii. Strategic partnerships between the CPA and white commercial farmers.
- iv. Other arrangements including emerging farmers on state farms (i.e. Balloon Orchards), emerging farmers who owned private land but who also owned land on an irrigation scheme, and emerging farmers who received land under the SLAG programme.

A key aspect of the success of the fieldwork process is owed to the collaboration and trust established with the DAFF extension officers in Sekororo, who provided much needed guidance and assistance in scheduling introductory meetings with farmers in these areas, as well as formal meetings with CPAs; obtaining access to farmers; locating remote farms; and obtaining broader buy-in from the communities, relevant CPAs and tribal authorities, and other institutional structures. The collaboration with DAFF extension officers also helped to ‘legitimize’ the project team in the communities visited, which helped to facilitate the smooth running of multiple engagements. In return, the WRC project team was able to provide project experience to several DAFF interns who assisted the team on field visits and acted as an interpreter and guide. The interns, Mr Lebepe; Mr. Stanford and Ms. Nkgapele, were all promising young extension officers invaluable to the success of the fieldwork process. The multi-method data collection process resulted in several data sets, including the following:

- i. 44 questionnaires (see Appendix 2 and Appendix 4) completed by farmers in the above-mentioned communities, pertaining to the productive use of water for food production by beneficiaries of land reform;
- ii. 4 questionnaires with strategic partners: Calais 225 KT (1 farm); Richmond estate (1 farm, 1 pack house); New Dawn (16 farms and 2 pack houses); Dinaledi Farming Enterprises Pty (Ltd) (3 farms and 2 pack houses). These questionnaires provide information on 20 farms;
- iii. 62 student-led questionnaires (see Appendix 3) completed by farmers in the above-mentioned communities, administered by a University of Limpopo student, on access to credit and food value chains;
- iv. Qualitative interviews with farmers (including some of the farmers who had previously completed questionnaires), organisational representatives from Maruleng Municipality, Lower Blyde WUA, Moletete CPA, Makhutswe CPA, strategic partners, Department of Agriculture and Forestry (DAFF) extension officers, and Lepelle Northern Water.

- v. Qualitative researcher observations (See Appendix 5) were also documented on observation sheets in each of the communities visited. This provided valuable information for mapping food value chains.

3.5.1 Productive use of water questionnaire sampling procedures

Individual questionnaires were completed by a random sample of 44 farmers in the Maruleng municipality in several different communities, pertaining to the productive use of water for food production. Questions related to land ownership, productivity (access to markets, alternative sources of income, yield, collective marketing strategies, etc.), water use (difficulties in obtaining water, water re-use, water licensing, cost of water, etc.) as well as the use of improved technologies and access to support systems (training, governmental grants, etc.) were included. Additionally, questionnaires were completed by strategic partners who provided data for a total of 20 farms; however, questions differed as a result of size of farms, yield, water allocation and licensing issues as well as the use of improved technologies and access to markets.

Table 6: List of communities and number of farmer respondents. Source: Survey data

Name of Community	Number of respondents	% of sample
Balloon	4	9.1%
Calais	2	4.5%
Hoedspruit	1	2.3%
Lorraine	3	6.8%
Madeira	6	13.6%
Makgaung	2	4.5%
Metz	11	25%
Sofaya	15	34.1%

In addition, a student from University of Limpopo administered a separate questionnaire. The student study used a stratified random sampling technique due to the fact that some emerging farmers have access to formal agricultural credit while others do not have access to such credit. A sample of 62 emerging farmers was used in this study. Due to limited time and the scope of the study it was not possible to collect data from all communities in Maruleng municipality. Emerging farmers were classified as borrowers and non-borrowers of formal agricultural credit. This was done in all the areas where the survey was conducted. The number of emerging farmers interviewed in each community is listed below.

Table 7: List of communities and number of emerging farmer respondents.
Source: Survey data

Name of Community	Number of respondents	% of Sample
Sofaya	6	9.7%
Metz	17	27.4%
Madeira	4	6.5%
Ballon	2	3.2%
Lorraine	6	9.7%
Makhutswe	6	9.7%
Calais	3	4.8%
Paris	7	11.3%
Nasional	2	3.2%
Makgaung	3	4.8%
The oaks	4	6.5%
The willows	1	1.6%
Turkey	1	1.6%
	62	100.0%

3.5.2 Interview and observation procedures

Qualitative theme-based interviews were conducted with farmers in the study area, including some who had already completed questionnaires. Once again the value of having extension officers present was evident. Extension officers assisted in identifying suitable farmers and organising interviews in order to get reliable data. Before the interviews were conducted, arrangements were made with farmers, permission was asked and the purpose of the research project was explained. All respondents also received a project brief, which provided a short overview of the project. In all instances, particularly where farmers could not read, the purpose of the project was also verbally articulated by the researcher. Translators were used in most instances because most emerging farmers spoke Sepedi. Interviews lasted an hour on average. Observation sheets were also completed for each of the questionnaires completed, which documented the visible condition of the farm, the size of the farm, evidence and state of water infrastructure, evidence of property demarcations and so on. Finally, theme-based interviews were conducted with strategic partners as well as several municipal officers, DAFF extension officers, the manager of the Lower Blyde WUA, and the regional manager of Lepelle Northern Water.

The next chapter explains the stakeholder consultation process in detail. Although it is considered part of the methodological approach, it also contains some key findings when presenting the stakeholder profiles. Consequently it is presented separately.

CHAPTER 4: STAKEHOLDER CONSULTATION

4.1 Introduction

This chapter documents preliminary findings of the initial consultative process conducted. The consultative process of the first year of study comprised of semi-structured interviews and a stakeholder workshop; as well as supporting desktop research of secondary sources, and an analysis of primary sources such as key legislation, policy and governmental programme documentation. A sample of government officials from relevant government departments such as the Department of Water & Environment Affairs, the Department of Rural Development and Land Reform, and the Department of Agriculture, Forestry and Fisheries, as well as non-governmental representatives from private consultancies, think-tanks and academia on water and land reforms were consulted.

The consultative process aimed to provide more clarity and practical insights from first-hand experiences on fundamental concepts on which the project is built. The research team first consulted with key policy-makers and the scientific community on their perceptions of the synergies between water use entitlements and land use rights, the level of coordination between water allocation reform programmes and land reform programmes, the degree to which land as well as water use entitlements have been apportioned to emerging and/or subsistence farmers, and the degree to which the individuals concerned working the land have obtained the necessary security and incentives. As such, it asked uncomfortable but important questions that produced divergent responses. These questions, in turn, revealed wide-ranging perspectives on the coordination and effectiveness of the provision of government support, the role of the state in providing, implementing and monitoring support programmes, as well as what it means to be productive. Additionally, it brought to the fore several dualities in participant perceptions relating the prerequisites of productivity including: land tenure security, access to credit, size of irrigation schemes, management structures of these schemes, and the challenges of collective schemes. These preliminary findings have identified key factors and trends that constrain or enhance productive land and water use and ultimately, the productivity of beneficiaries.

4.2 Context

In a World Bank report entitled, *Land Policies for Growth and Poverty Reduction*, Klaus Deininger (2003) argues that property rights, such as land use rights, are social conventions that regulate the distribution of the benefits that accrue from specific uses of a particular piece of land. Water use rights are very similar. These property rights, along with legislation and social and cultural norms, form part of what North (1990) refers to as “institutions” i.e. the humanly devised rules of behaviour that shape human interactions. However, land and water use rights do not only regulate the sharing of benefits, but also provide a discriminatory capability in cases of scarcity (Perret, 2002). In terms of the allocation and use of scarce resources, i.e. when there is insufficient land or water to meet

the objectives of all individuals within a society, discrimination is needed in order to ascertain the extent to which each individual's objectives will be satisfied (Challen, 2000). Land and water use rights therefore define this discrimination in terms of constraints and permissions, and also take into account the consistency, predictability and social acceptability of such discrimination (Perret, 2002). The manner in which these rights are formulated, implemented, secured, traded, communicated and evaluated is therefore critically important to the productive use of said resources.

Land tenure includes a collection of rights namely the right to remain on one's land and the right to use; the right to retain the income earned from the land in ways the individual or groups value; and the right to dispose, by exchanging some or all of these rights (Boudreaux & Sacks, 2009; Huggins & Clover, 2005). This involves a proprietary aspect (the right to 'hold' land) and also a management aspect (Huggins & Clover, 2005). Entitlements to use water as determined in South Africa's National Water Act of 1998 are outlined as follows:

- i. Schedule 1 use – small volumes of water for household use with little potential for negative impacts on the water resource, for which no application for authorisation needs to be made.
- ii. General Authorisations – larger volumes of water which may be generally authorised in any catchment, or for a specific type of water use or category of water user anywhere in the country.
- iii. Existing Lawful Use – which is a water use that lawfully took place in the period two years before the commencement of the National Water Act, and
- iv. Licensed Water Use – water use authorised in terms of a licence issued under the National Water Act, and upon approval of an application by a responsible authority (Republic of South Africa, 1998).

Water allocation reform addresses the last three of these authorisations and aims to replace existing lawful water use entitlements with licences or general authorisations issued under the National Water Act via compulsory licensing.

In line with mainstream literature, an important theoretical assumption on which this project is based is that in order for there to be productive use of water and land, access to these resources must be accompanied by land and water use security. Indeed, several scholars have argued that security of land rights and a clear definition of interests over land are the most important aspects of any tenure system (Backeberg, 2009; Backeberg & Sanewe, 2010; Boudreaux & Sacks, 2009; Deininger, 2003; Green, 2008; Huggins and Clover, 2005). However, the project's assumption was challenged by a multiplicity of divergent perceptions on land ownership.

Since 1994, parallel processes of land and water allocation reform have been underway in South Africa, both with less than satisfactory results. Both land and water allocation reform processes have had re-distributive, socio-economic and social redress objectives. Through these programmes, the South African government intended to make land and water vehicles for rural economic transformation.

The land reform objective, comprising of a three-tiered approach of land restitution, land redistribution and land tenure reform (Hall, 2008), intends to lead to the transfer of approximately 30% of the white-owned commercial farms to 'new' black commercial

farmers by 2014 in an effective and sustainable manner (Cousins and Scoones, 2009). The water allocation reform (WAR) objective, as stipulated under the WAR Strategy of 2008, pledges that by 2014, 30% of allocable water would be to the benefit of black people. By 2024, the target is meant to increase to 60%, of which half should be under control of black women (DWAF, 2008).

However, according to the Department of Rural Development and Land Reform's (DRDLR's) Strategic Plan for 2009-2012, by the end of the 2007/08 financial year the combined programme (Redistribution: 2.7 million ha; Restitution: 2 million ha; and Tenure Reform: 165.773 ha) had achieved: 4.9 million ha. Cumulatively, from 1994 to the second quarter of 2008/09, the National Land Reform Programme had achieved just over 5.1 million hectares of land delivery. This means that from 1994 to 2008, the Programme could, with the resources available to it, only achieve a yearly average output of 0.371 million ha, less than one third of the expected 1.23 million required to meet the 2014 target. More importantly, it has been acknowledged that 90% of land reform projects on redistributed farming land have failed (Pressley, 2010). Similarly, the Department of Water Affairs (DWA) faces an uncomfortable five-year backlog in the issuing of water licenses (Mothlihi, 2001; M'Marete, 2011).

South Africa has therefore failed to live up to its reform objectives. Apart from the usual reasons listed such as governmental capacity constraints to successful implementation and/or lack of sufficient funding to support programmes, Deininger (2003) lists additional key reasons for limited impact – reforms being guided by short-term political objectives, and/or implementation responding more to planners' conceptions than to the needs of beneficiaries, producing limitations to the reforms' sustainability and their impact on poverty reduction (Deininger, 2003). These points speak very directly to the purpose of the stakeholder consultation process conducted in this project, namely, to uncover the wide-range of scientific evidence-based, as well as non-scientific evidence-based perspectives contributing to the management of reform programmes and the formulation of policy. Reform programmes, and evaluating the success thereof, will always be challenging because people have very visceral reactions when discussing land ownership (Boudreaux & Sacks, 2009). These reactions very often spur on conflicts between different stakeholders and decision-makers who may have contrasting views on sensitive issues such as land ownership, the productivity of black “emerging” farmers, and land reform. It is only through the acknowledgement of a diverse multi-actor landscape and consequent diverging interests and perceptions that we are able to come to terms with the existence of multiple social and cultural norms that shape the property rights landscape. Indeed, as de Soto (2000) explains, property rights are not only concerned with the assets themselves, but also involve consensus between people about how these assets should be held, used, and exchanged.

4.3 Methods being followed for stakeholder consultation

4.3.1 Approach

The consultative process adopted a multi-method approach based on participatory engagement. The significance of participatory engagement for this project is threefold.

Firstly, it provided insights into the wide-ranging perceptions and misperceptions shared by governmental decision-makers and non-governmental stakeholders, and how these perceptions influence policies, strategies and programmes. Secondly, participant engagement provided direction to key research questions formulated in the terms of reference, and emphasised the importance of building participatory engagement processes into the project design from the onset as opposed to having stakeholder involvement as a mere positive by-product of the project. These findings also provided valuable insights into the identification of suitable study sites in which research will be carried out. Thirdly, participatory engagement, particularly from the start of any project improves the likelihood that findings remain relevant to those who could benefit from them the most i.e. beneficiaries of land and water allocation reform, and that these findings find their way into policy formulation. This approach produces holistic and integrated findings, and sketches the social complexity of the issue at hand – multiple understandings of water use entitlements and land use rights in helping or hindering beneficiary productivity.

4.3.2 Research methods used

A variety of methods were employed, including a literature review, desktop research of primary and secondary sources that focused on the review of land and water policy reform processes, and 13 semi-structured interviews. The purpose of the stakeholder engagement process was to seek inputs from first-hand experiences on aspects of the land reform and water allocation reform programmes, the challenges of the provision of government support to beneficiaries of these programmes, the degree to which programmes are coordinated, monitored and reviewed, and governmental department priorities in achieving national objectives. Open-ended interview guides were developed to facilitate this process.

Semi-structured and theme-based interviews were conducted with:

- i. Top and middle-ranking government officials from the departments of Water Affairs; Agriculture, Forestry and Fisheries; as well as Rural Development and Land Reform, at both the national and provincial level.
- ii. Water, land and agricultural experts and researchers from academia, and practitioners working in the scientific community.
- iii. NGO representatives.

Interviews are one of the most widely used methods for data collection in qualitative research. Interviews are a good way of accessing people's perceptions, assigned meanings, and definitions of situations and constructions of reality. Semi-structured interviews are based on a clear plan, but also characterised by a minimum of control over the informants' responses (Legard et al., 2003). This report presents wide-ranging views of this target group on aspects of the water allocation reform and various land reform programmes, and examines the dualities in understandings and misunderstandings, perceptions and misperceptions, interpretations and misinterpretations of the coordination of water use entitlements and land use rights.

The interview process was followed by a stakeholder workshop comprising of 13 stakeholders from government and academia. Stakeholder workshops are a useful way of gaining insightful information from a group of people in a short time. As such, key findings

from the interview process were presented to this group to confirm, reject or obtain more clarity on these preliminary views.

4.4 Interview process

4.4.1 Governmental Departments and Directorates Represented

The interview process targeted officials from the Department of Rural Development and Land Reform (DRDLR), the Department of Agriculture, Forestry and Fisheries (DAFF) and the Department of Water Affairs (DWA).

4.4.1.1 The Department of Rural Development and Land Reform (DRDLR)

The Department of Rural Development and Land Reform (formerly the Department of Land Affairs) is working towards realising its vision of “vibrant, equitable and sustainable rural communities”. The Department focuses on agrarian transformation, which entails “the rapid and fundamental change in the relations (systems and patterns of ownership and control) of land, livestock, cropping and community”. It therefore wants to achieve sustainable rural development and livelihoods as well as successful land reform (DRDLR, 2011).

Within DRDLR the project team interviewed individuals who directly deal with land and tenure reform, as well as policy research and development. The Directorate of Tenure Systems Reform is the custodian of the Communal Property Associations Act (CPAA), and awards title deeds. Importantly, several categories of land ownership exist. These are private land, legal entities (co-operatives, companies, CPAs, trusts, syndicates) and state land (public works, buildings). The Directorate faces a number of challenges in administering the CPAA. These include Community Property Associations not fulfilling their rights and obligations, a lack of support for people who have been given land, non-compliance with the CPAA and beneficiaries sometimes selling the land they have acquired from the government (Gumbi, 2011).

The newly established Land Acquisition and Warehousing Directorate sets up systems and procedures on how beneficiaries can acquire land, while the provinces implement these systems. District Screening Committees (which can have representatives from different sectors but are organised by the DRDLR district offices) consider applications for land initially. They then make recommendations to the Provincial Grants Committee (organised by DRDLR at the provincial level). This Grants Committee advises the DDG of Land Reform, who makes the final decision on whether land is to be awarded to the applicant (Mahlangu, 2011). The purpose of the restructuring exercise and the formation of the new Strategic Land Intervention Chief Directorate is to recapitalise the land reform projects that have failed in the past (Mahlangu, 2011).

The Policy Research and Legislation Development Directorate does policy research and development and drafts legislation in terms of the core mandate of DRDLR. The trend seems to be moving away from government transferring ownership of land to beneficiaries to leasehold systems for beneficiaries. While there is opposition to the leasehold system, the Directorate believes that this system has potential and that beneficiaries will still have access to loans from the Land Bank, regardless of whether or not they own the land they reside on (Govender van Wyk, 2011).

4.4.1.2 The Department of Agriculture, Forestry and Fisheries (DAFF)

The Department of Agriculture, Forestry and Fisheries (DAFF) wants to create a “leading, dynamic, united, prosperous and people-centred sector” with a particular focus on economic growth and development, job creation, rural development, sustainable use of natural resources and food security (DAFF. 2011).

Within DAFF, the project team interviewed staff from the Directorate of Land Settlement and Water Use and Irrigation. The Land Settlement Directorate facilitates land reform processes, policies and projects. The Project Implementation Support Sub-directorate specifically oversees the implementation of the Department's Comprehensive Agricultural Support Programme (CASP). The Department experiences challenges in terms of capacity (there is a lack of agricultural extensions officers), and the fact that its budget for support for emerging farmers is not in sync with that of DRDLR. Other challenges include farmers not being able to spend the money allocated to them by DAFF due to the complicated government procurement process, water rights not always being awarded together with land rights and emerging farmers selling off the land which government has given them (Mpangane, 2011).

The Land Administration Sub-directorate is responsible for the disposal of state agricultural land. In particular, land that was once acquired through the Agricultural Credit Board and has been repossessed is re-issued to successful applicants. Infrastructural and other support is given independently of CASP, and monitoring takes place on a monthly basis. Productivity is measured on a crop-by-crop basis based on commercial principles.

The Directorate of Water Use and Irrigation Development looks at three areas: the revitalisation of irrigation schemes, water management and the establishment of new irrigation schemes. Strong relations exist with the provincial departments to carry out the mandate of the Directorate. Water use related challenges include the current backlog in water use licensing that exists, farmers not having enough money to pay for water costs, a lack of availability of water for irrigation and farmers using water while they do not yet have a water use license and being fined as a result (Mofukeng, 2011).

4.4.1.3 Department of Water Affairs (DWA)

Officials from DWA's Chief Directorate of Water Use were consulted in order to obtain insights on water use authorisation processes and progress on compulsory licences. Within DWA, a pertinent support programme for this study includes the financial assistance provided to resource-poor farmers. In 2009/2010, DWA provided support to 360 poorly resourced farmers, ranging from bulk water distribution infrastructure for irrigation to subsidising operation and maintenance payments billed by water users associations (DWA, 2010). Furthermore, about 2 544 water tanks were provided to 500 households as part of the contribution to both the Comprehensive Rural Development Programme and War on Poverty Campaign (DWA, 2010). However, there was very little awareness of this support programme by officials at the DRDLR and DAFF, and this was also not coordinated with support programmes in other departments (Mothlihi, 2011; M'Marete, 2011).

4.4.2 Key legislation, support programmes and initiatives

4.4.2.1 Comprehensive Agricultural Support Programme (CASP)

The Comprehensive Agricultural Support Programme (CASP) (2003) is the biggest sub-programme at the provincial level in all provinces except Gauteng and the North West Province (Greenberg, 2010). CASP is designed to help black farmers to participate in a market that is dominated by white agri-business, but without altering the logic of the market or production system. The money that is awarded as part of CASP is used mainly for infrastructural development i.e. warehouses, access roads, irrigation systems. Money is also spent on training and capacity building and marketing. Farmers apply on a yearly basis and grants are awarded for a five year period (Mpangane, 2011).

DAFF monitors the success of impact of CASP by checking whether the infrastructure that has been promised has been completed, and whether farmers are using it for the right purpose. No impact assessment studies have however been conducted to establish the success of CASP (Mpangane, 2011). When the former Department of Agriculture and the former Department of Land Affairs fell under one minister, it was easier to ensure that the land reform financial support programmes of both departments were coordinated. This has become more difficult now that the two competencies are no longer governed by the same minister (Govender van Wyk, 2011).

To date, the success of implementation of the CASP programme has been uneven, although most provincial farmer support programmes have been expanded (Greenberg, 2010). It appears that currently CASP needs between three and four times its current budget in order to function effectively. Other difficulties include farmers not being aware of the different funding options they qualify for, the complicated nature of the government procurement process and the non-alignment of funding between different government

departments (Govender van Wyk, 2011). In addition, it can take a number of years for a CASP application to be successful. This is problematic for new beneficiaries who want to start farming immediately and cannot wait years for financial support to set up infrastructure, etc. (Raholane, 2011; Baloyi, 2011).

4.4.2.2 Land and Agrarian Reform Programme and Comprehensive Rural Development Programme

The government has attempted to integrate the CASP (the agricultural support programme) with the Land Redistribution for Agricultural Development (LRAD) programme (which focuses primarily on land reform) in the form of the Land and Agrarian Reform Programme (LARP), which was established in 2008 (Greenberg, 2010). The LARP is meant to offer collaboration on delivery and collaboration on land reform and agricultural support “to accelerate the rate and sustainability of transformation through aligned and joint action all involved stakeholders”. The idea is to have “one stop shop” service centres in close proximity to farms and beneficiaries (LARP, 2008). Implementation of the LARPD has been slow and to date there is little evidence of any significant change in practice (Greenberg, 2010).

A subsequent attempt by the South African government to integrate agricultural support, land reform and broader rural development without putting more money into rural areas has been the Comprehensive Rural Development Programme (CRPD). The programme aims to achieve “co-ordinated and integrated broad-based agrarian transformation, an improved land reform programme and strategic investments in economic and social infrastructure in rural areas” (CRDP, 2011). It is likely that this programme will run into difficulties as it relies on the weak institutions of the former Department of Land Affairs (which now is the Department of Rural Development and Land Reform with a bigger mandate but not a bigger budget). It also appears that the approach to planning and implementation is rushed with a focus on immediate delivery at all costs. The consequences of this approach are poor quality and lack of sustainability. Policy-making continues to be dominated by agri-business, which exerts a strong influence on the agricultural sector (Greenberg, 2010).

4.4.2.3 Pro-active Land Acquisition Strategy (PLAS)

An important component of revising the land reform programme has been the Pro-active Land Acquisition Strategy (PLAS). This programme currently involves approximately 1000 farmers. As part of the programme, land is leased out to beneficiaries for a trial period of three to five years during which they have to prove that they can productively use the land for agricultural purposes. This has occurred since April 2010. Beneficiaries have complained that this programme sets them up to fail and that the absence of a title deed makes it impossible for them to get financial assistance from banks. A reference group has been formed to further investigate the matter. It is still to be decided whether beneficiaries will eventually be able to own the land that is leased to them (Gumbi, 2011).

As part of PLAS, grants to the value of 25% of the value of the land are to be awarded. This award will be once-off for now, but it is planned that in future it will be invested over a period of five years. This will take the form of a pyramid scheme with most of the money being awarded in Year One, and then less and less with farmers co-investing more of their own money over the next five years. The idea is not to give aid to the emerging farmers/beneficiaries but to teach them to farm on their own (Mahlangu, 2011).

In addition, to aid emerging farmers, it is planned that they will team up with strategic partners, namely established commercial farmers, who will share in the profits and risks of the new enterprises. This partnership is regulated by means of an agreement between the strategic partner (farmer), the beneficiaries and the DRDLR (Mahlangu, 2011). Strategic partners are supposed to oversee activities on farms, ensure that the sowing and harvesting happens when it is supposed to, repair infrastructure, ensure that water allocations are paid for, etc. The problem with this approach is that it engenders an over-reliance of beneficiaries on the strategic partner, as the partners often take over the management of the farm completely and also often leave the farming operation after their five-year contract has expired. This leaves the beneficiary with little new knowledge of how to manage a farm and also deprives them of the independence of managing the farming operation on their own (Mofukeng, 2011).

4.4.2.4 Recapitalisation and Development Programme (RADP)

In response to the implementation challenges of CASP as well as the Settlement and Implementation Support (SIS) Programme, the DRDLR have introduced the RADP to address programmatic weaknesses. The RADP applies to all emerging farmers needing support and future land transactions, and aims to ensure increased production and food security; to graduate smallholders into commercial farmers; to create employment opportunities in the agricultural sector; to promote capacity building through training and mentorship; and to establish rural development rangers (DRDLR, 2010). The programme is to be sustained by the Recapitalisation and Development Fund (RDF), created from 25% of the baseline land reform budget per annum (DRDLR, 2010), and replaces the following land reform grants:

- i. The 25% PLAS Operational Budget
- ii. The 25% Household Development Grant
- iii. The 25% Restitution Development Grant
- iv. The Restitution Settlement Grant
- v. Commonage Infrastructure Grant

Additionally, it places an emphasis on compliance to strict monitoring criteria. In this regard, it “will issue stringent conditions for those who qualify to benefit from it so as to avoid creating a culture of entitlement from unscrupulous individuals who are in it, for personal gain (DRDLR, 2010: 4).

4.4.3 Key themes arising from interview process

Several key themes arose from the interview process. While participants shared De Lange's (2002) opinion on generally accepted factors that affect emerging farmer productivity, they held wide-ranging perspectives on issues of ownership, time needed to observe the impact of programmes, and what criteria is needed to measure success. Generally accepted factors affecting emerging farmer productivity include:

- Knowing what to do (knowledge and planning) i.e. knowledge of crop production or irrigation.
- Being able to do it (skills) i.e. effective water management.
- Access to the means of production (land, infrastructure and equipment).
- Production inputs such as water supply, seed, fertilizers, compost, manure and chemicals.
- Access to markets.
- Being able to earn sufficient income through profitable production such that it makes substantial and essential contribution to their livelihoods.
- Having voice in determining policy issues that affects them directly (lobbying) (De Lange et al., 2004).

4.4.3.1 A changing priority: From social redress to socio-economic development

Several participants, both governmental and non-governmental, expressed the perception that South Africa is ushering in a "new wave of reform" arguing that government's reform paradigm has shifted from one that was geared primarily to achieving social redress, to one that now also has a very strong focus on productive use of land and water (Gumbi, 2011; Govender Van Wyk, 2011; Magada, 2011). Participants who shared this view explained that when the focus of reform programmes and accompanying support programmes, in their earlier stages, was on social redress, less emphasis was placed on careful attention to socio-economic sustainability of programmes and beneficiaries. This has led to a "number crunch" exercise of reaching the 2014 water and land reform targets, with extensive land being apportioned (due to DRDLR's extensive reform budget in contrast with DAFF's comparatively smaller budget to provide support mechanisms) but less support mechanisms available to withstand the demand for support. For example, an official in the DRDLR's Directorate of Land Acquisition and Warehousing explained that the success of land reform was previously measured according to how many hectares had been transferred (Mahlangu, 2011). However, reviews were conducted and most land reform projects turned out to be dysfunctional. The DRDLR's new chief directorate (Strategic Land Intervention) will now look at recapitalising failed projects. Grants to the value of 25% of the value of the land are to be awarded. This award will be once-off in the interim, but in future it will be invested over a period of five years. This will take the form of a pyramid scheme with most of the grant being awarded in the first year, and decreasing gradually, with farmers co-investing more each year over the subsequent five-year period (Mahlangu, 2011). Participants acknowledged departmental objectives to review such programmes through impact assessments and recapitalisation programmes. However, to date, support programmes such as CASP have still not been reviewed since its inception (Mpangane, 2011).

4.4.3.2 Reform backlog

All of South Africa's target-based reform programmes are currently faced with extensive backlogs. For example, the target set for the issuing of water licences to historically disadvantaged individuals (HDIs) was not achieved due to capacity constraints within DWA (DWA, 2010). Similarly, both the restitution and redistribution programmes are not expected to reach their targets. The cut-off date for restitution was supposed to be in 2005, but an extension was granted. Currently 4000 claims are still outstanding. Additionally, officials within DRDLR also expressed concern about the sustainability of past reform programmes (Gumbi, 2011; Govender Van Wyk, 2011).

4.4.3.3 Multiplicity of property rights arrangements

The multiplicity of land reform programmes (restitution, redistribution, tenure) has resulted in a wide range of collective entities or Communal Property Institutions (CPIs), namely Communal Property Associations (CPAs), Trusts, and Commonages, etc., and in several property rights arrangements, ranging from short-term (three-year) lease agreements, to full title deeds. According to several officials from DRDLR, full title deeds have supposedly been handed over in all major programmes except under the revised PLAS, which is a three-year leasehold agreement (Gumbi, 2011; Magada, 2011). However, whether this has happened in reality or not received mixed participant responses. The 4000 restitution claims still outstanding is noteworthy (Gumbi, 2011). Farmers who have expressed dissatisfaction with the PLAS programme have argued that a three-year lease agreement is insufficient time to see particular crops to harvest i.e. citrus, or to get the full value out of infrastructural developments or expensive equipment. Government officials have argued that a three-year lease agreement aims to curb free-riding, reduce dependency, and provides government with a more manageable timeframe for measuring impact/productivity of such farms (Govender Van Wyk, 2011; Gumbi, 2011).

It should be noted that the CLARA was introduced to engage above-mentioned challenges, but was unconstitutional because of discrimination against women. There is currently no single cohesive piece of legislation that covers the range of different interpretations of property rights in South Africa.

4.4.3.4 Reconciling multiple perspectives on productivity

Several key issues relating to productivity also presented wide-ranging responses. The first and most controversial related to tenure security and specifically ownership of land. Participants used the term 'security of tenure' loosely. To some it meant security of housing or land ownership. To others, it meant security of income or employment, or greater fairness in the distribution of land or wealth. This report adopts Roth's (2004) three-tiered definition to be used in the analysis of responses:

- Breadth of rights (including use, transfer and exclusion rights);
- Duration (length of time these rights are held); and
- Assurance (certainty of rights).

Using this definition, secure land ownership may therefore be conceptualised as comprising a full set of transfer and use rights, being able to enforce those rights against the claims of others, having ownership over a suitably long period of time to recoup the benefits of labour and capital invested in the land, as well as having assurance that these benefits can be obtained with minimal risk of loss (Roth, 2004).

The debate of whether or not land tenure security should be considered a prerequisite for improved productivity relates to an on-going debate of whether customary African land tenure must be reformed or converted to a statutory, individualised land tenure system (often referred to as a 'titled' system) as a pre-requisite to agricultural development. Arguments in favour of titling claim that traditional tenure is insecure for the smallholder and thus creates disincentives for land improvements; that it prevents land from being used as collateral for credit; and that it prevents the transfer of land from inefficient users to efficient ones. Counter-arguments point out that farmers under customary tenure usually have durable usufruct rights, that credit is often inaccessible even where titles exist, and that informal land markets operate to make land available to efficient users (whereas formal land markets are sometimes seen to have the opposite effect).

4.4.3.5 Land tenure security is a prerequisite for improved productivity

Participants who argued for land tenure security cited the 'tripartite argument' of tenure security's positive effects on agriculture i.e. the incentive to improve land, greater access to credit, and efficient land markets (Baloyi, 2011; Mofukeng, 2011; Raholane, 2011). The duration of property rights was emphasised as particularly important, as landholders will not invest in their land if they are unsure of whether or not they will benefit from these investments. These views are shared by Deininger (2003), who argues that ideally, there should be no temporal limit to property rights. Rather, the owner should hold the land at his or her discretion (Deininger, 2003). However, in cases where governments are unwilling to cede their ownership of land absolutely, long-term leases should be established with a sound commitment from government to protect leasehold rights in an impartial manner (Deininger, 2003).

Participants also shared the view that though improvements to technology and training are important components of any drive to increase agricultural productivity, land tenure reform is a necessary, but not sufficient, requirement in any *long-term* agricultural development plan (although not necessarily in the short-term). It is true that improvements to land tenure security will help raise agricultural productivity by providing farmers with the peace of mind to invest in land with certainty that they will reap the long term gains of such investment (Boudreaux & Sacks, 2009). However, it needs to be emphasised that security of tenure alone is not sufficient to increase the productive use of land in the long term. Once the ownership of the land has been secured, financial capital, management and later, entrepreneurial skills are required in order to utilise land productively. However,

this hierarchy of requirements differs according to the type of value chain in which the land owner is currently operating and it is often the case that not all requirements need to be met (depending on the objectives of the farmer). Last mentioned implies different interpretations of “productive land use” and this project will provide more information in this regard.

Box 1: Examples of rights (FAO, 2002)

- A right to use land.
- A right to prevent unauthorised people from using the land.
- A right to control how land will be used.
- A right to derive income from the land.
- A right to be protected from illegal expropriation of the land.
- A right to pass on the land use rights to one’s successors, (i.e., a right held by descendants to inherit the land).
- A right to alienate all rights to the entire holding (e.g., through sale), or to a portion of the holding (e.g., by subdividing it).
- A right to alienate only a portion of the rights, e.g., through a lease.
- A residuary right to the land, i.e., when partially alienated rights lapse (such as when a lease expires), those rights revert to the person who alienated them.
- A right to enjoy the property rights for an indeterminate length of time, i.e., rights might not terminate at a specific date but can last in perpetuity.
- A duty not to use the land in a way that is harmful to other members of society, (i.e., the right is held by those who do not hold the right to use the land).
- A duty to surrender the rights to the land when they are taken away through a lawful action, (e.g., in a case of insolvency where the right is held by the creditors, or in the case of default on tax payments where the right is held by the state).

Participants also explained that because property rights in South Africa are not clarified, and only partially enforced, legal and practical security of owners and users remain limited, which in turn negatively impacts on the effectiveness of land markets to efficiently transfer property, and reduces incentives to invest in land – a view also articulated by Wily (2003).

4.4.3.6 Observed arguments that land tenure security (full ownership) alone DOES NOT improve emerging farmer productivity

Several participants including high-ranking government officials, a cane producer association representative and also academics and practitioners, shared the opinion that land ownership does not necessarily lead to improved productivity (De Lange, 2011; Govender Van Wyk, 2011; Gumbi, 2011; Magada, 2011; Mpangane, 2011; Saruchera, 2011). Several participants cited examples of the apparent under-utilisation of farmland in highly productive and commercialised areas, and attributed this failure to problems of technical knowledge and input supply being more urgent in the short term than access to land and tenure security (Gumbi, 2011; Saruchera, 2011).

In contrast, some governmental but also non-governmental participants cited several examples of emerging farmers who have very successful farms, and operate under drip irrigation on communal land, with no security of tenure but who can still boast highly successful yields (De Lange, 2011; Magada, 2011). One participant commented that “It’s interesting that in recent years the recipient of the Farmer of the Year Award, very rarely owns the land” (Magada, 2011).

In terms of the origin of such views, it is suspected that governmental perspectives sharing this view have originated in part from past experiences in reform programmes that have issued full title deeds but have seen more negative results than positive in terms of improved productivity. In this regard, it has led many to believe that land ownership does not produce more productive farms. Certainly a distinction must be made here between full ownership and land tenure security. According to some government officials, the DRDLR is looking into longer-term leases that take into consideration the length of the production cycle (Govender Van Wyk, 2011). This is arguably also a form of tenure security.

Additionally, these alternative views, when shared by governmental officials, helped to justify the existence of leasehold programmes such as PLAS or the approach to take corrective action in the Recapitalisation Programme, to curb the free-rider problem that has plagued land reform programmes where title deeds have been handed out but little productive activity actually being conducted.

Non-governmental participants who shared this perspective, expressed more complex responses. According to several participants, the argument that full security in the long-term can only arise when there is full private ownership (e.g. freehold) is questionable. Some participants cautioned that land tenure reform, even if fully implemented, does not necessarily, and by itself, guarantee increases in agricultural productivity or access to capital (via credit), particularly in the short run. In a similar manner, the FAO report on Land Tenure and Rural Development (2002) states that equating security with transfer rights to sell and mortgage may be true for only some parts of the world. Particularly in parts of the world where strong community-based tenure regimes exist, farmers may enjoy tenure security without wishing to sell their land, or without having the right to do so, or having strictly limited rights to transfer (e.g. transfers may be limited to heirs through inheritance, or sales may be restricted to members of the community) (FAO, 2002).

These wide-ranging perspectives illustrate the need to understand the widespread perspectives that exist in the multi-actor landscape that shape land and water allocation reform processes and influence behaviour. As previously indicated, land and water allocation reform is rarely based on scientific evidence but rather on an emotive or social objective. People have very visceral reactions when discussing land ownership, and the major challenge would be to reconcile or balance these contrasting perspectives, interests and reactions. Additionally, it is necessary to analyse how various perceptions influence policies, strategies and programmes. It is also important to understand from where these perspectives draw their legitimacy. Roth (2004) argues that it is essential to understand the role of trust and trust-building between individuals and groups that give land and water use rights their weight and meaning. Security of tenure is the certainty (or faith) that a person’s

rights to land will be recognised by others and protected in cases of specific challenges (FAO, 2002). This emphasises the role of trust in, for example, enabling a landholder in customary areas to rent out land to another individual because he/she trusts that the tenant will return the land with assurance at the end of the lease period (Roth, 2004). In cases where trust does not exist, or where it has been broken down, there is a need for a strong authoritative mechanism to enforce and protect these agreed upon rights. Formal administration of land and water use rights are beneficial because they lead to increased tenure security and improved access to credit, thereby providing the incentive and ability for farmers to invest in making improvements to the land (FAO, 2002). Formal administration is also regarded as a means to facilitate a land market, allowing land to move towards its “highest and best use” (FAO, 2002).

4.4.3.7 Secure access to credit or abundance of credit options?

The inability to offer land as collateral for obtaining credit is the typical reason cited for why lack of land ownership is a disadvantage to obtaining access to credit. Shah et al. (2002) argue that although banks agree in principle to provide loans, farmers are not always provided with credit because they do not have legal claim to their lands. Banks are often unwilling to accept other forms of loan guarantees (Shah et al., 2002). However, several participants pointed out that the insecurity of access to credit due to a lack of land ownership is no longer a strong causal factor in determining emerging farmer productivity due to the development of so many credit products that have come onto the market recently (De Lange, 2011; Govender Van Wyk, 2011). Land banks will accept the leasehold if it is a registered leasehold. Additionally, the DRDLR have committed to providing support in this regard, but will enter into a ‘social contract’ with beneficiaries, where conditions will be put in place (Govender Van Wyk, 2011).

4.4.3.8 Farm size and diversification

Interview participants also expressed a range of opinions on the most appropriate irrigated holding size and whether specialisation or diversification has led to improved productivity. The ideal situation, and indeed, the objective pushed through several support programmes is where full-time farmers derive a substantial proportion of their livelihoods from irrigated farming (Shah et al., 2002). This objective assumes that because of their vested interest to self-manage; smallholders will invest more time and resources into farming practices. However, participants with extensive field experience confirmed the occurrence of what has been referred to as the “hedgehog strategy” in literature (Chambers, 1983) i.e. the dependency on a variety of sources to earn a livelihood i.e. collecting firewood and selling it, small crop production, renting out land for various uses, etc. (Baloyi, 2011; Saruchera, 2011). The inability to depend upon irrigated farming for a substantial proportion of their livelihood needs therefore changes the incentives and behaviour of such individuals (Shah et al., 2002). Men often seek urban jobs while women cultivate the plots (Shah et al., 2002). According to several accounts, the smaller the plot, the stronger this tendency becomes (Mpahlele et al., 1999). Interview participants confirmed instances in selected case study

areas where very little “productive” activity actually takes place, and land is kept only in so far as it provides food security (Saruchera, 2011). In this case, little incentive is provided for individuals to invest resources and time into agricultural activities that clash with other livelihood options (Shah et al., 2002).

4.4.3.9 Challenges within community property institutions (CPIs) and strategic partnerships

Participants alluded to the numerous challenges of collective schemes, particularly the arbitrary manner in which many of them have been set up (clustering individual farmers together that had no previous history of working together, and where blocks were restructured to be managed as one entity. This results in a reduction of individual farmer autonomy) (Gumbi, 2011; Magada, 2011; Mofukeng, 2011).

Other social challenges include conflicts involving members of Community Property Institutions (CPIs) and AmaKhosi, internal conflicts involving CPIs and members of claimant communities where there is lack of accountability from Trusts who are supposed to report regularly to communities; as well as tensions between labour tenants and restitution beneficiaries.

Additionally, government officials from both DRDLR as well as DAFF have both acknowledged that government has still not arrived at a successful strategic partnership on irrigation schemes that work (Govender Van Wyk, 2011; Gumbi, 2011; Mofukeng, 2011; Mpangane, 2011).

Several studies conducted of joint management of irrigation schemes have cited different models of irrigation development (Brown & Nooter, 1992; Shah et al., 2002). In the Sahel, Brown and Nooter (1992) conducted a study for the World Bank, and found that most successful irrigation in Africa has been done by private individuals. These include ‘estate-type’ farming that comprises of a manager and is run like a company. Alternatively, all individual farmers on the estate are fully autonomous, and extension officers are employed to decide on technical matters such as how much pesticide will be sprayed and so forth (De Lange, 2011). In line with this thinking, interview participants argued that the management of irrigation schemes requires a decision-maker to make operational decisions that require immediate attention i.e. if a pump breaks (De Lange, 2011). This view contrasts with the challenges that strategic partnerships are faced with. A DAFF official described the resulting contentions relating to the disempowerment of small-scale farmers when strategic partners are co-opted to provide technical guidance (Mofukeng, 2011). In some instances, strategic partners restructured land use patterns on smaller plots and implemented a monoculture. Individual farmers became labourers on their own farms and in some cases, even became redundant as their technical assistance was no longer needed (Mofukeng, 2011). The term “glorified armchair farmers” was used to describe individuals who wait for collective dividends to be paid out (Mofukeng, 2011).

Management models based on both strategic partnerships and joint/communal management therefore present their own unique challenges that need to be assessed on a case-by-case basis. International experience has proven that while collective arrangements can be appropriate, these should not be made a permanent institutional feature within reform, and the rights and responsibilities of individuals must be clearly spelt out when the project is structured as a collective (FAO, 2009).

4.5 Stakeholder workshop

The stakeholder workshop brought together a small group of representatives from government and academia to confirm, reject and/or obtain more clarity on the project's preliminary findings of the interviews conducted, as well as research conducted on several governmental support programmes relating to land and water reform. Main findings were presented in a short presentation, and thereafter, small group discussions were facilitated to grapple with emerging issues. The workshop was therefore not designed to point fingers at the inadequacies of government programmes and policies, etc. Rather, it provided participants with a chance to collectively brainstorm some of the common challenges faced by governmental departments of support programmes, evaluate the role of the state in the provision of support in helping or hindering the productivity of beneficiary farmers, and to provide further insights on government priorities.

The workshop aimed to provide participants with a chance to review the myriad of social, cultural, institutional, economic and political variables influencing water allocation reform and land reform programmes and projects, with particular reference to apportionment and/or transfer of water use entitlements in relation to land use rights.

The workshop therefore aimed to unpack the factors that encourage individuals to become emerging farmers and their challenges. Additionally, it aimed:

- To bring together stakeholders to explore the role of water in the productivity of beneficiaries of land reform and/or water allocation reform and programmes in South Africa;
- To debate preliminary findings of a study of the degree to which water use entitlements have been apportioned to beneficiaries of land reform programmes, and discuss emerging issues;
- To explore the complex coordination challenges of these programmes.
- To review the role of the state and other actors in terms of the provision of support, security and incentives for emerging farmers, and the monitoring and regulatory capacity of the state.
- To review the myriad of social, cultural, institutional, economic and political variables influencing reform programmes and projects, with particular reference to apportionment and/or transfer of water use entitlements in relation to land use rights.
- To unpack the factors that encourages individuals to become emerging farmers and their challenges.

The workshop consisted of facilitated group-work exercise which assisted participants in pulling together ideas related to the overall theme of the workshop. The group-work exercise was divided into two main tasks: an individual brainstorming and mapping exercise, followed by a group discussion on a specific question or bundle of questions. Firstly, the individual brainstorming and mapping exercise tasked participants to jot down immediate short-hand responses to four broad questions on separate pieces of paper. Responses to these questions were then pasted on four wall maps. The four broad question topics are listed below.

Following the individual exercise, participants were then divided into four groups, each charged with one of the four broad questions. Each group had to cluster the mapped responses into main themes and discuss why these themes emerged. Secondly, they were asked to discuss how their specific question could best be addressed or explored. And finally, they discussed what the implications could be should it be addressed in the manner they proposed. Each group's findings and discussion are summarised below.

Question 1: What are the multiple perspective of "productivity of emerging farmers" and the associated challenges.

Three main themes emerged:

i. Multiple definitions of productivity

➤ *Farmers perspective*

- No agreed upon or single definition of productivity.
- Differing objectives – farmers' views of productivity may not be to become commercialised but rather to feed their families, for status, or to obtain power in the community.
- (Mis)perception that productivity on redistributed or restituted land should be the same as the level of productivity on "white-owned" commercial land.
- Increased yields per unit of land.
- Income generation.
- Produce for the market (i.e. to sell produce)
- Access to formal markets.
- Viability and sustainability of the farm.

➤ *Government's perspective*

- Limited to household food security.
- Priority is to bring farmers into the core economy.
- Mixed perspectives on the productivity of emerging farmers.
- Productivity according to government's perspective is the amount of surplus that a farmer can provide to the market. The focus is on achieving greater market access as well as surplus to the market.
- Farmers are productive if they participate in the economy and contribute to job creation.
- Full utilisation of allocated land.
- Acceptable quality produce which is suitable for the market.
- Should not be dependent on government but should be able to produce optimally.
- Taking part in the value chain and not just farming – emphasis on the notion of value addition.

➤ *Private sector's perspective*

- Focus is on marketing of the harvest/inputs.
- Producing for markets.

ii. Measuring productivity

- An array of methods, assumptions and approaches used to measure productivity.
- Lack of governmental capacity to monitor productivity.

iii. Challenges to productivity

- Inadequate support
- Lack of farming and business skills and training
- No selection criteria of farmers
- Lack of access to credit
- Lack of access to markets
- Lack of access to inputs
- *Addressing the challenges*
 - Coordinated support from stakeholders or government
 - Reviewed selection criteria
 - Feasible or implementable business plan

There were a number of key points that emerged from this group's reflections. Firstly, it was widely recognised that a multiplicity of understandings exist of what it means to be productive, with different sectors, governmental departments and support programmes using differing definitions. The multiplicity of definitions not only resulted from the tendency of governmental departments and sectors to work in 'silos' without much integration unless on a needs basis, but also due to the existence of diverse food value chains, all with different requirements regarding these concepts. Secondly, the term 'emerging farmer' was also debated, and whether this was an appropriate use of the type of farmer it depicts. A range of perspectives were expressed on who classifies as an 'emerging farmer.'

Multiple challenges to achieving productivity also exist, from social to technical, and there is a need to prioritise these different challenges. These challenges could best be addressed by examining the range of existing definitions of productivity. It is also important to identify the similarities and differences between these definitions, and carefully analyse the implications of this multiplicity. Most importantly however, is the degree to which the multiplicity of definitions and understandings on productivity impact beneficiaries of land and water reform.

Question 2: What are the challenges influencing the effectiveness of the apportionment of water use entitlements in relation to land use rights?

Five main themes emerged in this discussion:

i. Process and implementation challenges

- These include all bureaucratic processes for a farmer to follow before he/she could obtain rights e.g. DAFF requires BEE compliance for all tenders before it can provide support under CASP. The inability of programmes to identify suitable companies to carry out tenders creates unnecessary delays.
- Lack of implementation-oriented rules and procedures, or the inability to communicate these rules to all levels of government and to beneficiaries.
- Rolling out of government support fails to screen potential farmers.
- Indirect implications also present challenges, e.g. the provision of support for infrastructural development drives the property value up and provides an incentive for beneficiaries to sell the allocated land.
- Insufficient monitoring of programmes.

- Water use entitlements are dependent on successful establishment of CMA's.
- Commissions that decide on redistribution of land also require the inputs of DWA officials.

ii. Collaboration or coordination challenges

- Support programmes exist individually and operate in silos, leading to weak coordination that is need-based.
- The Recapitalisation Programme needs to take water into account too.
- Separation of land use rights and water rights.

iii. Design of the support

- So many support programmes in place but they are not working together.
- Financial "support to support programmes" is unevenly distributed i.e. budgets are not synchronised.
- Limited funds from government to provide for ALL farmers.

iv. Inconsistent timeframes

- Farming is time determined, therefore application for water allocation takes long before farmers receive it and this affects crop production.
- Water allocation reform is too slow with a five-year backlog, and should be shortened.
- Allocation of funds is oftentimes delayed.
- Water use entitlements are not allocated when farmland is allocated to beneficiaries.

v. Understanding/knowledge/access to information

- Access to information, training and skills
- Beneficiaries often do not know their rights in terms of land and water i.e. a lack of clarity about rights and licensing legislation.
- Beneficiaries of land reform may not understand water allocation reform processes.
- Lack of awareness of precise water use needs by beneficiaries.

As indicated, the main challenges of the provision of governmental support relates to process, procedural, coordinating, temporal and access to information issues. These issues can best be addressed or explored if programmes were coordinated inter-departmentally but also to farmers. The lack of coordination was identified as one of the main causes of delays that beneficiaries had to undergo, thereby preventing them from obtaining optimum benefit from the land reform process (FAO, 2009). Moreover, coordination challenges was listed as a recurrent theme in all support programmes and has been pointed out in virtually every programme evaluation that has been conducted to date. A review of all support programmes is also warranted to evaluate their impact and effectiveness, but these processes need to be based on clearly defined and suitable indicators or criteria. Access to knowledge, training and skills development needs to be improved as does the turnaround time in providing water use entitlements. In terms of the latter, the onus is on government to reduce its backlog and coordinate with other departments in this regard.

Question 3: What are some of the biggest challenges of current CPIs (CPAs, trusts, PLAS, etc.) in relation to water use?

Four primary themes emerged in this discussion:

i. Processes have negative outcomes

- Recapitalisation Programme assumes partnerships between emerging and established, commercial farmers will work, but this is oftentimes not the case.
- The state's SLAG programme encouraged free-riding in CPAs.
- PLAS programme does not provide sound criteria to determine when beneficiaries are able to own the land they have leased.
- Implementation challenges are wide-ranging.

ii. Role of state is mainly supportive and capacitating despite capacity constraints

- Provision of training and mentoring programmes.
- The state does not have the capacity to monitor effectiveness.
- State is hampered by its own party agenda.
- Beneficiaries receive little information about various policies.

iii. Private sector plays a supportive role because money and market mechanisms are important resources

- The private sector plays a supportive role but it is not always sustainable.
- The degree to which similar review processes occur in the private sector is not known, however many private companies have invested in supporting emerging farmers.

iv. Challenges are both individual and collective

- Insufficient review processes of the effectiveness of CPIs.
- Too many role players.
- 'Tragedy of the Commons.'
- Too easy to establish and register various CPIs i.e. trusts, CPAs.
- Too difficult or time-consuming to change ineffective leadership of CPIs.
- Infighting amongst beneficiaries that operate as a collective entity.
- Lack of commitment from some members in collective entities.
- Inability to separate the land holding structure from the business, which delays decision-making processes since members may have to hold meetings before a decision can be taken i.e. too much organisational red tape that hinders prompt decision-making.
- The lack of power or guidance puts beneficiaries at a disadvantage in both collective and individual schemes.

These questions can best be addressed through coordinated monitoring and evaluation processes that include ALL relevant government departments, including the Department of Minerals and Energy, throughout the reform process, and by interacting with different stakeholders. This could lead to a better understanding of challenges and improved capacity to address related issues. A facilitating or capacitating mechanism was emphasised as the most suitable way to determine the success of collective schemes.

Question 4: Given the current policy context, how could land and water support programmes be improved, and how could they complement each other better?

Five cluster themes emerged from the group discussion on the improvement of support:

i. Co-ordination

- Reform programmes are currently implemented independently of each other, and require government coordination at all levels.
- Alternative perspective: programmes already complement each other and do not need improvement.
- Government's role is to create an enabling environment where various land and water support programmes can work together towards the successful implementation of reform programmes.
- Greater consultation with farmers is required.
- New land reform initiatives such as PLAS must take into account water rights/licenses.
- Implementation of land and water reform should be concurrent and coordinated at the lowest level of government.

ii. Policy review

- Current policy is not meeting its reform objectives.
- Policy reviews also need to include farmers' needs.
- The current, proposed revision of national water legislation should consult all sectors.

iii. Capacity building

- WAR is failing because WUAs are failing (no capacity/support).
- WUAs need a more comprehensive capacity building effort.
- A clearly defined and agreed upon criteria of what it takes to be productive is needed i.e. a resource toolkit for beneficiaries

iv. Implementation of water use rights

- There is a need for policy implementation, especially in terms of water rights or water reform.
- There is a need to facilitate easier trade of water rights among farmers.
- There is a need to establish only one forum to allocate water rights when approving grants for land acquisition.

v. Understanding of policy

- There is a need for a thorough understanding of policy, in order to shorten the gap between policy and implementation. Also, an examination of whether policies complement each other is required.
- Policy language needs to be simplified for farmers and communicated to them in a clear and concise manner.

The group discussion highlighted the need for clearly defined definitions of productivity, the classification of 'emerging farmers,' as well as the criteria needed to measure effectiveness or monitor the success of support programmes. This project would therefore have to formulate and communicate clearly defined definitions of these terms. The lack of coordination between different support programmes inter-departmentally, but also from national to local levels, as well as coordination with all other stakeholders in the food value chain needs to be improved. Implementation was prioritised as a key challenge, particularly as it related to monitoring and evaluation of support programmes. Access to information, skills and training by many beneficiaries of land and water reform still pose serious challenges to the productive use of allocated land and the efficient use of water.

These findings are consistent with existing literature and findings on the challenges of land and water allocation reform in South Africa.

The value of the workshop was in its ability to grapple with the multiplicity of perspectives that exist regarding water use entitlements and land use rights and to understand the origins of perspectives. Oftentimes, policy-makers do not have time to examine the range of divergent perspectives, both within and outside of government and how they influence behaviour. This project therefore aims to investigate this diversity of perspectives and how they contribute to policy formulation and implementation. Given this complexity, understanding the role of the state is critically important to understanding how these perspectives converge. Specifically, how the state will reconcile satisfying the emotional and/or economic need will be a key determinant in the success of many support programmes.

4.6 *Discussion on stakeholder consultation*

The findings of the stakeholder consultation process have helped to address the broader project objective of investigating how to support emerging farmers and improve the productivity of their water use. This necessitated a closer examination of the coordination of water use entitlements in relation to land use rights for farmers that are beneficiaries of land and water reform programmes.

Additionally, the stakeholder consultation process posed several uncomfortable but important questions on the challenges of reform and support programmes in an attempt to understand how they determine and influence the productivity of beneficiaries. Perceptions were not always based on scientific evidence, results were heavily debated, and issues were highly politicised and sensitive. Given that water and land use rights are social constructions defined by institutions and socio-cultural, socio-political and socio-economic norms, it is beneficial to investigate how these constructs emerge, how they obtain legitimacy, and who gives them legitimacy. In this regard, the role of the state is critically important in determining how property rights are defined, how they can be enforced, and how they evolve in line with changing economic conditions (FAO, 2002). This, in turn provides a basis for the level of tenure security enjoyed by individual landowners and their ability and willingness to exchange such rights with others. Given that land and water use rights are not static, but change in response to changes in the socio-economic and socio-political environment, it would also be advantageous to track the evolution of land and water use rights in influencing beneficiary productivity in the short-term.

Answeeuw and Mathebula (2008) make a case for an understanding of the beneficiary as the primary unit of analysis in order to assess their individual behaviour related to the project. Assessing the degree to which land and water reform programmes help or hinder productivity also necessitates the identification of the benefits, opportunities, challenges of beneficiaries. In this regard, case study sites within the study area was identified not on geographical location, but rather on beneficiary profile, including whether land and water use rights have been granted, the degree of land and water use security experienced, the type of CPI arrangement.

CHAPTER 5: AGRO-ECONOMIC PROFILES OF RESPONDENTS IN STUDY AREA

Agriculture remains the main employment generator in Maruleng Municipality and is characterized by commercial farming of mangoes and citrus, tourism, and subsistence and small-scale farming of maize and different types of vegetables. Emerging farmers on irrigation schemes typically do not grow citrus or sub-tropical fruits but rather engage in mixed-vegetable production. A summary of farm agro-economic profiles is provided in Table 8; while strategic partnerships are summarized in Table 6 in terms of their water use.

Table 8: Agro-economic profiles for emerging farmers in Maruleng

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
Balloon Orchards	Balloon	27	Legalametse River	1. State farm 2. Sekororo Tribal Authority 3. Balloon Farm Committee	Restituted land, collective ownership, communal land	No	No	Emerging/ Subsistence Mixed commodities (mangoes, litchi, avocado)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	Furrow irrigation
Lewis Farm	Balloon	46	Canal	Makhutswe CPA	Restituted land owned by CPA and leased to farmer on a 10-yr renewable lease	No	Yes	Emerging/ Subsistence Mixed commodities (mangoes, litchi, tomatoes, onion)	Local community (informal) and nearby town distributors.	None
Lofdal 42 KT (Portion 4)	Balloon	444.8	Makhutswe River	Makhutswe CPA	Restituted land owned by CPA and leased to farmer on a 10-yr renewable lease	No	Yes	Emerging/commercial Mixed commodities (baby corn, green beans, butternut, maize, chillies, cabbage)	National market	Centre pivot and drip irrigation, pump
Lebeko and Sons C11	Balloon	14	Canal	Makhutswe CPA	Restituted land owned by CPA and leased to farmer	Don't know	Yes	Emerging/commercial mixed commodities (green beans, gem squash, patti-pans)	Local community (informal market)	Drip irrigation, pump
Calais Community Farm	Calais	450	Canal and boreholes	Calais CPA	Restituted land (SLAG), communal land, DLA has title deed but CPA	No	No	Emerging/ Subsistence Mixed commodities (maize, beans,	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	Sprinklers, drip, furrow

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
					'owns' land			butternut, pumpkin, cabbage, tomatoes, mango)		
Bemborough Farm	Calais	530	Canal, boreholes	Makhutswe CPA	Restituted land owned by CPA and leased to farmer on a 10-yr renewable lease	Yes (ELU)	Yes	Emerging/ commercial, commodities (litchi, mango, tomatoes, green peppers, maize)	Local community (informal and distributors i.e. Woolworths,	Drip irrigation
Tsogamolele le Farm	Hoedspruit	6.8	Small dam	Moletele CPA	Restituted land owned by CPA, no payment	Yes (CPA holds license)	No	Emerging/ commercial, mixed commodities (green, red and yellow pepper, tomatoes)	Local community (informal and national market.	Drip irrigation
Named after owner (Mahlo)	Lorraine Irrigation Scheme	1	river	1. Sekororo Tribal Authority 2. Lorraine Irrigation Scheme Committee	Communal land given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (beans, tomatoes, onions, beetroot)	10% of farmer supply goes to the local community. Local community is accessed from roadside stalls and informal markets. But 90% goes to the national market.	None
Named after owner (Komani)	Lorraine Irrigation Scheme	1	river	1. Sekororo Tribal Authority 2. Lorraine Irrigation Scheme Committee	Restituted communal land given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (beans, tomatoes, mango)	100% of farmer supply goes to the local community, accessed from roadside stalls and informal markets.	None

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
Named after owner (Moela)	Lorraine Irrigation Scheme	2	river	1. Sekororo Tribal Authority 2. Lorraine Irrigation Scheme Committee	Restituted communal land given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (sugar beans, green beans, tomatoes)	National market	None
Named after owner (Moropane)	Madeira Irrigation Scheme	3	mountain	1. Sekororo Tribal Authority 2. Madeira Irrigation Scheme Committee <i>(but respondent said none)</i>	Restituted communal land given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (chillies, sweet potatoes, beans)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	None
Named after owner (Mangane)	Madeira Irrigation Scheme	7 feet x 10	river	1. Sekororo Tribal Authority 2. Madeira Irrigation Scheme committee <i>(but respondent said none)</i>	Restituted communal land given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, cabbage, tomatoes, mango)	Farmer supplies only to the local community, accessed from hawkers who come to the farm to buy produce.	Furrow irrigation
Named after owner (Magolele)	Madeira Irrigation Scheme	1	river	Madeira Irrigation Scheme Committee	Restituted communal land, inherited	No	No	Emerging/ Subsistence Mixed commodities (beans, cabbage)	Farmer supply only to the local community, accessed from hawkers who come to the farm to buy produce.	none
Named after owner (Makwala)	Madeira Irrigation Scheme	1.5	canal	Madeira Irrigation Scheme Committee	Restituted communal land given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, green beans,	10% of farmer supply goes to the local community, accessed from roadside stalls and informal markets. But the majority (90%)	none

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
								green pepper)	goes to the national market.	
Named after owner (Thobejane)	Madeira Irrigation Scheme	1	River to furrow to dam	Madeira Irrigation Scheme Committee	Restituted communal land given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, green beans, green pepper)	Farmer supplies only to the local community, accessed from hawkers who come to the farm to buy produce.	none
Named after owner (Phasha)	Madeira Irrigation Scheme	2	River	Madeira Irrigation Scheme Committee	(no answer)	No	No	Emerging/ Subsistence Mixed commodities (maize, green beans)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	none
Mmakgala Trading Project	Makgaung Irrigation Scheme	5.4	Pipeline and dam	Sekororo Tribal Authority	Restituted communal land given to owner by chief as PTO	No	No	Emerging/ Subsistence Mixed commodities (potatoes, chillies, tomatoes)	50% of farmer supply goes to the local community, accessed from roadside stalls and informal markets. And 50% goes to the national market.	None
Named after owner (Raseona)	Makgaung Irrigation Scheme	6	river	Sekororo Tribal Authority	Restituted communal land given to owner by chief as PTO	No	No	Emerging/ Subsistence Mixed commodities (green beans, beetroot, tomatoes, chillies, spinach)	40% of farmer supply goes to the local community, accessed from hawkers who come to the farm to buy produce. And 50% goes to the national market.	None
Named after owner	Metz Irrigation	2.5	Dam	Metz Irrigation	Restituted communal land	No	No	Emerging/ subsistence, single	Farmer supplies only to the local	None

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
(Mailula)	Scheme			Scheme Committee	given to owner by chief and owner has title deed			commodity (mango)	community, accessed from roadside stalls and informal markets.	
Named after owner (Mangena)	Metz Irrigation Scheme	1.5	Dam	Metz Irrigation Scheme Committee <i>(but respondent said that there was none)</i>	Restituted communal land given to owner by chief	No	No	Emerging/ subsistence, single commodity (mango, and some guava)	100% of farmer supply goes to a processor in a nearby town (Mango atchar factory in Tzaneen)	None
Named after owner (Seroto)	Metz Irrigation Scheme	1.2-1.4	Canal	1. Ba-Letsoale Tribal Authority 2. Metz Irrigation Scheme Com.	Restituted communal land given to owner by chief	No	No	Emerging/ subsistence, single commodity (mango)	100% of farmer supply goes to a processor in a nearby town (NTK in Trichardsdal)	None
Named after owner (Rakoma)	Metz Irrigation Scheme	1.2-1.4	Dam	1. Ba-Letsoale Tribal Authority 2. Metz Irrigation Scheme Com.	Restituted communal land given to owner by chief	No	No	Emerging/ subsistence, single commodity (mango)	100% of farmer supply goes to a processor in a nearby town (NTK in Trichardsdal)	None
Named after owner (Letsoalo)	Metz Irrigation Scheme	1.6	Dam	1. Ba-Letsoale Tribal Authority 2. Metz Irrigation Scheme committee	Restituted communal land given to owner by chief	No	No	Emerging/ subsistence, single commodity (mango)	Farmer supplies only to the local community, accessed from hawkers who come to the farm to buy produce.	None
Named after owner (Rakoma)	Metz Irrigation Scheme	7	Dam	1. Ba-Letsoale Tribal Authority 2. Metz Irrigation Scheme committee <i>(but respondent said that there was none)</i>	Restituted communal land given to owner by chief	No	No	Emerging/ subsistence, single commodity (mango)	Local retail grocery stores and distributors (white farmers)	None

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
Named after owner (Letsoalo)	Metz Irrigation Scheme	18	Dam	1. Ba-Letsoale Tribal Authority 2. Metz Irrigation Scheme Com.	Restituted communal land given to owner by chief	No	No	Emerging/ subsistence, single commodity (mango)	No answer	None
Named after owner (Senosa)	Metz Irrigation Scheme	18	Dam	1. Ba-Letsoale Tribal Authority 2. Metz Irrigation Scheme Com.	Restituted communal land given to owner by chief	No	No	Emerging/Subsistence Mixed commodities (maize, green beans, cabbage, tomatoes, mango)	Retail trade and national market (JHB)	None
Named after owner (Masemola)	Metz Irrigation Scheme	2	Dam	1. Ba-Letsoale Tribal Authority 2. Metz Irrigation Scheme Com.	Restituted communal land claim	No	No	Emerging/ subsistence, single commodity (mango)	No answer	None
Named after owner (Modiba)	Metz Irrigation Scheme	1.5	Dam to canal to furrow	1. Ba-Letsoale Tribal Authority 2. Metz Irrigation Scheme Com	Restituted communal land claim given to owner by chief	No	No	Emerging/ subsistence, single commodity (mango)	100% of farmer supply goes to a processor in a nearby town (Atchar factory)	None
Named after owner (Rakoma)	Metz Irrigation Scheme	3	Dam	Ba-Letsoale Tribal Authority	Restituted communal land given to owner by chief as PTO	No	No	Emerging/ Subsistence Mixed commodities (maize, mango, nuts)	10% of farmer supply goes to retail trade (suppliers buy from her and sell in informal markets), and 90% goes to a processor (outlet/depot for atchar in Tzaneen)	None
Named after owner (Mathake)	Sofaya Irrigation Scheme	1	River to canal	Sofaya Irrigation Scheme Committee	Restituted communal land claim given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (sweet green beans, potatoes, dry	100% of farmer supply goes to a processor in a nearby town (NTK)	None

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
								beans, ground nuts)		
Named after owner (Morema)	Sofaya Irrigation Scheme	1.25	River to canal	1. Tribal Authority 2. Sofaya Irrigation Scheme committee	Restituted communal land claim given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, sweet potatoes, green beans, beetroot, cabbage and tomatoes)	Farmer supply only to the local community. Local community is accessed from roadside stalls and informal markets, as well as local processors (NTK), hospital and schools.	None
Named after owner (Moeng)	Sofaya Irrigation Scheme	1	Canal and rain	1. Tribal Authority 2. Sofaya Irrigation Scheme committee	Restituted communal land claim given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, sweet potatoes, sugar beans)	Farmer supply only to the local community. Local community is accessed from roadside stalls and informal markets.	None
Named after owner (Morei)	Sofaya Irrigation Scheme	1.5	River to furrow	Sofaya Irrigation Scheme committee	Restituted communal land claim given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, potatoes, sugar beans, dry beans, beetroot)	Farmer supplies maize to local processor (Progress) in exchange for mielie meal, but 85% of other produce goes to the national market.	None

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
Named after owner (Mogote)	Sofaya Irrigation Scheme	3	River to canal	Sofaya Irrigation Scheme Committee	Restituted land owned by CPA and leased to farmer on a 3-yr renewable lease	No	No	Emerging/ Subsistence Mixed commodities (maize, beans, cabbage, tomatoes, beetroot)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	None
Named after owner (Moraba)	Sofaya Irrigation Scheme	1	River to furrow	Sofaya Irrigation Scheme Committee	Restituted communal land claim given to owner by chief	No	No	Emerging/Subsistence Mixed commodities (maize, dry beans, sugar beans, cabbage, tomatoes, sweet potatoes)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	None
Named after owner (Thobejane)	Sofaya Irrigation Scheme	1	River to canal to furrow	Sofaya Irrigation Scheme Committee	Restituted communal land claim given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, sweet potatoes, ground nuts)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	None
Named after owner (Mohlabé)	Sofaya Irrigation Scheme	1	River to canal to furrow	Sofaya Irrigation Scheme Committee	Restituted communal land claim given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, sweet potatoes, ground nuts)	Farmer supply only to the local community, accessed from hawkers who come to the farm to buy produce.	None
Named after owner (Sokoma)	Sofaya Irrigation Scheme	15 plots	Dam	Tribal authority	Restituted communal land claim given to owner by chief	No	Yes	Emerging/Subsistence Mixed commodities (maize, beans,	Farmer supplies only to the local community, accessed from roadside stalls	Furrow irrigation

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
Plot 221 Raganya Farm	Sofaya Irrigation Scheme	1	River to dam to furrow	Sofaya Irrigation Scheme Committee	Restituted communal land claim given to owner by chief	No	No	Emerging/ Subsistence Mixed commodities (maize, sweet potatoes, tomatoes, cabbage, green beans, dry beans, mango)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	None
Named after owner (Sekgoka)	Sofaya Irrigation Scheme	1	River	Sofaya Irrigation Scheme Committee	Restituted communal land claim inherited by grand-parents	Yes	Yes	Emerging/ Subsistence Mixed commodities (maize, beans, cabbage, tomatoes)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	None
Named after owner (Masete)	Sofaya Irrigation Scheme	12	Dam	Sofaya Irrigation Scheme Committee <i>(but respondent said that there was none)</i>	Restituted communal land claim inherited by grand-parents	No	Yes	Emerging/ Subsistence Mixed commodities (maize, beans, cabbage, tomatoes)	Farmer supplies only to the local community, accessed from roadside stalls and informal markets.	None
Named after owner (Moraba)	Sofaya Irrigation Scheme	11	Dam	Sofaya Irrigation Scheme Committee	Restituted communal land claim, owner inherited it.	No	Yes	Emerging/ Subsistence Mixed commodities (maize, beans, cabbage, tomatoes, mango)	Farmer supplies only to the local community, accessed from roadside stalls in Sofaya.	None

Farm	Community / Irrigation Scheme	Size (ha)	Water source(s)	Governance structures	Land ownership arrangement	Water License?	Electricity on farm?	Orientation	Access to Markets	Improved Irrigation?
Named after owner (Shai)	Sofaya Irrigation Scheme	10	Dam	Sofaya Irrigation Scheme Committee	Restituted communal land claim, owner inherited it.	No	Yes	Emerging/ Subsistence Mixed commodities (maize, tomatoes, beans,	Farmer supplies only to the local community, accessed from roadside stalls in Sofaya.	None
Named after owner (Moeng)	Sofaya Irrigation Scheme	13	Dam	Sofaya Irrigation Scheme Committee <i>(but respondent said that there was none)</i>	Restituted communal land claim, owner inherited it.	No	Yes	Emerging/ Subsistence Mixed commodities (maize, cabbage, mango, banana, beans, tomatoes, beetroot,	Farmer supplies only to the local community, accessed from roadside stalls in Sofaya.	None

Despite the fact that Maruleng is characterized by low rainfall, water shortages due to lack of rain was seldom articulated by emerging farmers. More often, the major water challenges included lack of infrastructure, poor-maintenance of infrastructure, or no/aging irrigation equipment. Very few emerging farmers have water licenses or pay for water. Additionally, while water in Maruleng is supplied by one of three sources; namely the Lepelle Northern Water Board (LNWB), the Department of Public Works and/or directly from the Blyde River; most emerging farmers in the case study area abstract water directly from the river, while a few have access to canal systems and boreholes.

Table 9: Summary of strategic partner water use

Strategic Partnership	Legal Entity	Number of Farms	Farm Portion	Commodity	Farm Size (ha)	Combined Size (ha)	Water License	Water Allocations April 2011 to March 2012		
								Pipe 'Old Water' (ha)	River (h)	Blyde 'New Water' (ha)
ART/GFC	Moletele CPA	1	Richmond 605KT	Citrus	2434	2434	Yes	500.00	550.38	240.00
Dinaledi	Moletele CPA	3 farms (and 2 pack houses)	Southampton 213 KT (7)	Citrus	128.48	700	Yes	258.75	-	310.00
			Grovedale 239 KT (10 rem, 57)	Citrus	227.15					
			Grovedale 239 KT (16, 52 rem)	Citrus	173.64					
			Glencoe 210 KT (32)	Citrus	55.99					
			Glencoe 210 KT (28)	Citrus	114.07					
New Dawn	Moletele CPA	16 (2 pack houses)	Blyderus 596 KT (41 rem ext)	Citrus and mango	39.29	1017	Yes	482.18	-	-
			Blyderus 596 KT (42)	Citrus and mango	39.25					
			Blyderus 596 KT (43)	Citrus and mango	57.71					
			Essex 204 KT (15)	Citrus and mango	36.00					
			Glencoe 210 KT (25)	Citrus and mango	50.44					
			Glencoe 210 KT (26)	Citrus and mango	50.44					

Strategic Partnership	Legal Entity	Number of Farms	Farm Portion	Commodity	Farm Size (ha)	Combined Size (ha)	Water License	Water Allocations April 2011 to March 2012		
								Pipe 'Old Water' (ha)	River (h)	Blyde 'New Water' (ha)
Soleil Citrus	Motsemetse Trust	1	Glencoe 210 KT (29 rem ext)	Citrus and mango	48.86	2316	No			
			Glencoe 210 KT (33)	Citrus and mango	72.68					
			Glencoe 210 KT (35)	Citrus and mango	49.98					
			Glencoe 210 KT (8 rem ext)	Citrus and mango	98.15					
			Glencoe 210 KT (9)	Citrus and mango	75.29					
			Jongmansspruit 234 KT (4 rem ext)	Citrus and mango	98.52					
			Moriah 238 KT (52)	Citrus and mango	25.10					
			Moriah 238 KT(4 rem ext)	Citrus and mango	24.82					
			Moriah 238 KT (2 rem ext)	Citrus and mango	116.154					
			Moriah 238 KT (60)	Citrus and mango	2.10					
			Southampton 213 KT (3)	Citrus and mango	68.12					
Soleil Citrus	Motsemetse Trust	1	Southampton 213 KT (9)	Citrus and mango	64.24	2316	No		500 litres per week	-
			Calais 226 KT	Citrus	260					

Existing agro-economic characteristics of emerging farmers are summarized below.

5.1 Diversity of production and alternative sources of income

Firstly, many emerging farmers, particularly those not engaged in strategic partnerships, produced a mix of commodities, with some producing up to seven different commodities in any given year. This differed starkly to the single crop model of emerging farmers engaged in strategic partnerships. The emerging farmer commodity mix (based on the questionnaire of 44 respondents) is illustrated in Figure 3. Beans (dry beans, sugar beans and green beans) were the most commonly produced commodities grown by emerging farmers in Maruleng, with 26 out of the 44 farmers in the sample engaging in bean production. The second most commonly grown commodity was maize with 25/44 farmers engaging in maize production. Despite the fact that citrus is the main commodity grown in Maruleng, no irrigation scheme emerging farmers were engaged in citrus production. This implies that citrus is only grown by emerging farmers engaged in strategic partnerships, e.g. Moletete CPA-owned farms engaged in strategic partnerships.

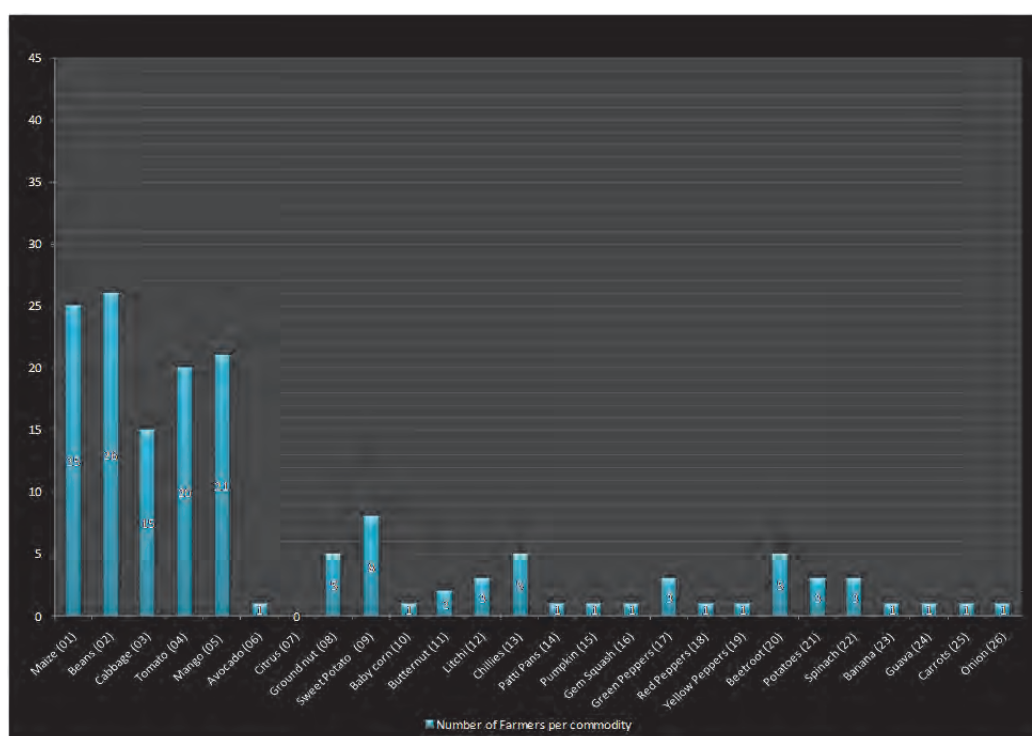


Figure 3: Emerging farmer crop mix

Project findings also confirmed the “hedgehog strategy” referred to in literature (Chambers, 1983), i.e. the dependency on a variety of sources of income to earn a livelihood, e.g. collecting firewood and selling it, small crop production, as well as alternative sources such as government grants and the dependence on other family members working in big cities (Baloyi, 2011). The inability to depend upon irrigated farming for a substantial proportion of their livelihood needs changes the incentives and behaviour of such individuals (Shah et al., 2002). Men often seek urban jobs while women cultivate the plots (Shah et al., 2002). According to several accounts, the smaller the plot, the stronger this tendency becomes

(Mpahlele et al., 1999). Three-quarters of the emerging farmer respondents confirmed that they have alternative sources of income other than farming.

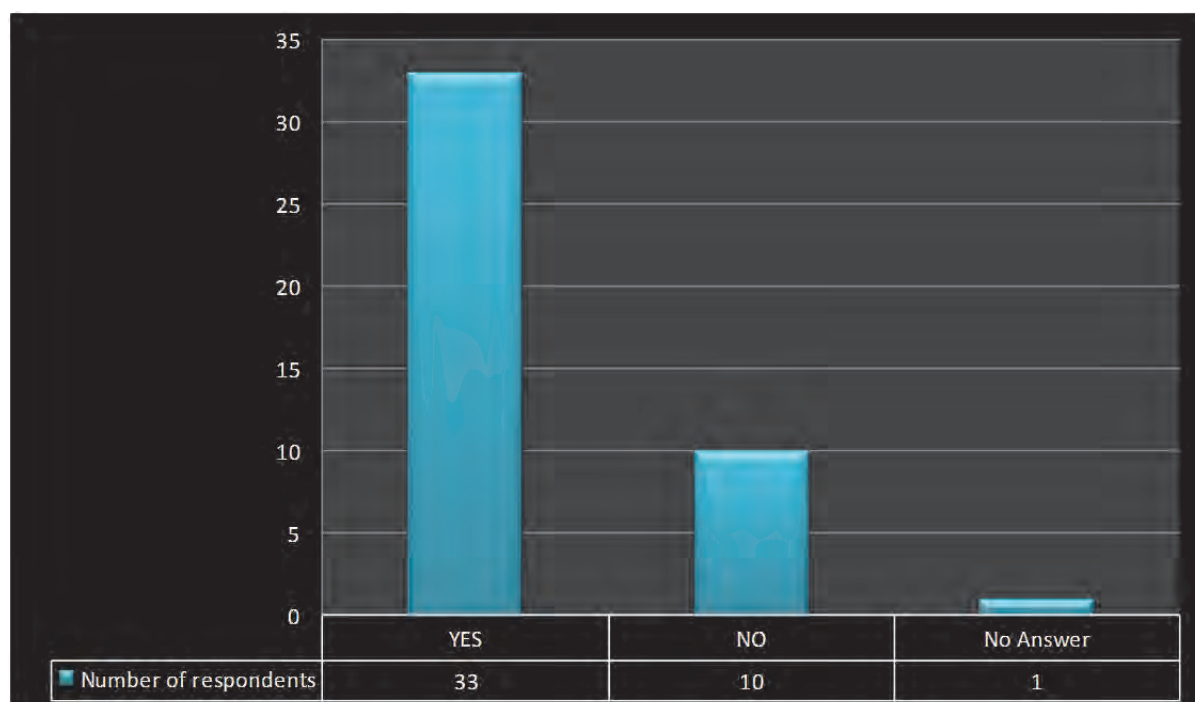


Figure 4: Do you have other sources of income (salon, state grant, crafts, etc.)?

5.2 Land ownership arrangements

The bulk of the respondents stated that they “own” land, while only five said they rent. Of the thirty nine that said they own land, the majority believe their land was given to them by the chiefs, ten obtained the land through land restitution initiatives and six through inheritance (of which the nature of the ownership was not clear). The most common land ownership arrangement in the sample was communal land given to emerging farmers by the chief (43%). The second most common land ownership arrangement was restituted land (23%). It should be noted that there may be overlap between these two categories, since most communal land is also part of restituted land claims (either finalised claims or in the process of being finalised).

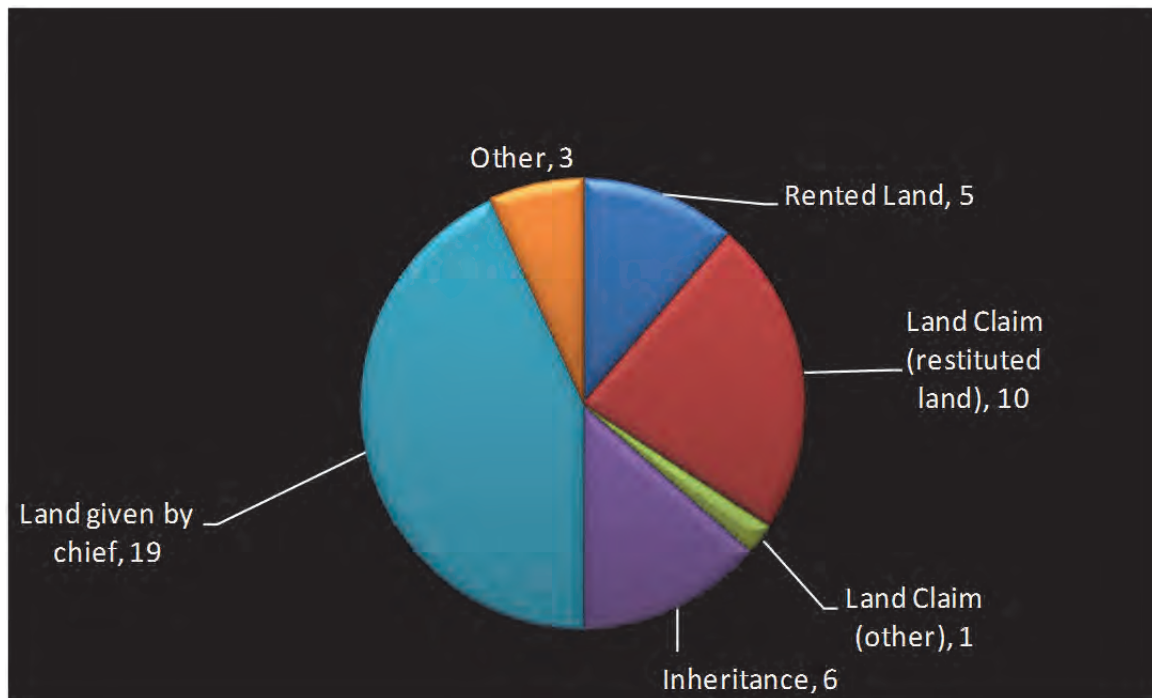


Figure 5: Percentage differences in land ownership arrangements

It should be clear that different interpretations of “land ownership” are at play. It is also important to remember here that these are perceptions and beliefs of the respondents and do not necessarily reflect the legal status of the land. However, respondent perceptions are important in this study as these perceptions and beliefs influence the way in which people behave and make decisions in relation to the land.

The way in which people generally answered this question suggests that they believe the local chief to still wield a significant amount of power when it comes to the allocation of land, despite the fact that in ‘reality’ all the land here has been transmitted through the restitution process; it is just that they *believe* the chief to have given them this land. It also illustrates the low level of awareness by emerging farmers of the various land reform programmes and land ownership rights and processes.

What was clear was that very few farmers owned the land in accordance to the definition of ownership in the constitution. Strictly speaking, the majority of the “owners” actually held use rights and not ownership rights to the land and although the respondents do not always see it in this light, the fact remains that the difference between these two types could have major implications in terms of their ability to present their land as collateral for access to credit.

5.3 Recognised legal entity in community presiding over water use

Respondents also articulated who they thought were the authoritative entities presiding over land and water use matters in their communities. The majority of the respondents recognised the irrigation scheme committee as the main authority presiding over water use. Nine

respondents said that they recognise no legal entity, eight said they recognised a mixture of tribal authority and irrigation scheme committee leadership, and seven recognised the CPA.

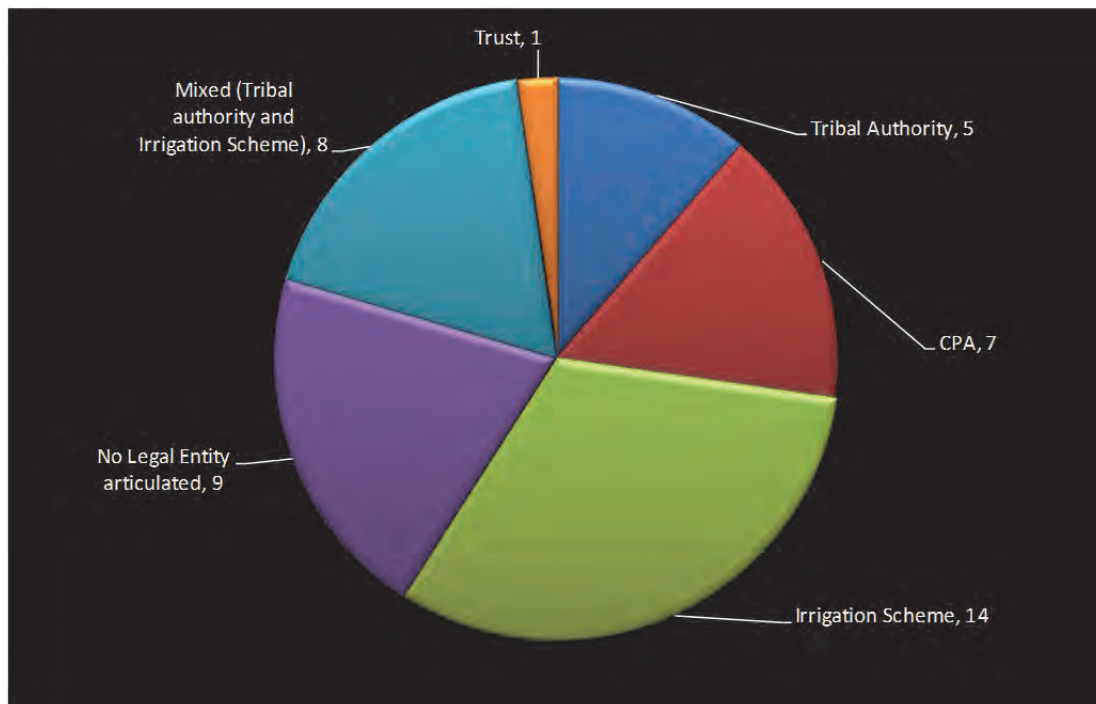


Figure 6: Recognised authoritative entity in community presiding over water use

5.4 Water use profile

Several questions were asked pertaining to the productive use of water. These related to alternative water sources, water availability, the cost of water, as well as whether farmers had water licenses or not.

When respondents were asked whether they received enough water from the current water delivery system in their respective communities, more than half (24/44) indicated that they did not receive enough water from the current delivery system.

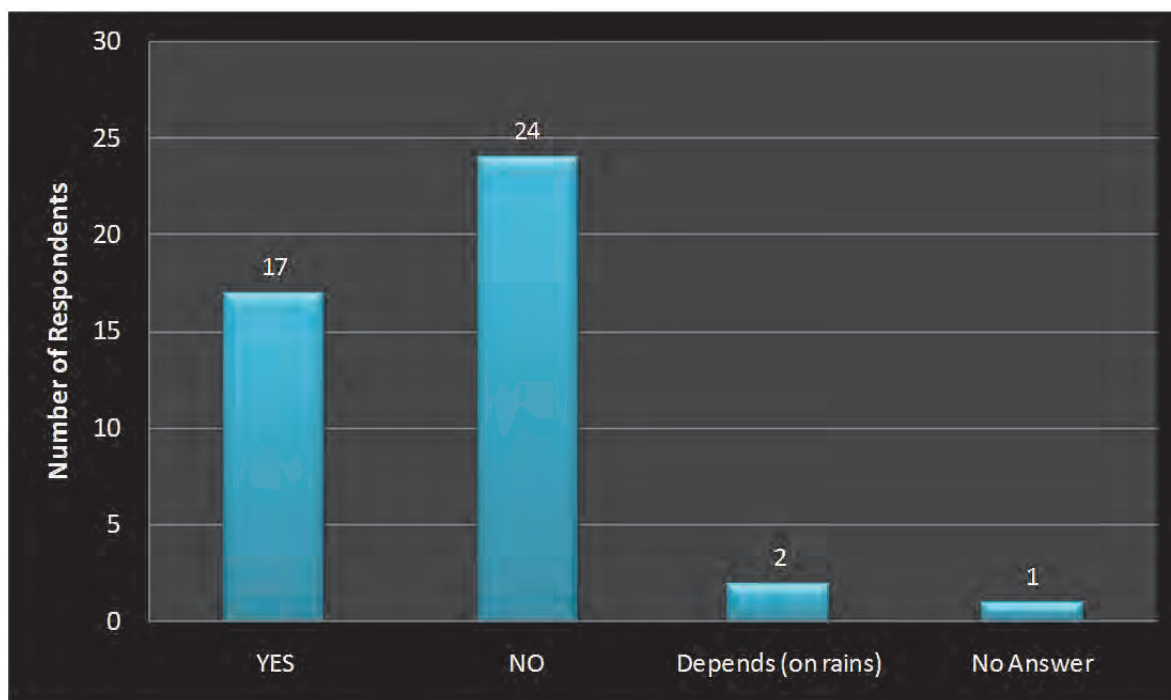


Figure 7: Do you get enough water from the current water delivery system?

Farmers articulated a range of difficulties in obtaining water, most of which ranged from the absence of water infrastructure, to the existence of inadequate infrastructure (not being able to absorb the increased demand for water), to the non-maintenance of existing infrastructure, to the cost of fixing this very infrastructure. As indicated in Figure 8, the majority (16/44) of respondents confirmed the non-maintenance of infrastructure (e.g. canal leaks, freshwater crabs destroy furrows, pipes are old, dam is leaking, breakage and blockage of furrows) as the major difficulty in obtaining water, while other difficulties included inadequate infrastructure e.g. poor roads or dam too far (10/44 respondents); absence of water transfer infrastructure i.e. no pipes (7/44 respondents); absence of irrigation equipment i.e. no pump (9/44); absence of water storage facility i.e. no dam (4/44 respondents); as well as the cost of fixing pipes, canals and boreholes (4/44 respondents). In Maruleng, water scarcity in the form of droughts was listed by 4 respondents as a major difficulty in obtaining water. This confirms the fact that in many parts of Maruleng, water availability is still very regular; however, access to this water as a result of infrastructural, storage and transfer challenges proves to be a greater obstacle to water access and its productive use.

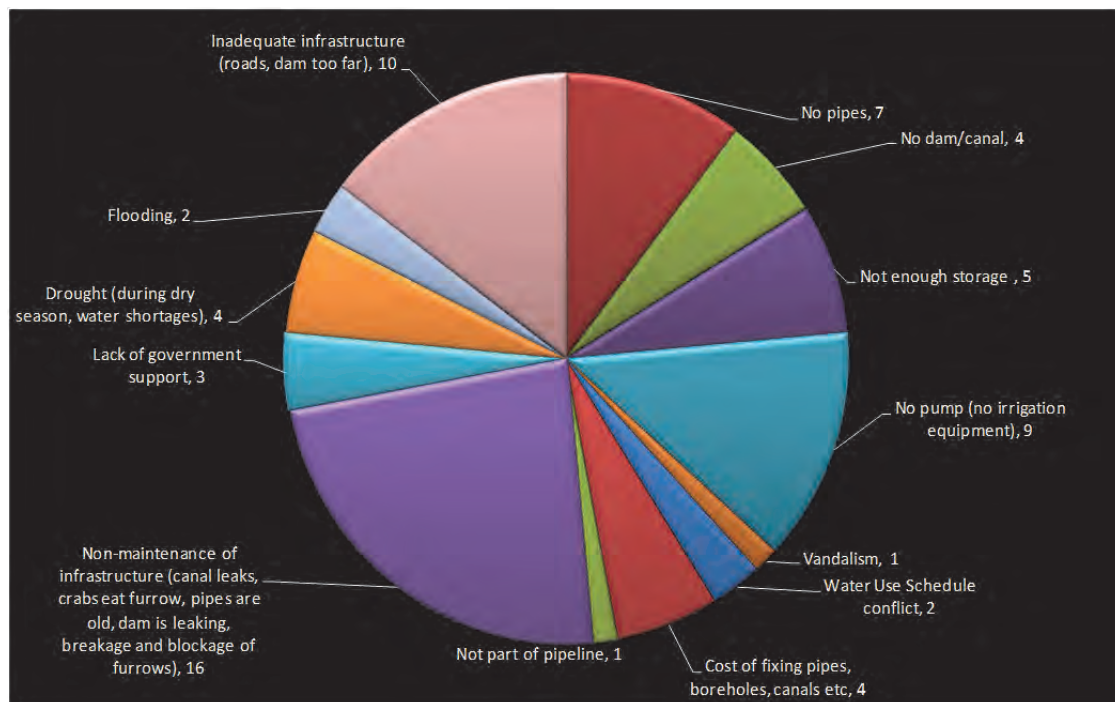


Figure 8: Range of difficulties that emerging farmers face in obtaining water

Several questions were asked that related to whether emerging farmers have alternative water sources, e.g. rainwater or water re-use. The majority of respondents (29/44) indicated that they use rainwater for irrigation, while 40/44 respondents indicated that they do not re-use water for irrigation (Figure 10).

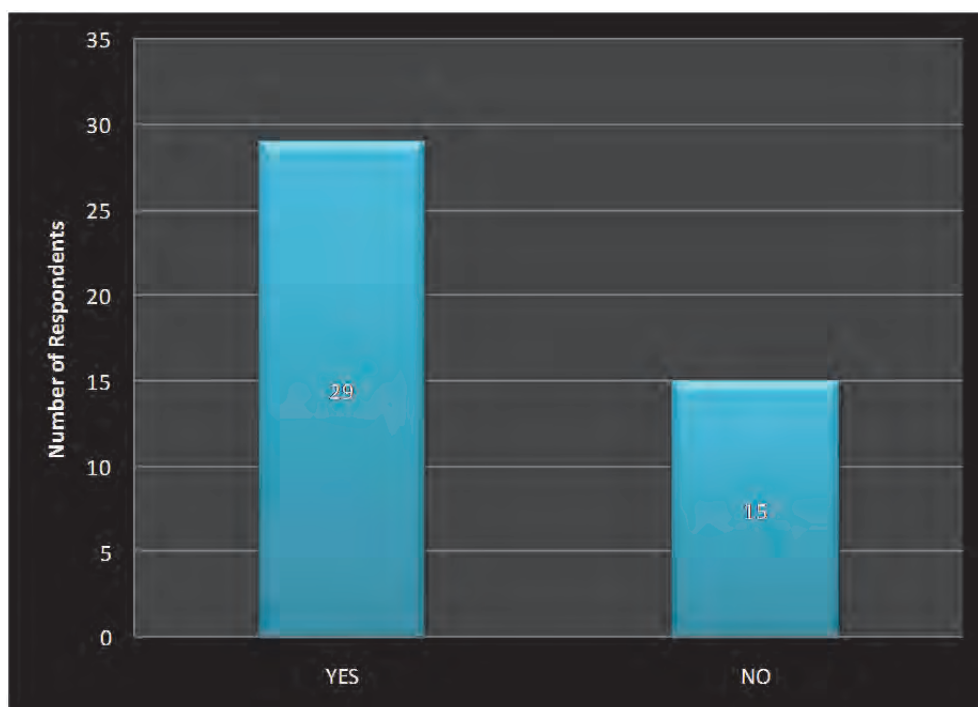


Figure 9: Do you use rainwater for irrigation?

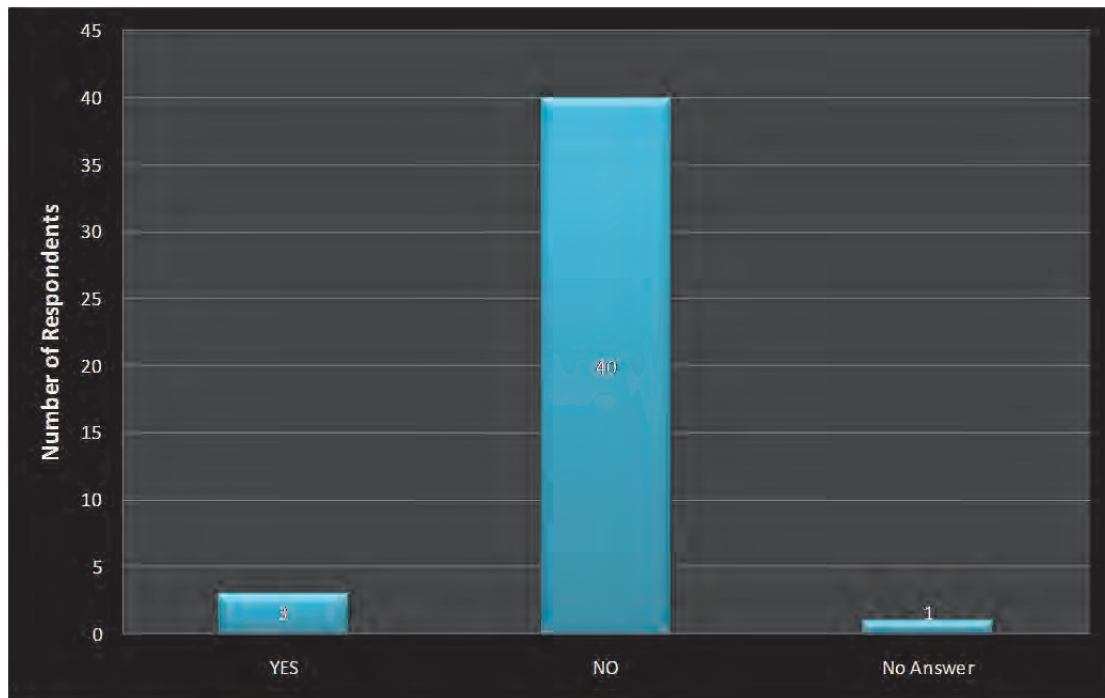


Figure 10: Do you use water more than once (recycle water)?

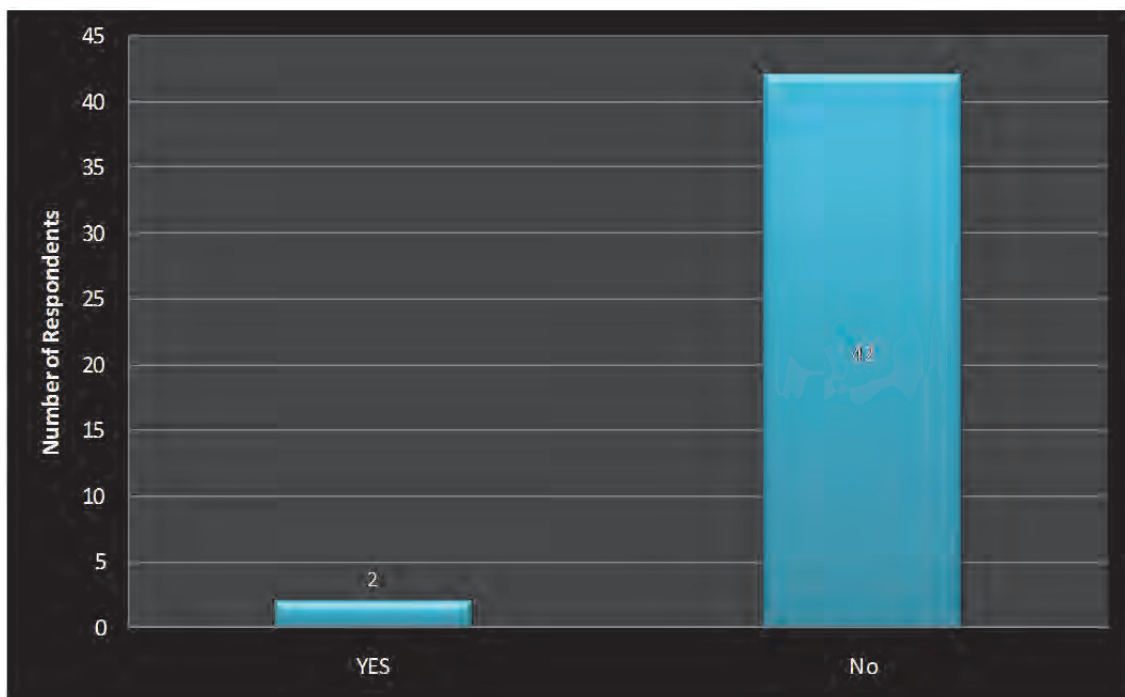


Figure 11: Do you pay for water for irrigation?

Almost all emerging farmers (42/44 respondents) confirmed that they did not pay for water for irrigation (Figure 11). Similarly, 41/44 respondents indicated that they did not have a water license, either inherited from previous owners or applied for by current owner, while only 2/44 confirmed that they did hold an existing lawful use (ELU) water license (Figure 12).

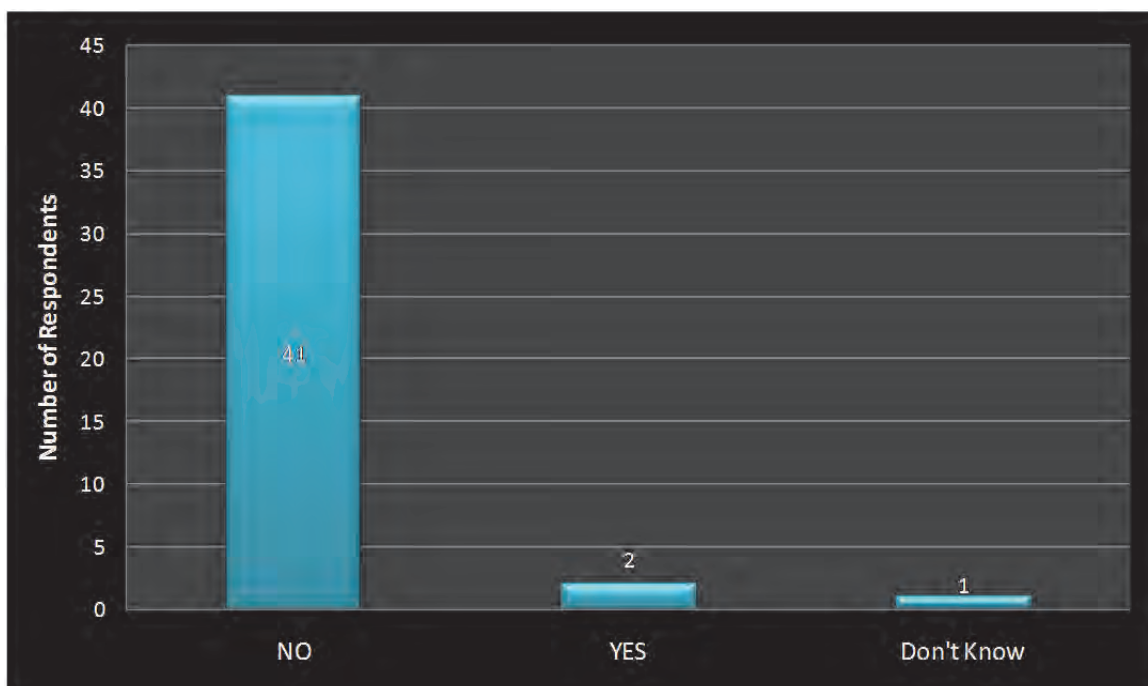


Figure 12: Do you have a water license?

A diversity of reasons was expressed for not having a water license. These included confirmation that the irrigation schemes either applied or were going through the application process for collective licenses; various delays in the application process; water is free and therefore emerging farmers do not need licenses; and that it is government's responsibility to arrange licenses for individual farmers. However, a large number of respondents (14/44 respondents) did not answer this question (Figure 13) (perhaps out of fear of being reprimanded or being identified as not complying with the law); while others were unsure as to why they needed a license; or were unfamiliar with the process of applying for licenses. This could indicate that the urgency and/or importance of obtaining water licenses was not acknowledged by respondents.

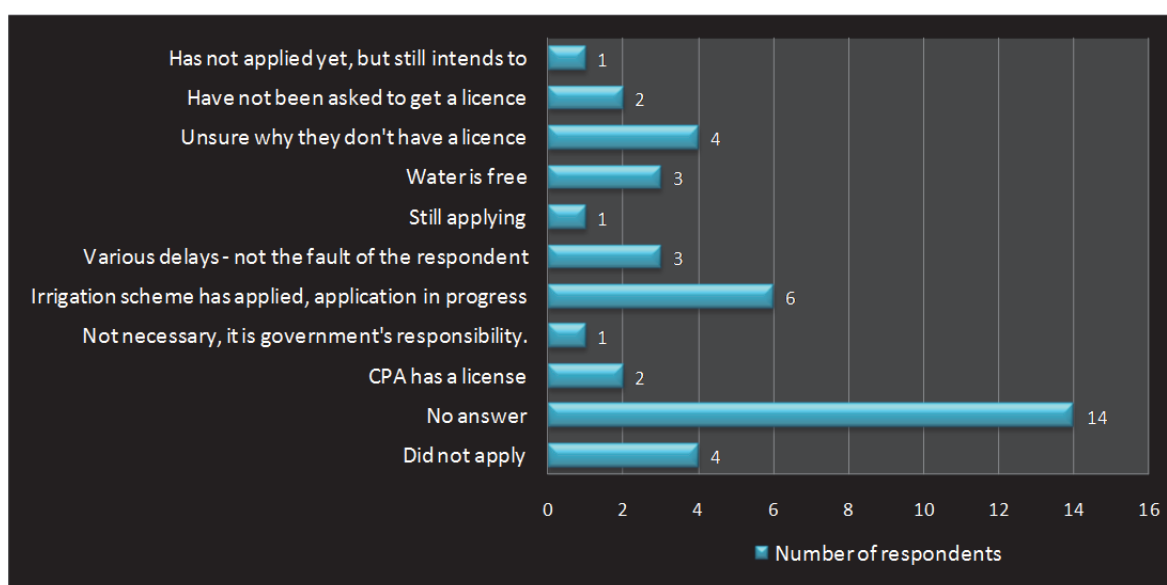


Figure 13: Reasons for not having a water license

5.5 Emerging farmer markets

A short list of markets was identified based on respondents' answers to the question of where they sell their goods. Figure 14 clearly shows that for emerging farmers the local market is the most accessible, i.e. 24/44 respondents sold their produce to roadside stalls, while 23/44 respondents sold theirs to informal markets in nearby towns. In a very few cases respondents are able to access the national market, but these are in the minority. Those who mentioned 'other' markets specified processors such as NTK, Progress, as well as various atchar factories where they sell green mangos for the production of atchar.

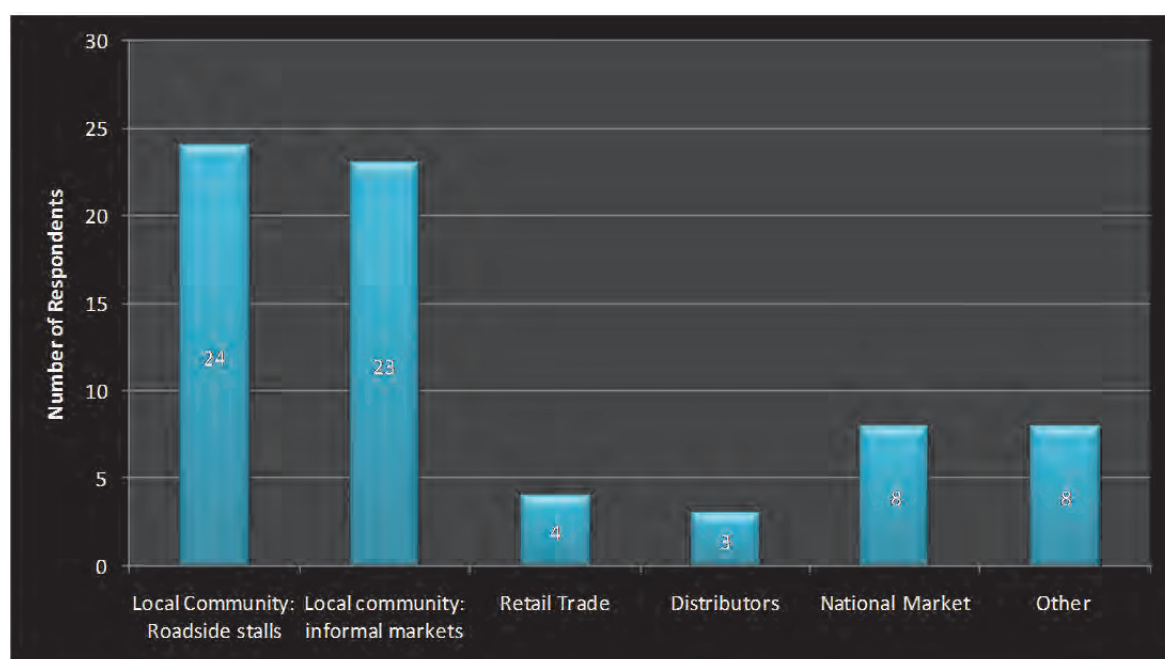


Figure 14: List of emerging farmer markets

When respondents were asked whether they were satisfied or not with the price their products fetch in these above-mentioned markets, more than half (24/44 respondents) indicated that they were not satisfied with the prices their goods are able to fetch, while 18/44 respondents expressed a level of satisfaction with the prices of their goods (Figure 15). Those farmers who did express a level of dissatisfaction attributed it to inflation, transport costs, and over-supply at national markets as well as the increase in fuel costs and costs of equipment repair.

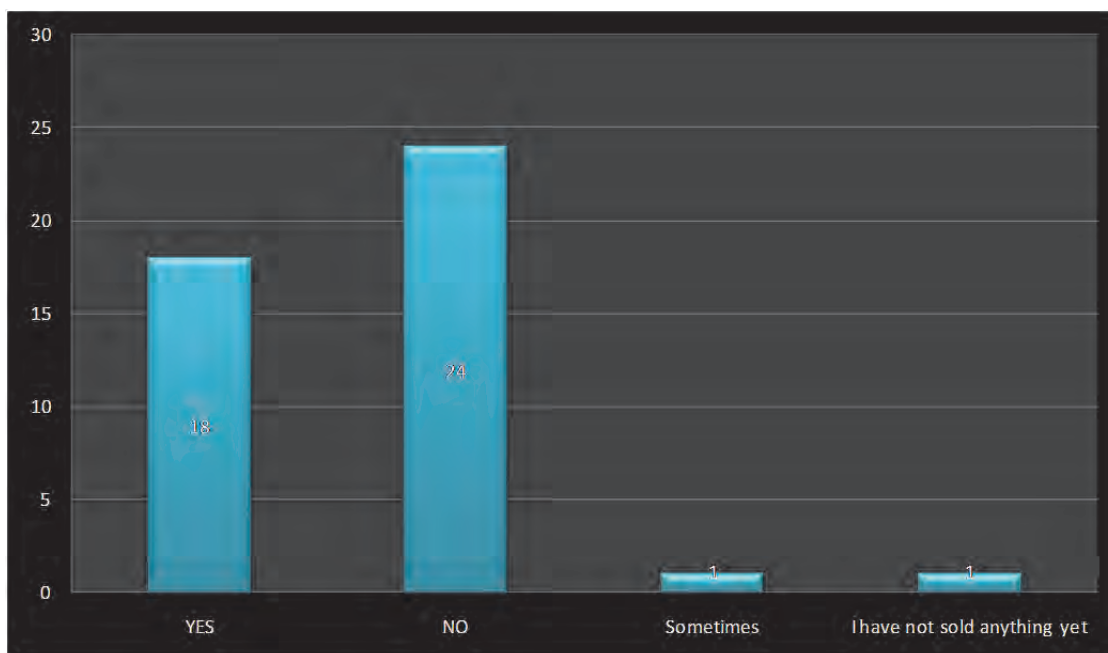


Figure 15: Are you happy with the price your goods fetch in various markets?

5.6 Improved technologies to lower production costs

Very few emerging farmers make use of improved technologies to offset production costs.

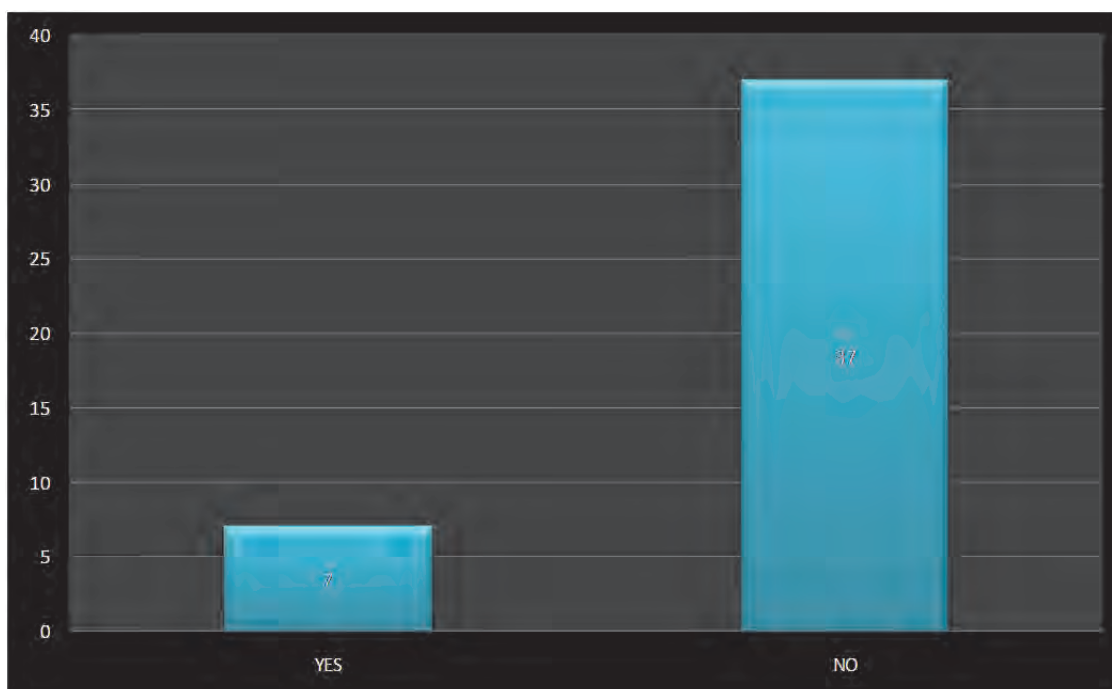


Figure 16: Do you use improved technologies (e.g. drip irrigation) so that production costs are more reasonable?

The above-mentioned information on the socio-economic profile and agro-economic profiles (chapter 5) was now used to develop suitable typologies as presented in chapter 6.

CHAPTER 6: TYPOLOGY DEVELOPMENT

The way in which government proceeds with support strategies for emerging farmers is inevitably dependent on the underlying interpretation of the term 'emerging farmer' itself. This is important because any support strategy based on a logical and justifiable thought process, based on critical scientific research and experience, runs the risk of being invalidated if the concepts that underpin such a drive are insufficiently defined or misunderstood. We are of the opinion that the notion of an "emerging farmer" is a case which displays some of these traits; it is widely referred to without consensus about its meaning. It would therefore be essential to explore this concept in more detail before proceeding to assess water use efficiency and the guideline development phases of the project (see Volume II).

A key question for the study was to determine the basis on which farmers in the study area can be categorized for the purpose of assessing water use efficiencies and for the development of suitable, target-audience specific guidelines. In other words, farmers need to be categorized for two main purposes; namely to enable an assessment of water use efficiencies among different types of farmers (for which different methods of assessing water use efficiencies are likely to be required); and secondly, to provide an understanding of the target audience that will be receiving guidelines that are tailored to their specific needs. This chapter focuses on the development of a typology for this study that is suitable for fulfilling these needs. The rationale for such a typology, the types of farmers identified and their attributes, as well as an analysis of specific case examples according to the typology, are presented and discussed in detail.

6.1 *Definition and rationale for a typology*

A typology is a system of categorisation of a particular phenomenon, with the intention of better understanding the phenomenon through comparison (Laurent, 1999; Kluge, 2000). Laurent (1999) argues that although there are various methods for building typologies, most approaches share a similar aim, which is to create a framework where characteristics (aspects or attributes) of the phenomenon can be singled out, given meaning through group structure, and thus become comparable, as they can then be analysed in the same dimension (Laurent, 1999). Therefore one can argue that a typology is a result of a grouping process, where the object field is divided into some groups or types which have specific shared attributes (Kluge, 2000). Within a typology, types or groups are constructed in order to comprehend, understand and explain complex social realities as far as possible (Kluge, 2000). Types do however not replace context and detail. Kluge (2000) argues that the elements within a type have to be as similar as possible (internal homogeneity on the "level of the type"); additionally, the differences between types have to be as strong as possible (external heterogeneity on the "level of the typology").

Laurent (1999) argues that in agriculture, one may find a multitude of factors that can culminate in different typologies, each of which can be used to answer various questions. For example, in any agricultural process there is diversity in practice, land size, attitude to farming, source of labour, application of capital, motivation for farming, governance systems, systems of co-operation, systems of market access, notions of productivity and success, parameters of effective resource use, and practices of progenitor and heritage, to name only a few. Typologies, by virtue of the fact that they can be built through the use of both qualitative and quantitative data, can sort through this diversity in order to answer specific questions around the complex realities that occupy the agricultural space. The case study area of Maruleng offers such a multitude of complex social realities within the group of people involved in farming activities in the area, as described here.

A specific need in the project was expressed for a method or framework that enables the assessment of water use efficiencies among different categories of farmers; as well as to develop effective guidelines that meet the needs of the different categories. We observed that farmers in the study area differ in terms of aspirations, objectives, and needs. For example, not all beneficiaries of land and water reform in the study area aspire to large scale commercial farming. They also have different levels of record keeping systems and different ways of interpreting and measuring productivity and efficiency. Water use efficiencies cannot therefore be interpreted and/or assessed in the same way for different groups of farmers (e.g. conventional quantitative water use efficiency assessments cannot be done in the absence of record keeping); moreover, guidelines cannot (and should not) be developed without a better understanding of the complexity of these groupings. As such, it was decided that a typology would be best suited to answer this need, both because it can provide a suitable method for characterization, and due to its ability to use both qualitative and quantitative data to inform the types and the attributes associated with the types.

6.2 *Focusing on farmers in South Africa: What typologies of farmers already exist?*

In this section we give a brief overview of different typologies of farmers as identified in the literature. Since we are specifically interested in farmers in South Africa, the focus of this discussion is similarly oriented. We identify two main kinds of typologies for farmers. The first kind focuses on economic principles of production and scale. These typologies focus on characteristics such as subsistence and commercial farming, small-scale and large-scale farming, and corporate and family-owned farms. The second kind of typology is based on different needs, for example a need to inform policy or strategy. We focus on these to illustrate how diversity and socio-economic variables combine to create such a typology.

This section focuses on the concept of an 'emerging farmer'. While this concept can (and does) cut across many of the different typologies already discussed, it is still considered to be quite an elusive concept to define, and a difficult category of farmer to understand. Our focus on the concept 'emerging farmer' is also significant in terms of the purpose of the typology; as the focus of the typology is primarily on beneficiaries of land and water reform in the case study area.

6.2.1 Typologies that focus on economic principles of production and scale

Subsistence vs. Commercial

Makhura et al. (1998) argue that 'commercialization' is described as a categorical concept to define farmers according to their commercial orientation as well as their stages of development. Makhura et al. (1998) identify a number of possible criteria which different authors have used to characterize the degree of 'commercialization'. These criteria, each with different emphases, can be summarised as follows: number or percentage of crops produced relative to own consumption (e.g. households or farms producing more than 200% of their consumption are defined as 'commercial'); number or percentage of produce consumed (e.g. households or farms who consume less than 50% of their total production); market related activity (e.g. the earnings generated); proportion of area planted with marketable crops; and volume of produce and household resources (Makhura et al., 1998).

Van Averbek (2008) argues that subsistence farming in the strict sense of farmers not producing any marketable surplus has become a very rare phenomenon. While subsistence farming has mainly been identified with the production of sufficient food and fibre to satisfy the needs of the farming family (Makeham and Malcolm, 1986), this does not rule out some sale or bartering of goods. However, the difference is that subsistence farmers do not adopt a 'commercial attitude' to farming (van Averbek, 2008). Van Averbek (2008) identifies a number of elements characteristic of subsistence farming: size and output of farming activities are small; farming activities do not rely much on purchased inputs; any activities related to acquiring food are aimed first and foremost at supplying the farming family with basic nutrients; subsistence farmers are not adventurous in their choice of practices and tend to avoid taking risks even if taking such risks could result in increased production; subsistence farmers tend to invest their savings for the short-term rather than for the long-term; the total gross income of the household is only slightly bolstered by cash sales of farm produce (they have a diversified income structure); labour is the main category of direct farm inputs, with very little cash expenditure; and cash is used as the main mode of payment for expenses such as fertilizers, tools, and contract services, including personal expenses such as schooling, clothing and savings.

Kirsten and van Zyl (1998) distinguish between two types of farmers in South Africa, namely subsistence and commercial. However, the way in which these authors describe the two types of farmers is not limited to an economic description. For one, they argue that subsistence farmers are mostly farmers located in former homelands – a geographical distinction. Secondly, they are generally black – a racial distinction. In turn, they argue that commercial farmers are mostly white farmers not living in these areas. This is different to the way in which farms and farmers are classified in other parts of the world. Kirsten and van Zyl (1998) argue that in many other countries, one would be able to identify farms and the activities that occur on them based on the size of the farm, ranging from small-scale subsistence to large-scale commercial. This is however not so simple in South Africa, as historical imbalances and political considerations permeate and thus blur these simple boundaries based on size and the ability to produce.

Small-scale vs. Large-scale

Farms can also be defined in terms of their size. Farms that are smaller in size would be labelled 'small-scale', while those larger in size would be labelled 'large-scale'. Size is often also used as an indicator of production capacity, and as such the terms small-scale and smallholder are often used interchangeably. To illustrate, Nieuwoudt (2000) categorises *small-scale farms* in South Africa into different types according to their avenue of income: 1) emerging farmers who earn money by farming as well as other means and who are trying to become established full-time farmers; 2) farmers who farm as a hobby or sideline, but make a living by other means; and 3) people who grow food and livestock to make ends meet – i.e. subsistence farmers. Similarly, van Averbeké and Mohamed (2006) argue that in post-apartheid South Africa, *smallholders* can be categorised into three groups, namely: 1) 'subsistence farmers' (making up the majority); 2) 'commercial farmers' (a minority) and 3) 'emerging farmers'. Looking at the concept from a socio-economic point of view, Essa and Nieuwoudt (2003) argue that instead of looking at physical factors such as rainfall, soil type and land use, one should look at farmers' use and ownership of agricultural inputs, socio-economic characteristics and access to organisational services. Essa and Nieuwoudt's (2003) research shows that these small-scale farmers generally have problems with insecure and fragmented land rights, communal tenure arrangements, non-viable and small farm units, overstocking, and the deterioration of land. They also lack support infrastructure, water supplies, transport and communication networks, financial support, extension and research.

Kirsten and van Zyl (1998) argue that while using the typology differentiating between small-scale and large-scale farms may be useful to better understand farms and their farming activities and outputs in other parts of the world, literature suggests that this is not the case in South Africa. In fact, like many of the other typologies applied in South Africa, these types do not exist without values attached to them. Kirsten and van Zyl (1998) for example argue that small-scale is often a term that is thought of in a negative way, for example, with negative connotations such as "backward", "non-productive", and "non-commercial". In addition, further links are made between small-scale and subsistence, small-scale and homeland areas, and small-scale and black farmers. In contrast, large-scale farming in South Africa is described using terms such as "white," "commercial," "modern," "efficient" and "advanced technology". Essa and Nieuwoudt (2003) note that this may be attributed partly to the fact that small-scale farming developed almost entirely as a separate mode of agriculture in South Africa due to historical, economic, social and political factors.

Kirsten and van Zyl (1998) argue that international empirical evidence from Asia, Latin America and Africa shows that given a level playing field, small-scale farmers in developing countries are considered to be more efficient as compared to large-scale farmers. What is important to note, however, is that the policy environment in South Africa has historically favoured the enlargement of farming (Kirsten and van Zyl, 1998). According to Kirsten and van Zyl (1998), a small number of case studies in South Africa have shown that small-scale farmers in South Africa are at least as viable, profitable and efficient as their large-scale

counterparts; however, the relative efficiency of these farmers depends on the neutrality of the policy framework facing farmers.

Family Farms

Another type of farming found in the literature that is linked to modes of economic production is the family farm type, which focuses mainly on the utilization of labour as a production input. Kirsten and van Zyl (1998) argue that family farms, by definition, are farms “where the owner is the operator and where his/her family provides the large bulk of the regular labour requirements throughout the year”. Van Averbeké (2008) notes that literature identifies five elements of the family farm, which include the following criteria: 1) those in charge of the business are related by kinship or marriage; 2) family members provide capital to the business; 3) family members do farm work; 4) ownership and control of the business are transferred between the generations over time; and 5) the family resides on the farm.

6.2.2 Typologies based on specific research or policy needs

There are also other ways to understand different types of farming and farmers that do not focus specifically on the mode or size of production, but rather on diversity within the groups identified and the socio-economic characteristics of these groups. These typologies are developed for specific needs, such as to feed into strategy or policy development. For example, Essa and Nieuwoudt (2003) build a typology for the purposes of identifying the dimensions of small-scale farmers in order to inform policy interventions. They used a Principal Component Analysis to categorize a number of socio-economic variables, and eventually produced six component groups that represent the different types of small-scale farms in communal areas in KwaZulu-Natal (see Box 1).

Box 1: Component analysis to inform policy interventions (Essa and Nieuwoudt, 2003)

- Component 1 is an emerging commercial and mechanized household (i.e. it uses machinery)
- Component 2 is a landless farm household that is more educated and earns more non-farm related income, largely from contractor services.
- Component 3 is a non-farm female-headed household that depends on income from land renting and a non-farm job. This is a resource-poor household.
- Component 4 is a small intensive garden farmer household headed by a more educated female with better access to institutional services.
- Component 5 is a less educated, female-headed and land-poor household that rents in more land and is an intensive producer.
- Component 6 is a land-less household that rents in land and is also involved in contractor services. The implication is that policies aimed at assisting small-scale farmers should take into account the different dimensions of farmers, as economic policies may influence different households differently.

Similarly, Denison and Manona (2007) developed a typology to inform strategies for irrigation scheme revitalisation. The typology is divided into theoretical farming styles, which they argue will “allow for practical early decision-making in the planning process regarding the general nature (mix of styles) of the scheme development, which otherwise gets overwhelmed by diversity or is simplified to death by generalisation.” The typology consists of four theoretical farming styles, each with a narrative description of the elements or attributes of the style. The theoretical farming styles are: The “Business Farmer” – commercially oriented production on consolidated larger farms; the “Smallholder Farmer” – lower risk, diversified farming; the “Equity-Labourer” – plot-holders in large scale commercial partnerships; and the “Food Producer” – intensive home food gardening.

Laurent et al. (1999), while doing research in Khambashe, an area that forms part of the Amatola District Council in the central zone of the Eastern Cape Province, classified rural agricultural households into a typology for the purposes of improving their livelihoods through agricultural technology innovation. They developed a typology which identifies seven types according to the farmers’ means of income (see Box 2).

Box 2: Typology for the purposes of improving their livelihoods through agricultural technology innovation (Laurent et al, 1999):

Type 1. "Moneyless" households: People do not farm for the market. They have no regular source of income (other money earning activity, pension ...) and get a very low total monetary income (less than R1000 per year). When they have access to land they have a small agricultural activity. For this activity they do not buy inputs (fertilisers, seeds, ...) but they can benefit from some resources from their neighbours.

Type 2. "Households depending on social welfare grants and family remittances ": People farm for home consumption, not for the market. Pensions are the main source of income for most of them. Other households rely on children grants and family remittances from parents who work far away.

Type 3. "Households earning income from non-farming activities": People farm for home consumption, not for the market. They get income from non-farming activities.

Type 4. "Households whose main source of income is farming": Farming is their main source of income. They sell on the market and farming is the main source of income for the household who runs the farm. They employ casual and/or salaried labour. They consider themselves as farmers and they are involved in farmers' professional organisations. They may use a high level of inputs in their farming activity.

Type 5. "Households who define a minor part of their income from commercial farming": Farming is seen as part of a complex set of income and activities. They sell on the market but farming is not the major source of income. They have other gainful activities (salaried activities, self-employment, ...). Some earned low cash income from agricultural activity at the moment of the survey but planned to increase it.

Type 6. "Landless households": These households have no access to land, not even a family garden. They do not farm for themselves. Most of them get pensions and/or family remittances. These households were located in resettlement areas

Type 7. "Households with access to land, who do not farm": These households consist of old people, who get remittances, and are not able to embark on agricultural activity.

In comparison, van Averbek and Mohamed (2006), in their research on the Dzindi irrigation scheme in Thulamela Local municipality in Limpopo Province, develop three types of farming styles, namely food farmers, profit-makers and employers. The authors describe these farming styles by looking at themes such as farmer objectives and attitudes towards risk (what do they want to achieve with the farming), farmer strategy (type of tractor service, choice of crops, planting date, plot use intensity and approach to marketing), and key constraints (constraints to being successful in their endeavours).

Scoones et al. (2010) presents a livelihood typology for new resettlement households in Zimbabwe (see Box 3).

Box 3: A livelihood typology for new resettlement households (Scoones et al, 2010):

Dropping out (10%): distinguishing between three reasons: “Exists”, i.e. those who have abandoned their plots for various reasons, no-one is living on the land. “Chronically poor”, i.e. those with no assets and no support. “Ill health”, i.e. suffering from severe health challenges.

Hanging in (33.6%): three strategies: “Asset poor farming”, i.e. limited assets, but heavy reliant on support. “Keeping the plot”, i.e. the plot is being kept for the future, little activity, but no pressure to sell or exit. “Straddling”, not producing much on the plot, but no pressure to sell or exit.

Stepping out (21.4%): four strategies: “Survival diversification”, i.e. sufficient production for household use only in some years, diversified income required to survive. “Local off-farm activities”, i.e. complete diversified income from which farming forms part of. Cross subsidisation between different income streams. “Reliance on remittances” i.e. those who receive either state grants or foreign income from family to stay on the farm. “Cell phone farmers”, i.e. those who generate the bulk of their income outside farming, but keeping the farm as a “backup”.

Stepping up (35%): three strategies: “*Huradza*”, i.e. the ‘real farmers’ accumulating through agriculture as some communal areas did before. Sell to diversified markets, and have sufficient resources. “Part-time farmers”, i.e. farming is a hobby, but is managed on healthy financial principles. “New commercial farmers”, i.e. those with skills and resources and stand right at the verge of being a commercial farmer.

These different kinds of typologies are more difficult to measure, as they deal with attributes that are not necessarily measurable; such as attitudes, farmer objectives, strategies and so forth. Also, these typologies look to incorporate diversity rather than to minimise it.

Finally, the last type of farmer or farming activity which needs to be discussed under this heading is that of the emerging farmer. This concept deserves sufficient attention to warrant a separate sub-section.

6.2.3 Understanding the concept “emerging farmer”

In South Africa, the concept “emerging farmer” has been very loosely defined. For example, it is often used when describing a group of individuals who are involved in agricultural activities especially in the rural (and often former homeland) areas. Van Averbeké (2008) notes that “the concept of ‘emerging farmer’ is understood to refer to farmers who have a ‘desire’ to commercialise their production”; while Makhura et al. (1998) note that an emerging farmer “uses various coping strategies to earn an income from limited resources”. Lahiff et al. (2012) on the other hand define emerging farmers as “a new (or ‘emerging’) group of workers, shareholders, smallholders, entrepreneurs or community members with limited commercial experience and little or no access to finance or leading-edge markets”. Boonzaier (2009) uses the term “small, resource-poor farmers” as synonymous with emerging farmers.

These definitions, however, ignore some elements of the important socio-political context which is critical to understanding the position which this group of farmers occupies in the space that is the South African agricultural sector. The definition should in fact be applied to a specific group of farmers who through the historical injustices of the past are classified as “previously disadvantaged”; in other words, black South Africans. A better definition could therefore be that the concept “emerging farmer” is “an ambiguous, yet widely used term describing black farmers who receive support to engage in agriculture” (Denison and Manona, 2007). However, Denison and Manona (2007) argue that the parameters for this ambiguous group of people have not been defined, and as a result it is unclear as to when the “emerging process” can be said to have been successful or completed.

The following section is a short overview of how different government departments and the Land Bank use the term “emerging farmer” in policy documents. The conclusion from this overview is that this term, alongside other terms, is used widely but not very well or consistently defined.

Department of Rural Development and Land Reform (DRDLR)

In its Strategic Plan of 2010-2013, the DRDLR refers to “emergent black farmers” as one of its core clients. It does not, however, provide a definition for this term (DRDLR, 2010). DRDLR classifies qualifying beneficiaries of its agricultural transformation policies into three broad categories. The first category is made up of landless poor people who need land for shelter or household food production. These approximately 2.8 million people include people who live on commercial land without any security of tenure, landless poor people who live in and around rural small towns, and people from overcrowded former homelands. The needs of these people can be met by providing small units of land to accommodate their specific needs. Such people are not regarded as farmers, but would require land for shelter, ploughing and grazing to meet their basic household needs. DRDLR is currently developing a support package to meet these specific needs (DRDLR, 2010).

The second category comprises small-scale farmers with proven ability and commitment to farm, but who cannot expand as they do not have enough land or access to finance, and also lack technical support. These people are found in communal areas or commercial farms. DRDLR will focus on targeting this category in particular as they are seen as having a good chance of success. The department will aim to focus on production discipline, skills development, mentorship and job creation as the necessary conditions for obtaining government support. DRDLR would measure its success in this area by the number of farmers in this category who would be able to graduate to the commercial level (DRDLR, 2010).

The third category is made up of relatively established black farmers who are already entrepreneurs. These farmers have largely managed to achieve their success despite limited or a lack of government support. DRDLR sees these farmers, together with the second category, as standing a good chance to contribute to the country’s food security, also by

complementing the efforts of existing commercial farmers. Again, it is acknowledged that these farmers will require support from the government (DRDLR, 2010).

The Proactive Land Acquisition Strategy (PLAS) defines its target group as “black people (Africans, Coloureds and Indians), groups that live in communal areas and black people with the necessary farming skills in urban areas, people living under insecure tenure rights. In this way the framework seeks to contribute to the decongestion of the communal areas, secure on or off farm accommodation and to create sustainable livelihoods. While the approach is pro-poor, it also caters for emergent and commercial farmers”. The document also does not define the term “emergent” farmer (DLA, 2006).

Department of Agriculture, Forestry and Fisheries (DAFF)

The White Paper on Agriculture (DoA, 1995) refers to resource-poor farmers. Although this term is not defined, the White Paper recognises the need to direct financial resources towards these farmers in order to enable them to purchase land and agricultural inputs. The White Paper further calls for the support of resource-poor farmers through appropriate training, extension and research. DAFF has its own categorisation of farmers (although in many ways similar to DRDLR’s classification) as part of its Integrated Growth and Development Plan (2012). Commercial farmers are interpreted as being predominantly white farmers who occupy about 82 million hectares. It is believed that they produce above 95% of the country’s formal marketed agricultural output. Smallholder farmers are predominantly black farmers and mainly farm in the country’s former homeland areas. This area makes up approximately 14 million hectares, but also includes a large number of subsistence producers. Finally, subsistence farmers comprise approximately two million households, who engage in agricultural activities primarily for their own consumption.

The Integrated Growth and Development Plan (2012) also uses such terms as emerging farmers, emerging producers, resource-poor/beginner farmers and emerging growers and emerging black entrepreneurs, particularly in relation to the forestry sector. All of these terms are however used without definitions. The Land and Agricultural Reform Programme (LARP) talks about “new producers from and in rural, peri-urban and urban areas” as a target group for priority 1. This priority refers to redistributing 5 million hectares of white-owned agricultural land to 10 000 farm dwellers and new agricultural producers. It also refers to “new primary producers, farm dwellers, communal farmers, new and existing black agribusiness entrepreneurs from and in rural, peri-urban and urban areas” as a target group for priorities 2 to 5. Priorities 2 to 5 refer to increasing black entrepreneurs in the agribusiness industry by 10%, providing comprehensive support to the target group, increasing agricultural productivity by 10-15% and increasing agricultural trade by 10-15%. The document also uses the term “emerging farmers,” but again does not define the term (DoA, 2008a).

Department of Water Affairs (DWA)

The Department of Water Affairs' 2004 Policy on Financial Assistance of Resource Poor Irrigation Farmers (DWAF, 2004) uses the term "resource poor farmers" referring to farmers who are South African citizens and members of historically disadvantaged population groups.

The Land Bank

The Land Bank (2011) released a research report on "Addressing challenges of financing emerging farmers", a relatively new mandate for the Bank. While the report analyses the factors influencing the success or failure of emerging farmers, it offers only a scant definition of what it means by the term "emerging farmer". The definition is "emerging farmers are those who were previously excluded from mainstream agriculture based on their skin colour, and who are now accessing resources and farming for the market".

Overall, it is challenging to find an adequate definition for "emerging" farmers in government documents, let alone consensus with regards to its meaning. The term is used, but hardly ever defined. It is easier to find definitions related to what is meant by the term "emerging farmer" in the agricultural economics literature. D'Haese et al. (1998) refer to small-scale farmers in their case study as farmers whose farms are smaller than 20 ha. According to Bonzaaier (2009), the term "small-scale" farmer is often viewed in a negative light and is also often associated with "backward", "non-productive", "non-commercial", and "subsistence" farming, which dates back to the apartheid government's policy of restricting assistance to farmers with small farms. However, the size of a plot should not be the only consideration for what can be considered small-scale farmers, a term that is usually associated with black farmers farming or living in the former South African homelands. Many white South African farmers also referred to as commercial farmers manage to farm successfully on less than 10ha of land.

There is a definite link in the literature between small-scale and emerging farmers, as small-scale black farmers are these days often referred to as emerging farmers, who are in the process of emerging from subsistence to commercial farming (farming mainly for income) (Bonzaaier, 2009). Jari (2009) cites the Department of Agriculture (now DAFF) as stating that 'emerging farmer' is a relatively new term used to define previously underprivileged farmers who are determined to enter the commercial farming space. Because such farmers have the potential to expand into commercial farming, they are also known as developing farmers. Some of what these farmers produce is for their own consumption, but they are mostly interested in selling their produce. D'Haese et al. (1998) add an element of ambition to this definition. They use the term "emerging" for farmers who "want to move from subsistence to commercial farming, selling part of their output to the market". It is this 'ambition' that separates them from subsistence farmers.

Rother et al. (2008) reflect on the complicated nature of defining an "emerging farmer". They state that by the late 1990s the term "emerging farmer" came into use as land reform started

taking on a commercial farming focus. These authors also emphasise government's underlying intention that emerging farmers need to, over time, become more productive, market an increasing proportion of their output and increase their profitability. The term emerging farmer therefore represents the vision of an initially resource-poor new farmer who succeeds by eventually moving into the ranks of the established white commercial farming sector. In their research, Rother et al. (2008) confirm that the emerging farmers they interviewed define themselves according to what they are moving towards or are aspiring to become, in other words according to where they want to be and not where they are currently. This research therefore confirms the assumption that 'emerging farmer' can be seen as an aspirational category, and shows the ambitions of a farmer who is producing within the constraints of limited secured access to capital, production inputs, markets, land, labour and skills.

Emerging farmers are often inexperienced and therefore do not have access to physical resources such as the necessary infrastructure, equipment and capital to embark on commercial agriculture (Bonzaaier, 2009). Jari (2009) supports this view by stating that emerging farmers, similar to smallholder farmers, find it difficult to penetrate already established markets and have limited resources to support their ability to produce. They also generally have problems with land tenure, as often they do not own the land they farm on.

Given the lack of clarity and consistency around the use of the term emerging farmer, a range of other terms are also commonly used to describe farmers who fall within the emerging farmer sub-sector. These terms include "smallholders", "small-scale farmers", "resource poor" farmers, "subsistence farmers", "small growers" or "smallholder farmers". These terms are opposed to the terms "commercial farmers" or "large-scale farmers" (Bonzaaier, 2009).

It should be clear that the term "emerging farmer" has many meanings, and many of them are ideologically driven. It may therefore have little analytical merit, but remains a politically important term as it has an important effect on raising and directing resources.

6.3 *A typology to understand the basis on which farmers in the study area can be categorized for the purpose of this study*

6.3.1 The purpose of the typology

The purpose of the typology is vested in Research Question 1 (see Table 1), which requires the development of a framework in which to categorise farmers in order to both assess water use efficiency and develop guidelines that are target-audience specific. With reference to the previous section, it is clear that the typology that we are suggesting will have to transcend both kinds of typologies; i.e., we need a typology that deals with relevant economic principles of production and scale, but which is also tailored to a specific need which has as much to do with context and social reality as with measuring production and

efficiency. This typology will serve as a context to assess water use efficiency, and forms the basis for guideline development.

6.3.2 Context within which the typology is embedded

Any typology is situated in the context within which it was developed. In the case of the typology developed here, we have identified three important contexts. Firstly, we look at the emerging farmer context within South Africa; secondly we examine the context provided by current economic definitions of subsistence and commercial farming types; and lastly, the local farmer context which provides an emic understanding for the typology.

6.3.2.1 Policy and political ethos in South Africa; and government support programmes for emerging farmers

The typology we have developed is specifically for farmers in our case study area who are also identified as emerging farmers by the South African government. Section 6.2.3 has already discussed the way in which the concept 'emerging farmer' is defined and understood. For our typology, this concept provides an important context within which the typology is embedded and operates. In the following discussion of this emerging farmer context, we identify a clear policy and political ethos in South Africa that supports the existence of this group and their migration from being subsistence-orientated to commercial-orientated. Within this migration we also find an implicit hierarchy in the process, where remaining a subsistence farmer is considered 'less desirable' than becoming a commercial farmer.

In the AgriBEE charter (DoA, 2008b), agriculture is defined as "all the economic activities associated with the production and processing of agriculture from the provision of farm inputs, farming, value addition and right up to the consumer." Agriculture from a BEE perspective thus has a clear commercial angle to it, and black farmers are expected to partake in commercial agricultural activities.

This commercial AgriBEE focus is also evident in DAFF's aim to facilitate broad-based black economic empowerment in the agricultural sector by implementing initiatives to include black South Africans at all levels of agricultural activity and enterprise along the entire agricultural value chain, by:

- "Promoting equitable access and participation of black people in the entire agricultural value chain;
- De-racialising land and enterprise ownership, control, skilled occupations and management of existing and new agricultural enterprise;
- Unlocking the full entrepreneurial skills and potential of black people in the sector;
- Facilitating structural changes in agricultural support systems and development initiatives to assist black South Africans in owning, establishing, participating in and running agricultural enterprises;
- Socially uplifting and restoring the dignity of black South Africans within the sector;

- Increasing the extent to which communities, workers, co-operatives and other collective enterprises own and manage existing and new agricultural enterprises, increasing their access to economic activities, infrastructure and skills training;
- Increasing the extent to which black women, people living with disabilities and youth own and manage existing and new agricultural enterprises, increasing their access to economic activities, infrastructure and skills training;
- Empowering rural and local communities to have access to agricultural economic activities, land, agricultural infrastructure, ownership and skills;
- Improving protection and standards of land rights and tenure security for labour tenants, farm workers and other vulnerable farm dwellers and addressing the inherently paternalistic nature of relationships associated with insecure tenure by promoting more permanent forms of tenure with the emphasis being on the transfer of ownership of land" (DoA, 2008b).

Also, in terms of the AgriBEE charter (DoA, 2008b), AgriBEE is very important to the long-term growth and competitiveness of the agricultural sector. The aim of activities linked to AgriBEE is to create viable and sustainable enterprises in the agricultural sector. This again suggests that productive use of land is the underlying ethos of the support that government renders to black farmers.

This ethos plays out in expectations that established agri-industry (mostly commercial farms owned by whites) should sell land at market value or lease it, enter into partnerships with black farmers through equity schemes or joint ventures, and sell agri-business assets; and for the government to continue working towards meeting its land reform objectives. There are also expectations of established agri-industry to promote the participation of black people in management positions and to promote employment equity. Training of black people in the agricultural sector is also aimed at contributing towards enhanced productivity of the sector. There is also a strong focus on enterprise development and the development of the operational and productive capacity of black enterprises and focusing on mentoring, access to inputs, credit, infrastructure, markets, technology and extension services (DoA, 2008b). Added to this is a focus on skills transfer from white commercial farmers to black subsistence farmers (Joemat-Pettersson, 2010).

A problem with the government's very strong focus on commercial agriculture is that state agencies often impose poorly designed or inappropriate business plans (also known as farm plans). These plans encourage the production of high-value commodities for the market without necessarily considering the financial or technical resources available to the emerging farmer in question. These plans also tend to discourage the subdivision of land into family plots or the production of food for direct consumption because of the associated decreasing economies of scale associated with subdivision (Lahiff, 2007: 1590; van den Brink et al., 2006: 45).

Interestingly, in what seems to be a move toward finding ways to support farmers who do not have the means to farm on a large commercial scale, DAFF in its strategic plan of 2012-

2016 outlines two new policy initiatives: the Zero Hunger Programme and the Strategic Plan for Smallholder Producers. The Zero Hunger Programme ties in with the ethos of subsistence and small-scale farming in that it aims to link subsistence and smallholder producers to government organisations such as government schools, hospitals and prisons. The idea is that these agricultural producers are able to meet the nutritional needs of low-income individuals and households in communities. This initiative could also enable subsistence farmers to become small-scale farmers, thereby helping them take the necessary step to move from subsistence only to small-scale commercial farming. Zero Hunger has not yet been adopted as a formal policy, but is being tested and refined through collaboration with DAFF, provincial agriculture and through links to the Comprehensive Agricultural Support Programme (CASP). The Zero Hunger campaign strives to boost productivity and sustainability among smallholder producers. This campaign will therefore require strong integrated support services as well as guaranteed market access (DAFF, 2012).

The Strategic Plan for Smallholder Producers aims to improve support to smallholder producers and increase the numbers of smallholder producers. The idea is to align and, if necessary, adjust separate functions such as extension, cooperative development, marketing, mechanisation, financial services, etc. This plan is closely related to the Zero Hunger initiative, and DAFF has initiated a Smallholder Development Working Group, which is made up of members from provincial departments of agriculture, the Agricultural Research Council (ARC), DRDLR, the Economic Development Department (EDD) and DAFF. The aim is to increase the number of smallholders from 200 000 to 250 000 by 2014 and to 500 000 by 2020. These smallholders need to remain viable and contribute meaningfully to food security and job creation in rural areas (DAFF, 2012). DAFF's focus on supporting small-scale farmers and subsistence farming also becomes evident in the agrarian transformation focus of DRDLR, which emphasises expanding and supporting individual households to improve food security and developing smallholder family farming initiatives (DRDLR, 2010).

The strategy of DRDLR is one of "agrarian transformation", which translates as "the rapid fundamental change in the relations of land, livestock, cropping and community". This, among other things, focuses on establishing rural business initiatives, agro-industries, co-operatives, cultural initiatives, and local/rural markets; and on empowering rural people and communities. DRDLR also particularly focuses on trying to achieve the following: sustainable land reform, food security, rural development, and sustainable livelihoods and job creation, with a focus on skills training. With regard to emerging farmers in particular, DRDLR has consolidated its resources for the different land reform support programmes, including the Land Reform for Agricultural Development (LRAD) programme, the Settlement and Production Land Acquisition Grant (SPLAG) programme, and restitution projects. There is also a realisation that rural development and sustainable livelihoods can only be achieved if mechanisms are put in place to deal with post-settlement support and effective mechanisms for disaster mitigation and management (DRDLR, 2010).

In order to realise the agrarian transformation strategy, rural development and sustainable livelihoods, and to achieve food security, DRDLR seeks to implement an improved land reform programme, as suggested by the Green Paper on Land Reform (DRDLR, 2011a), and will also develop and implement joint programmes with other sector departments, spheres of government and the private sector (DRDLR, 2010).

Overall, DRDLR will measure its success in bringing about land reform and agrarian transformation through the number of jobs created, increased incomes, and a critical mass of successful farmers who are able to contribute to the gross domestic product (GDP) and balance of payments (DRDLR, 2010). Refer to section 4.4.2 for a summary of key and often overlapping programmes indicating what support is available for emerging farmers and how well these programmes are currently functioning.

6.3.2.2 *Subsistence and commercial – categories used as primary identity markers*

The emerging farmer typology we developed refers innately to ways in which farmers have been traditionally referred to, namely, subsistence and commercial. These two definitions are at their core, economic in nature. Much has been written on the distinction between subsistence farming and commercial farming (see Section 6.2.1). Such a definition is also necessary in order to effectively ascertain the mode of assessment to be used when determining water use efficiencies amongst different farmers. As such, it is also necessary to use the traditional categories of subsistence and commercial as prime identity markers in our typology. Towards this purpose we therefore define the two identity markers as follows:

Subsistence farming: A farmer who produces mainly for own use/consumption (self-sufficiency). This form of farming is mostly found in situations where people cannot afford to buy food (affordability), or if no food is available to buy (absence of formal / informal markets). The range of crops/animals is necessarily broader as compared to commercial farmers. Regular purchases in the market place are not a prerequisite; however, subsistence farmers will trade their surpluses if the opportunity presents itself.

Commercial Farming: Profit seeking agri-businesses. The dominant strategy for profit-seeking in agriculture is to maximize both the yield per hectare and the price received per unit of produce, while minimizing the production cost (or combination of these). Yield maximization is achieved via product specialization and input-intensification (fertilizer, hybrid seeds, irrigation, etc.). Economies of scale and the employment of labour-saving technology are the two main drivers of cost minimization. Commercial agriculture enables the production of surpluses, which allows the bulk of the population to venture out of agriculture into secondary and tertiary sectors of the economy. The majority of people can then fulfil their dietary requirements as consumers, using currency earned outside of agriculture to purchase food.

6.3.2.3 Local farmer context to the typology

Qualitative interaction in the form of interviews with a variety of farmers in the study area revealed that they generally identify three types of farmers present in the area. These are: subsistence, commercial and emerging. However, the way in which they define these three categories was revealed to be somewhat different to the formal definitions discussed thus far. Nevertheless, it is useful to understand the way in which farmers understand these categories, because this emic understanding can help us to better understand the categories themselves, as well as people's actions and behaviour with regards to water use. In addition, it tells us something about how these people see and understand the world in which they operate, as well as their aspirations, which are not only driven by their own needs and wants, but also generated through socialisation and government intervention.

"A subsistence farmer does not contribute to the economy; they do not employ people or sell anything"
respondent

The following sections look at each of these categories and illustrate how farmers speak of each of these categories.

SUBSISTENCE FARMER:

Farmers generally speak of subsistence farmers by referring to four elements:

Market: Interviewees identified subsistence farmers as farmers who have no access to a market, do not sell their crops, and only produce for their own households. Many also noted that because subsistence farmers do not sell their crops, they do not contribute to the economy.

Employment: Subsistence farmers do not employ others to work on their farms.

Capital: Subsistence farmers have no capital to purchase inputs for farming.

Size of land: Subsistence farmers only have small pieces of land which restricts them from producing more than what is required for the household.

"An emerging farmer is one who makes little money from farming. Someone who starts farming but doesn't have knowledge or money. They want to become commercial".

respondent

EMERGING FARMER:

Farmers generally speak of emerging farmers by referring to seven elements:

Attitude: Farmers noted that emerging farmers have an entrepreneurial attitude to their farming

Market: Emerging farmers can both produce for their own consumption and sell to the market. However, these farmers are often limited to the local market only.

In terms of the other farming categories: An emerging farmer occupies a space somewhere between the subsistence farmer and the commercial farmer. Emerging farmers are “developing farmers”.

Strategic partnership: Emerging farmers are often in strategic partnerships with other (generally white), more advanced commercial farmers. Often the strategic partner is mentioned as having an “over-seeing” role.

Government interest and intervention: High levels of government intervention are observed. Farmers argue that emerging farmers can be supported by government through grants, but in turn are monitored. Some argue that emerging farmers do not get enough support from government.

Making money: Emerging farmers do not make a lot of money, but are hoping to (when they become fully-fledged commercial farmers).

Aspirations: Emerging farmers aspire to become commercial farmers, but they don't have all the necessary knowledge or money.

COMMERCIAL FARMER:

Farmers generally speak of commercial farmers by referring to six elements:

Making money: Farmers understand commercial farmers to be rich and make a lot of money.

In terms of other farming categories: Other farmers should aspire to become commercial farmers. Commercial farmers have lots of knowledge that they can share with other farmers.

Market: Commercial farmers are seen to be large scale and produce for the international market.

Higher purpose: Commercial farmers are thought to have a higher purpose in that they “feed the nation”.

System: Commercial farmers have advanced farming systems in place, such as record keeping, irrigation and so forth.

Size of land: Commercial farmers need large plots of land to be successful.

Thus, although farmers in the case study area have identified three categories of farmers, they do not use the same elements to describe what each of these categories entail. The



“A commercial farmer is one who makes lots of money!”
“Commercial farmers are successful, they feed the nation”
respondent



different elements that farmers in the case study area have used to explain the different types of farmers are compared in Table 10 below.

Table 10: Different elements that farmers in the case study area have used to explain the different types of farmers

	Subsistence	Emerging	Commercial
Categories used to describe the type of farmer by farmers in the case area	MARKET	ATTITUDE	MAKING MONEY
	PROVIDE EMPLOYMENT	MARKET	IN TERMS OF OTHER FARMING CATEGORIES
	MAKING MONEY	IN TERMS OF OTHER FARMING CATEGORIES	MARKET
	SIZE OF LAND	STRATEGIC PARTNERSHIPS	HIGHER PURPOSE
		GOVERNMENT INTEREST AND INTERVENTION	SYSTEMS
		MAKING MONEY	SIZE OF LAND
		ASPIRATIONS	

This table gives a good overview of the way in which farmers frame different types of farmers in the case area. From this we can also make some observations:

Observation 1:

The elements “market” and “making money” are the elements most used by farmers to distinguish between the different categories of farmers. Both of these are easy and obvious to identify and can thus easily become indicators (attributes) for the type of farmer. There is also an observable link that farmers make between accessing a specific kind of market and the amount of money to be made. Therefore subsistence, local market access and making little money are discussed with serious negative overtones, whereas commercial, access to international markets and making lots of money are discussed in a way which indicates success of the farmer.

Observation 2:

Farmers were mostly unsure of the distinction between subsistence farmer and emerging farmer, and often used the two terms interchangeably. One could argue that this is the case because the two terms can in fact refer to the same farmer (refer to our proposed typology). The difference is that the definition of the term ‘subsistence farmer’ is economic in nature; while that of “emerging farmer” is generally political in nature (in the South African context).

Observation 3:

Farmers perceive a clear progression between categories of farmer identified and the value attached to these categories. For example, the fact that subsistence farmers do not “fulfil a higher purpose”, while commercial farmers “feed the nation” and “participate in the economy” indicated a clear hierarchy between the two categories.

Observation 4:

Personal motivations for farming, other than money, as well as attitudes and aspirations, do not feature high up in the hierarchy of elements farmers use to distinguish between the different types.

6.4 How does the typology work?

Six basic types of emerging farmers emerged from the qualitative research conducted in the study area. The six types identified in the typology are presented in Table 11.

Table 11: Emerging farmer typology

Type 1 (T1)	•The “really” big guys
Type 2 (T2)	•The big guys in training
Type 3 (T3)	•The entrepreneurs
Type 4 (T4)	•The transitioners
Type 5 (T5)	•The wishful thinkers
Type 6 (T6)	•The “survivalists”

In order to make sense of the types, the typology defines attributes according to which each type can be discussed. In this way the typology allows for diversity to be discussed without taking away its ability to still compare the different types. The attributes chosen for this typology speak directly to the need (expressed above) to categorise farmers in a way that facilitates assessment of their water use efficiency, by including some attributes that specifically focuses on their position on the economic trajectory from subsistence to commercial, and also examines water conservation and agronomic practices. The attributes are also chosen to illustrate the social reality in which the types have to operate – a necessity that will feed directly into decisions regarding the development of guidelines. The following sections give a brief discussion of each of the attributes in terms of the case study context from which the typology has emerged.

6.4.1 Agricultural economic practices as distinctive attributes

The attribute ‘agricultural economic practices’ looks at where on the trajectory of subsistence versus commercial the farmer and the associated farming practices are located. See Table

12 for the specific questions being asked under this attribute. Note that these questions are based on accepted economic principles embedded in the context of the case study area, and which are under-pinned in each of these types, namely subsistence and commercial.

Table 12: Agricultural economic attributes being considered

Questions	Subsistence farming	Commercial farming
Main reason for production?	Main priority is to serve livelihoods	To make a profit (it's a business)
Government support?	Yes	No
Farming main source of income?	No	Yes
Other sources of income?	Yes	No
Variety of crops?	Wide	Small
Annual crops?	Yes	Yes
Perennial crops?	No	Yes
Target user of produce?	Mainly own consumption	National and International market
Make use of trade agent?	No	Yes
Member of a growers association?	No	Yes
Export?	No	Yes
EUROGAP or similar compliant?	No	Yes
VAT registered?	No	Yes

In terms of the typology then, the distinctive attributes that commercial or subsistence farming practices and approaches bring to the types are then incorporated as follows.

T1	• <i>The “really” big players</i> : Generally identified as large scale commercial farmers who do not need to be in a strategic partnership
T2	• <i>The big players in training</i> : Generally identified large scale commercial farmers but who still need to be in a strategic partnership
T3	• <i>The entrepreneurs</i> : Generally identified as small scale commercial farmers with aspirations to grow their farming business
T4	• <i>The transitioners</i> : Generally identified as subsistence farmers well on their way to become commercial farmers
T5	• <i>The wishful thinkers</i> : Generally identified as subsistence farmers with vague aspirations to be commercial
T6	• <i>The “survivalists”</i> : Generally identified as subsistence farmers with no aspirations to be commercial

6.4.2 Strategic partnerships as a distinctive attribute

There are a number of strategic partnerships in the case study area, ranging from formal and large scale, to those which are informally established between individuals. As previously mentioned, these partnerships are primarily between already established commercial farmers (in our study area these farmers were all white farmers) and emerging farmers (both subsistence and commercial).

Lahiff et al. (2012) argues that the term “strategic partnership” is interpreted differently in South Africa as compared to international business literature. The term ‘strategic partnership’ is used to refer to a “joint venture or other form of collaboration between an established commercial firm and a new (or ‘emerging’) group of workers, shareholders, smallholders, entrepreneurs or community members with limited commercial experience and little or no access to finance or leading-edge markets” (Lahiff et al, 2012). These kinds of partnerships often have social as well as economic objectives (often as stipulated by government policy and linked to funding) around empowerment of workers, skills transfer, accelerated career paths and creation of trading opportunities for small and micro-enterprises (Lahiff et al., 2012).

Four strategic partnerships were investigated in this study, three of which were associated with the Moletete CPA. The other strategic partnership was between a strategic partner and the Motsemetse Trust near Hoedspruit. It is important to mention however that while we have investigated these specific strategic partnerships in more detail, there are other similar partnerships which occur in a more ad hoc way and are as such more difficult to investigate, as they often have no formal agreement in place. In terms of the Emerging Farmer Typology, we have identified strategic partnerships as playing a prominent role in the types T2 to T3, where the formal strategic partnerships are most observable in T2, while the ad hoc partnerships are most observable in T3.

T1	• <i>The “really” big players</i> : Generally identified as large scale commercial farmers who do not need to be in a strategic partnership
T2	• <i>The big players in training</i> : Generally identified large scale commercial farmers but who still need to be in a strategic partnership
T3	• <i>The entrepreneurs</i> : Generally identified as small scale commercial farmers with aspirations to grow their farming business
T4	• <i>The transitioners</i> : Generally identified as subsistence farmers well on their way to become commercial farmers
T5	• <i>The wishful thinkers</i> : Generally identified as subsistence farmers with vague aspirations to be commercial
T6	• <i>The “survivalists”</i> : Generally identified as subsistence farmers with no aspirations to be commercial

Between 2007 and 2010, the Moletele CPA formed strategic partnerships with four enterprises: New Dawn, Batau, Dinaledi and Richmond. New Dawn, Dinaledi and Richmond were investigated in this study. Each of the partnerships in place at Moletele involves a contractual agreement between the Moletele community, represented by the Moletele CPA, and a private-sector company. The CPA is supported, in terms of both grant finance and advice, by a range of state agencies from national, provincial and local government (Davis and Lahiff, 2011).

According to the contractual agreement, the private-owned company operates all agricultural activities along commercial lines, but does not own the land. When these strategic partnerships were established, it was anticipated that the CPA would own 52% of the new enterprises and the strategic partners would each own 48%, and that this would be reflected in the composition of the respective boards of directors and in the distribution of profits (dividends). However, this model has evolved over time and many of the expected activities and benefits have not materialised. For example, early proposals to include farm workers of the Moletele community as minority shareholders in the joint venture companies have been dropped, apparently due to opposition from both the CPA and the strategic partners (Davis and Lahiff, 2011).

These strategic partnerships cover combined plot sizes ranging from 700-2434 ha, although some of this is not irrigated land. All the Moletele CPA strategic partnerships have water licenses and their water allocations comprise of direct abstraction from the Lower Blyde River, an allocation from the Lower Blyde Irrigation Pipeline project, as well as a share of what is referred to as the "Blyde 800." The Blyde 800 is a subsidy scheme of the Department of Water Affairs for an allocation of pipeline water designated to emerging farmers as part of a contractual agreement articulated when the development of the pipeline was negotiated by the then Minister of Water Affairs, Prof Kader Asmal. The Department's interest was to save water and to 'empower former disadvantaged people' at minimum costs. In the pipeline plans it was estimated that 10% in extra water savings could be made on top of the regular savings. The Minister decided that this water could be used for black emerging farmers. The amount of this extra water is approximately 8 million cubic meters, and should provide sufficient irrigation for 800 ha of farmland in the area. The Blyde 800 allocation saves these enterprises thousands of Rands per year in water charges. Water is also supplied directly from the river and from the Blydepoort Dam through paid allocations from the pipeline (Personal Communication with Moletele CPA representatives, 16 August 2011).

The first strategic partnership, Richmond farm, has an area of 2 434 ha and was purchased for R63.9 million in April 2009 from African Realty Trust (ART, a group of locally-based white landowners). Unlike other farming operations at Moletele, Richmond comprises just a single portion of land, on one title deed. It is considered to be well equipped, with its own packhouse on site and a large area (over 400ha) under established citrus production (David and Lahiff, 2011; Survey, 2011a).

The second strategic partnership, Dinaledi, is a partnership between the Moletele CPA and the Boyes Group, a family-run agri-business company in Limpopo. The land in question comprises roughly 700 ha in five portions, which were purchased between November 2007

and October 2008 for a total price of R31.7 million (US\$4.5 million). The farm is engaged almost exclusively in citrus production, with substantial orchards of oranges, grapefruit and lemons, much of which is exported to Canada, the EU, Russia, Middle East, Japan and Mauritius, providing 650 jobs (David and Lahiff, 2011; Survey, 2011a).

New Dawn Farming Enterprise (Pty) Ltd is the third Moletete CPA strategic partnership investigated in this study. It was formed in 2008 as a joint venture between the Moletete CPA and Strategic Farm Management (SFM), a company formed specifically for this purpose by a group of local landowners who were bought out as part of the restitution process. In its original form, New Dawn adhered closely to the general model of strategic partnership then being promoted by the office of the Regional Land Claims Commissioner and the Limpopo Department of Agriculture; but it has since suffered a number of setbacks that have forced departures from the original model (David and Lahiff, 2011; Personal Communication with M. Scott, 22 August 2011). The partnership encompasses a total of 1 017 ha of land, 296 ha of which is currently under irrigation, consisting mainly of mangos and citrus.

The fourth strategic partnership investigated is slightly different to the three Moletete CPA strategic partnerships. The farm 226 KT has an area of 2316 ha, with 260 ha ready for irrigation. This farm operates under a different model because it is managed by a Trust as opposed to a CPA. Also, it does not have access to the pipeline or the Blyde 800 allocation, and abstracts water directly from the Olifants River.

6.4.3 Water conservation and agronomic practices as distinctive attributes

For this category of attributes we look at two kinds of practices, namely water conservation and agronomic practices. We considered specific criteria for each of these types of practices. The criteria, while fairly general, are useful in that they allow for qualitative assessment of elements which are not necessarily measurable. As such, in combination, these criteria can give one a sense of how, according to accepted agronomic and water conservation practices, farmers are faring. However, it is also important to mention that actual efficiency of a method in any particular case should ideally be understood and measured in terms of its particular context. One cannot therefore generalise and argue that, for example, furrow irrigation is generally less efficient as compared to drip irrigation, because the latter might be unsuitable for a particular application (De Lange et al., 2000). However, one could distinguish between different efficiency levels of a particular type of irrigation method. For example, one could argue that that farmer “A” utilises furrow irrigation in a less efficient way than farmer “B” (where both farmers use furrow irrigation).

6.4.3.1 Water conservation practices

Farmers are profiled on the basis of water conservation practices, and the specific criteria include:

- i. *Irrigation method*: irrigation method is indicative of water use efficiency and relates to how well a particular irrigation method is managed compared to best

management practices. This criteria does not compare between different types of irrigation technologies (i.e. drip vs furrow), but rather how well a particular type of irrigation technology is managed.

- ii. *Irrigation scheduling*: Irrigation scheduling means determining the timing of irrigation, the duration of irrigation, and the amounts of water applied based on crop needs, soil water storage capacity and climatic conditions. Irrigation scheduling and monitoring are generally the most cost effective methods of improving water use efficiency.
- iii. *Timing of irrigation*: direct loss of water through evaporation is greatest during the hottest part of the day. For furrow and sprinkler irrigation, avoiding irrigating around noon to early afternoon reduces water loss through evaporation.
- iv. *Reducing water loss during conveyance*: maintaining irrigation infrastructure to avoid loss of water through leakage and seepage conserves water.
- v. *Mulching*: Mulch is any material placed on the soil surface to conserve moisture, lower soil temperatures around plant roots, prevent erosion and reduce weed growth. Reducing evaporation from bare soil through mulching conserves water.
- vi. *Windbreaks*: Reduce evaporation by shielding crops from wind and contribute to water conservation.
- vii. *Minimum tillage*: improves water infiltration into the soil, reduces runoff and loss and water loss due to evaporation.
- viii. *Weed control*: Water loss can occur through transpiration by weeds. Weed control reduces water loss from crop lands.

6.4.3.2 Agronomic (crop growth optimization) practices

Farmers were also profiled on the basis of agronomic practices, focusing on crop growth optimization. The basis for this profiling is crop water use efficiency, which can be measured as the response of a crop to irrigation, in terms of its growth and yield. To maximize crop water-use efficiency, it is necessary to promote maximal growth. Promoting maximal crop growth includes planting high-yielding crops well adapted to the local soil and climate. It also includes optimizing growing conditions through agronomic practices which promote healthy, vigorous crops such as adequate tillage, fertilization, and pest and disease control. In summary, raising water-use efficiency requires good farming practices from planting to harvest of a crop. The farms visited were assessed in terms of agronomic practices which optimize growth (good farming practices).

The criteria used were:

- Fertilizer application on the basis of soil analysis or foliar analysis: An optimised fertilizer supply to the crop improves crop growth and yield and thus crop water use efficiency. The optimum fertilizer levels (to meet crop nutrient requirements) are accurately determined through soil and/or crop tissue (foliar) analysis.
- Pest and disease control: adequate pest and disease control ensures healthy and vigorous crops which use water efficiently
- Crop rotation: selecting an appropriate crop sequence can optimize water and nutrient use and minimize disease and weed problems. For example, different crop types have different rooting depths and water requirements.

Taking into consideration the criteria that water conservation and agronomic practices bring to the discussion, one can apply these criteria to the Emerging Farmer Typology. The following table illustrates how one may then consider each of the types in terms of the criteria discussed above.

Table 13: Categorization of farmers

	Types	Water use efficiency (scores in terms of agronomic attributes)				
		Highly efficient	Fairly efficient	Average	Fairly inefficient	Highly inefficient
Beneficiaries of water and land reform also known as emerging farmers politically	T1: The “really” big players (large scale commercial farmers who do not need to be in a strategic partnership)					
	T2: The big players in training (large-scale commercial farmers but who still need to be in a strategic partnership)					
	T3: The entrepreneurs (small-scale commercial farmers with aspirations to grow)					
	T4: The transitioners (subsistence farmers well on their way to becoming commercial)					
	T5: The wishful thinkers (subsistence, vague aspirations to be commercial)					
	T6: The “survivalists” (subsistence, no aspirations to be commercial)					

6.4.4 Aspirations as distinctive attributes

Aspirations of farmers are integral to the attitude they have towards farming. For the purposes of the typology, aspirations can be characterised as that which farmers hope to achieve one day. A variety of aspirations have been expressed in the interactions with farmers; these can be summed up as follows:

- *Having agency and becoming less dependent on government:* farmers expressed the need to have more agency in their operations and hoped that one day they would be more self-sufficient and less dependent on government for help, knowledge and funding.
- *Be more productive:* farmers expressed the aspiration to be more productive. Here they generally refer to the amount produced and rather than how effectively or efficiently it is produced.
- *Stronger networks:* farmers hoped that they would be able to create stronger networks amongst their counterparts so that they would be able to establish and be a part of co-operatives, for example. Currently not many of the farmers feel that they have this or know how to go about creating such networks.
- *Grow the business:* Farmers generally expressed the hope that they would be able to grow the business. Despite this hope, however, not many could describe how this could happen and what would be needed for it to occur.

- *Inheritance*: Farmers noted that they would like their children to inherit their land, in contrast to how they themselves had obtained the land. However, some noted that young people in the area are not that keen on farming as it is not “easy money” as many expected when they first started farming.
- *Capacity building*: many farmers who have reached a level of commercialism mentioned that they would like to increase their ability to build capacity among emerging farmers. However, it should be noted that many of the farmers who mentioned this are in a strategic relationship with emerging farmers, where capacity building is stipulated in the partnership contract.
- *Becoming a commercial farmer*: most farmers said that they would like to become a commercial farmer one day.

6.4.5 Other attributes

There are three other notable attributes that can also potentially give insight into the types identified in the typology. These are discussed below:

- *Systems of governance*: The attribute ‘systems of governance’ refers to the ability of farmers to make decisions regarding their land in relation to a larger (higher) authority. For example, most emerging farmers in the area do not own land individually, rather their land is owned communally and presided over either by a local traditional authority in the form of a chief, or the land is presided over by a Communal Property Association (CPA). In both of these cases, the individual’s ability to make decisions regarding their land can be limited, as they may for example need approval from either a Chief or an Executive. The following is a brief summary of the different governance systems in operation in the case study area regarding decision-making on land:
 - o *Emerging farmers forming part of CPAs*: These farmers either rent the land from the CPA or “own” the land, with the title deed resting in the custodianship of the CPA.
 - o *Emerging farmers living in irrigation schemes*: These irrigation schemes comprise of restituted communal land, and some have ad hoc CPA committees in place, although these function differently to the bigger CPA structures. Emerging farmers on these schemes own the land in a PTO arrangement, inherited the land, or obtained a portion from the chief.
 - o *Other arrangements*: Other types of emerging farmers include those farmers operating on state farms (e.g. Balloon Orchards), emerging farmers who own private land but who also own land on an irrigation scheme, as well as emerging farmers who received land under previous land reform programmes such as the SLAG programme.
- *Self-classification in terms of category of farmer*: Most farmers are able to classify themselves into different categories of farmer; however, as already noted in this document, the way in which farmers express these categories are limited to the three well-known categories of subsistence, commercial and emerging. In addition, the elements used to describe these categories differ somewhat.
- *Self-classification in terms of using water efficiently*: This attribute focuses on whether or not farmers believe that they use water efficiently. Since there are a variety of definitions of what it means to use water ‘efficiently’, it is interesting to see

how the self-classification of farmers differs to our assessment of water conservation practices.

6.5 Application of the typology to the field data and presentation of the types

This section shows how the typology can be used to make sense of farmers in the study area through the application of the typology in a qualitative way. There were twelve case study examples. The case study examples will be discussed as part of each of the types identified in the typology as illustrative examples.

6.5.1 T1: The “really” big players

This type of emerging farmer is generally described in the typology as a large scale farmer who does not need to be in a strategic partnership. It is interesting to note that we did not find any farmers in our case study area that fit this description. One could enumerate a number of possible reasons for this, such as the legacy of Apartheid, the current government's inability to provide adequate support for emerging farmers, or lack of education or entrepreneurial spirit among the farmers. Many of these reasons were also identified by the case study farmers as explanations for why they have either not become more commercial or have not expanded their own operations.

6.5.2 T2: The big players in training

This type of emerging farmer is generally described in the typology as a large scale farmer who still needs to be in a strategic partnership.

In terms of water use efficiency, as scored according to agronomic attributes mentioned above, we have identified three case study examples (i.e. respondents J, K and L) that fit under this type.

	Water use efficiency (scores in terms of agronomic attributes)				
	Highly efficient	Fairly efficient	Average	Fairly inefficient	Highly inefficient
T2: The big players in training (large-scale commercial farmers but who still need to be in a strategic partnership)	J, K, L				

We also considered the other attributes for each of the case examples falling under this type. In general the farmers under T2 see farming as a business and their aspirations are to grow the business. Many of them are in strategic partnerships and as a part of the formal agreement in these partnerships; capacity building of the emerging farmer is also one of the aspirations. It is important to note that these emerging farmers are not yet able to go at it alone and still need the expertise of the strategic farmer to guide them. It is also significant to note that these farms are quite successful despite the strategic partner not owning the

land. These farms are mostly owned by CPAs and as such security of tenure lies with the emerging farmer and not the strategic partner. The strategic partners that we spoke to often mentioned that the reason why they are so successful is because farming is more than a business for them; it is in fact a passion. Lastly, it became apparent that while these farmers are mostly highly efficient in their water use, they are constantly looking towards improving this. Some even commented that they are not “yet” efficient in their water use, despite our assessment that they were.

The following is a typology summary of each of these case studies.

Typology summary for Respondent J

Respondent J is classified as large-scale commercial, as the activities on the farm are market based, specialized and involve production on a large scale, with the focus on profit maximizing. In terms of water conservation and agronomic practices Respondent J performs as follows:

Water conservation

- Irrigation method: Uses micro irrigation
- Knows amount of water applied during irrigation
- Uses irrigation scheduling – measures evaporation and soil moisture depletion
- Proactive management, use of equipment such as probes to measure soil moisture and manage irrigation
- Uses minimum tillage
- Uses windbreaks

Crop growth optimization

- Appropriate spacing is used
- Applies fertilizer on basis of soil and foliar analyses
- Sprays crops to control pests and diseases

Respondent J is the managing director for a company which is in a strategic partnership with a CPA, who were awarded land as a part of the land restitution process. It works in terms of shareholdership, where all 1600 beneficiaries are registered in the shareholders’ agreement. After 15 years the partnership will come to an end. At this point the CPA can decide to go it alone or to renew the partnership.

Typology summary for Respondent J	
Type	T2
Agricultural economic practice	Large -scale commercial
Water conservation and agronomic practices	Adheres to most (90%) water conservation and crop growth optimization principles
Systems of governance	CPA
Strategic partnerships	Yes
Aspirations	Be more productive and grow the business. Also capacity building
Self-classification: category of farmer	Commercial
Self-classification: using water efficiently?	Not yet

Respondent J believes that an emerging farmer is someone who wants to farm on a commercial scale. He notes that an emerging farmer may have commercial aspirations but there are no short-cuts when it comes to farming. It's a long-term business and many of the beneficiaries are too impatient.

"You need large farms to make this work as a commercial farmer – it's about economies of scale!"
Respondent J (T2)

Respondent J argues that their water use is not yet efficient enough. They are currently busy consolidating the title deeds of all the portions into one profitable unit and hopes that this can improve their water use efficiency quite significantly. They inherited very old and inefficient systems from some of the title deeds and consolidating these into one system takes time.

Typology summary for Respondent K

Respondent K is classified as large-scale commercial as the activities on the farm are market based, specialized and involve production on a large scale, with the focus on profit maximizing. In terms of water conservation and agronomic practices Respondent K performs as follows:

Water conservation

- Irrigation method: Uses micro irrigation
- Knows amount of water applied during irrigation
- Uses irrigation scheduling – measures evaporation and soil moisture depletion
- Proactive management , use of equipment such as probes to measure soil moisture and manage irrigation
- Uses minimum tillage
- Uses windbreaks
- Effective weed control

Crop growth optimization

- Appropriate spacing is used
- Applies fertilizer on basis of soil and foliar analyses
- Sprays crops to control pests and diseases

Typology summary for Respondent K	
Type	T2
Agricultural economic practice	Large -scale commercial
Water conservation and agronomic practices	Adheres to most (90%) water conservation and crop growth optimization principles
Systems of governance	CPA
Strategic partnerships	Yes
Aspirations	Grow the business. Also capacity building
Self-classification: category of farmer	Commercial
Self-classification: using water efficiently?	Water use is responsible

Respondent K is a manager for a farm which is part of a joint venture which leases land from a CPA, which was given the land as a part of the land redistribution process. Respondent K notes that the CPA ventured into this partnership when they realised that the government is not going to deliver on the promises of grants. The strategic partner has been farming on this land since 2011, and the CPA beneficiaries can buy shares only after year 4 of the partnership. Respondent K would like to extend the partnership with the CPA in order to expand their production. While there is a capacity-building component built into the partnership, Respondent K argues that the beneficiaries do not want to learn how to farm and prefer “soft jobs” like working in the pack house. Respondent K argues that “the way forward in South Africa is that former owners of commercial land farm on behalf of beneficiaries of land reform. These farmers need to exploit the land for as long as they can”.

“Success means high productivity, markets and good cash flow. Farming is difficult and has to be a passion.”
Respondent K (T2)

Respondent K argues that they use water efficiently because they have to. He argues that Eskom’s electricity hikes are putting immense pressure on the farmers. In terms of irrigation scheduling they are doing what they can although there is always room for improvement.

Typology summary for Respondent L

Respondent L is classified as large-scale commercial as the activities on the farm are market based, specialized and involve production on a large scale, with the focus on profit maximizing. In terms of water conservation and agronomic practices Respondent L performs as follows:

Water conservation

- Irrigation method: microjet irrigation (high water economy)
- Irrigate both during the day and at night – night time irrigation minimizes water loss
- Use irrigation scheduling, with the schedule changing frequently depending on weather, etc. so that the right amount of water is applied

Typology summary for Respondent L	
Type	T2
Agricultural economic practice	Large -scale commercial
Water conservation and agronomic practices	Adheres to most (90%) water conservation and crop growth optimization principles
Systems of governance	CPA
Strategic partnerships	Yes
Aspirations	Grow the business. Also capacity building
Self-classification: category of farmer	Commercial
Self-classification: using water efficiently?	Water use is responsible

- Probe system – at every cycle they monitor the soil moisture content with probes,
- Use of windbreaks – windbreaks were evident
- Effective weed control

Crop growth optimization

- Fertilization on basis of soil, foliar and juice analysis (EU market specifications followed)
- Appropriate spacing is used
- Sprays crops to control pests and diseases

“In order to be a successful farmer you have to keep your feet in the soil!”
Respondent L (T2)

Respondent L has been farming this land for 20 years, first as a helper to the original owner, then as a partner in a group who bought the land, and now as a manager in a strategic partnership with a CPA. He believes it is important for inexperienced farmers to have a mentor. This was the case with him, and his mentor taught him everything he knows. He believes that commercial farming allows you to develop, while subsistence farmers do not contribute to the economy. He sees an emerging farmer as one that starts from scratch. He says he knows of one or two farmers that “tried to emerge,” but 90% do not make it because they cannot secure bank loans.

He would like to grow the business through expansion. He believes that the farm uses water efficiently because he has good technology in place that monitors and reports instantly on water use at each orchard.

6.5.3 T3: The entrepreneurs

This type of emerging farmer is generally described in the typology as a small scale farmer with aspirations to grow his/her business.

In terms of water use efficiency as scored according to agronomic attributes, we have identified three case study examples that fit under this type.

	Water use efficiency (scores in terms of agronomic attributes)				
	Highly efficient	Fairly efficient	Average	Fairly inefficient	Highly inefficient
T3: The entrepreneurs (small-scale commercial farmers with aspirations to grow)			G, H, I		

Generally farmers in the T3 type want to grow their farming enterprise. They are still small-scale farmers but their farming activities steer towards the commercial side of farming. Farmers in this type obtained the land mostly through two avenues, either as a PTO or through the land reform process. Many of them express the wish to be in a strategic partnership but have either not had the opportunity to do so, or have been unable to sustain the partnership due to various reasons. One of the prominent explanations farmers across

the typologies have given as a reason for such a partnership to be disintegrated is a breakdown of trust between the parties. Either the emerging farmers believe that the strategic partners are swindling them out of money, or the strategic partner believes that the emerging farmer is being unreasonable in their demands for profit instead of further investment into the business. It is also interesting to note that many of the T3 farmers believe that being a successful farmer means you make a lot of money, which they equate with being a commercial farmer, increasing your land and owning more equipment. There is thus a clear aspiration to make money, and they believe that the only way to do this is to become commercial. All our case study farmers in this type believe that they are already using their water efficiently, yet our own assessment shows that there is room for improvement.

The following is a typology summary of each of these case studies.

Typology summary for Respondent G

Respondent G is classified as an emerging small-scale commercial farmer. The respondent can be classified in this way due to their ability to produce one crop that they are able to sell to a chain food store. In terms of water conservation and agronomic practices Respondent G performs as follows:

Water conservation

Positive:

- Irrigation method: drip irrigation
- Does not irrigate on windy days
- Uses windbreaks to shield crops - these were not observed on farm however
- Controls weeds – not 100% effective – some weedy plots observed

Negative

- Does not know how much water is applied during irrigation
- No irrigation scheduling based on monitoring quantity of water applied and evaporation – farmers mentioned that irrigation is scheduled as per advice of extension workers but without on farm monitoring this advice is inaccurate

Typology summary for Respondent G	
Type	T3
Agricultural economic practice	Small commercial (market based diversified production focuses on profit making)
Water conservation and agronomic practices	Adheres to a significant number (more than 50%) of water conservation and crop growth optimization principles
Systems of governance	CPA
Strategic partnerships	Not currently, but aspiration to have
Aspirations	To be a commercial farmer
Self-classification: category of farmer	Commercial
Self-classification: using water efficiently?	Water use is responsible

“If you make a lot of money from farming you are successful”
Respondent G (T3)

- Could not specify time of day when they irrigate – not critical since they use drip irrigation
- Could not specify duration of irrigation period
- Does not apply minimum tillage
- Does not use mulch

Crop growth optimization

- Practices crop rotation
- Appropriate plant spacing applied
- Sprays for pests and diseases – pest control not always effective – black stem disease observed on tomatoes
- Applies fertilizers based on soil analysis results

Respondent G leases land from a CPA, who were allocated the land through the Land Restitution process. The respondent is part of a co-operative. While not currently in a strategic partnership, the respondent and other members of the co-operative used to be in a strategic partnership with the former white owner of the farm; however, for “various reasons” the partnership was not successful. The respondent aspires to be commercial and profitable; however, the respondent’s biggest obstacle to achieving this is access to a loan from the Land Bank. The respondent thinks of himself as a commercial farmer, and believes he uses his water efficiently because he “makes use of drippers”.

Summary typology for Respondent H

Respondent H is classified as an emerging small-scale commercial farmer. In terms of water conservation and agronomic practices Respondent H performs as follows:

Water conservation

Positive

- Irrigation method: drip irrigation – saves water, labour and time
- Timing of irrigation: irrigates morning and late afternoon/evening – avoids irrigating noon to early afternoon to minimize water loss through evaporation

Typology summary for Respondent H	
Type	T3
Agricultural economic practice	Small commercial (market based diversified production focuses on profit making)
Water conservation and agronomic practices	Adheres to a significant number (more than 50%) of water conservation and crop growth optimization principles
Systems of governance	Chief (PTO)
Strategic partnerships	No
Aspirations	Build the business, be more productive and have his children inherit the farm
Self-classification: category of farmer	Commercial
Self-classification: using water efficiently?	Water use is responsible

Negative

- No irrigation scheduling
- Not sure of how much water is applied to crops
- No mulching
- No minimum tillage
- Leaking pipes

“Successful farmers have
greenhouses”
Respondent H (T3)

Crop growth optimization

- Practises crop rotation
- Uses fertigation – fertilization based on soil analysis

Respondent H inherited the land from his father, who purchased a PTO from the local chief. He has been encouraged to get a title deed by the Land Bank to enhance his prospects of getting a loan. Although he is entitled to sell the land, he doesn't want to sell, he wants to stay and would like his children to inherit the land one day like he did from his father. The respondent went to an agricultural college to learn about farming, but he also believes he learned a lot from his father. Respondent H believes that commercial farmers are successful, and they ‘feed the nation,’ whereas emerging farmers sell only to the local market, and are not that successful. Respondent H believes he uses water efficiently in that drip irrigation is more efficient than furrow irrigation. His father started with furrow irrigation but he has advanced to drip irrigation, which he maintains himself.

Summary typology for Respondent I

The farming activities on this land can be classified as small-scale commercial. In terms of water conservation and agronomic practices Respondent I performs as follows:

Water conservation

- Irrigation method: microjet irrigation (high water economy)
- Timing of irrigation: Irrigate throughout the day – not critical as water loss due to evaporation is minimal with microjet irrigation
- Use of irrigation scheduling – soil moisture monitoring
- Use of windbreaks – windbreaks were evident

Crop growth optimization

- Fertilization on basis of soil and foliar analysis
- Appropriate crop spacing is used

Typology summary for Respondent I	
Type	T3
Agricultural economic practice	Small commercial (market based diversified production focuses on profit making)
Water conservation and agronomic practices	Adheres to most (90%) water conservation and crop growth optimization principles
Systems of governance	Trust beneficiary
Strategic partnerships	Yes
Aspirations	To be a commercial farmer
Self-classification: category of farmer	Emerging
Self-classification: using water efficiently?	Water use is responsible

- Sprays crops to control pests and diseases

Despite the fact that the respondent's farming activities are categorised as small-scale commercial, the historical context of this farm tell a different story. The farm was reclaimed by the Trust in 2008 and has 1 300 beneficiaries. Between 2008 and 2012 the farm has seen a number of white strategic partners who have all left for various reasons. Respondent I is the current manager on the farm. Most of the infrastructure and systems on the farm are as a result of the strategic partnerships. Currently there is no farming being conducted, as they are busy negotiating with a new partner, and as a result the farm is in a state of disrepair.

“If you make a turnover of more than R7 million you are doing well”
Respondent I (T3)

The farm uses microjet irrigation (which was already in place when the trust reclaimed the farm). Respondent I believes the farm uses water efficiently because they “try to repair leaks”. The farm has three balance dams, and uses an electric pump to abstract water. The cost of electricity for pumping is not known by the respondent, and he notes that only the strategic partner knows this. In addition, the respondent does not know whether the farm has a water license – again, only the strategic partner knows this. The respondent remarked that the strategic partner’s knowledge is needed to “show them the way”.

The long term goal of the respondent is to farm an additional 150ha of citrus, acquire two more pickup trucks and three tractors.

6.5.4 T4: The transitioners

This type of emerging farmer is generally described in the typology as a small scale farmer with aspirations to grow his/her business.

In terms of water use efficiency as scored according to agronomic attributes, we have identified three case study examples that fit under this type.

	Water use efficiency (scores in terms of agronomic attributes)				
	Highly efficient	Fairly efficient	Average	Fairly inefficient	Highly inefficient
T4: The transitioners (subsistence farmers well on their way to becoming commercial)			E, F	D	

T4 emerging farmers, though still small scale, see the benefits of growing their farming operations, and have aspirations to become commercial. Yet what is significant about this group is that they acknowledge that they still need help, especially from government, and have much to learn. This corresponds to their general assessment of themselves as “emerging” farmers. Some of them even go as far as having “mentors” – these are people

who help and give direction but who are not in a strategic partnership with the emerging farmer. It is interesting to note that while they all think they are using water responsibly, they are in fact generally assessed as having average performance in this category. The reason for this might be that, for these farmers, using water responsibly or efficiently means moving away from practices such as furrow irrigation and rain-fed cropping towards drip irrigation. The problem, however, as many of them acknowledge, is that they struggle with the upkeep of these systems. And, while some have taught themselves how to repair the pipes, etc., the T4s are not entirely able to keep these systems from becoming inefficient.

The following is a typology summary of each of these case studies.

Summary typology for Respondent D

Respondent D is classified as a subsistence farmer but displays tell-tale signs of a farmer who is on his way to becoming a small-scale commercial farmer. In terms of water conservation and agronomic practices Respondent D performs as follows:

Water conservation

Positive

- Irrigation method: drip – saves water
- Timing of irrigation: Irrigates in the morning and late afternoon-: avoids irrigation during hottest part of the day when losses due to evaporation are high
- Equipment is in state of repair, but is functional – no water losses due to leakages.

Negative

- No use of windbreaks to shield crops from wind and decrease evaporation
- Does not know how much water is applied during irrigation
- No irrigation scheduling
- Not familiar with minimum tillage and does not use minimum tillage
- No use of mulching

Crop growth optimization

- Practices crop rotation
- Appropriate plant spacing is applied

Typology summary for Respondent D	
Type	T4
Agricultural economic practice	A subsistence farmer who displays in transition towards small scale commercial farming
Water conservation and agronomic practices	Adheres to some (35 to 45%) of water conservation and crop growth optimization principles
Systems of governance	CPA
Strategic partnerships	No
Aspirations	Grow the business
Self-classification: category of farmer	Commercial
Self-classification: using water efficiently?	Water use is responsible

“You are successful if you enjoy farming.”
Respondent D (T4)

- Sprays for pests and diseases – this may not be effective – leaf discolouration observed in okra crop, indicating presence of either a nutrient deficiency or a disease
- Applies fertilizer on basis of soil analysis results and advice of extension officer

Respondent D has been renting the farm from a CPA since 2007. He pays R1500pm to the CPA and is mostly able to pay this contribution. Respondent D believes that a commercial farmer “is someone who makes lots of money and who does not run short of things and can meet all of your requirements”. Despite the fact that he considers himself to be a commercial farmer he still believes that government is responsible to help him with infrastructure such as a tractor and dam repairs. He aspires to grow the business and his son is keen on joining him. Respondent D believes that he uses water efficiently because he has drip irrigation installed, however he does acknowledge that it needs to be repaired.

Summary typology for Respondent E

Respondent E is classified as a subsistence farmer but displays tell-tale signs of a farmer who is on his way to becoming a small-scale commercial farmer.

In terms of water conservation and agronomic practices Respondent E performs as follows:

Water conservation

Positive

- Irrigation method: uses drip or sprinkler irrigation – these methods are less prone to water wastage and are more efficient than furrow irrigation
- Timing of irrigation: Irrigates in the morning and late afternoon – avoids irrigation during hottest part of the day when losses due to evaporation are high
- Does not water on windy days to minimise water loss
- Functional and well maintained infrastructure observed on farm – no water leakages observed

Negative

- Does not use windbreaks to shield crops from wind and reduce evaporation
- Does not know how much irrigation water he uses -to manage irrigation effectively, it is very

Typology summary for Respondent E	
Type	T4
Agricultural economic practice	A subsistence farmer who displays in transition towards small scale commercial farming
Water conservation and agronomic practices	Adheres to a significant number (more than 50%) of water conservation and crop growth optimization principles
Systems of governance	Trust beneficiary
Strategic partnerships	No
Aspirations	To be a commercial farmer
Self-classification: category of farmer	Emerging
Self-classification: using water efficiently?	Water use is responsible

“You are successful if you are profitable”
Respondent E (T4)

important to know the water application rate, i.e. how much water is being applied in a given time period

- No irrigation scheduling and monitoring
- Does not use minimum tillage
- Does not use mulch to reduce evaporation from soil surface

Crop growth optimization

- Sprays crops to control pests and disease – to achieve optimum crop growth which ensures agronomic water use efficiency,
- Applies fertilizers based on soil analysis results

Respondent E obtained his land in 2000 through the SLAG programme, where he was one of 187 beneficiaries. The land is managed as a trust and by 2006 many of the beneficiaries left the trust, and as a result the future of the trust has been in question ever since. Respondent E is not in a strategic partnership but he mentions that he has a “white mentor” whom he depends upon. Respondent E thinks of himself as an emerging farmer, which he sees as a farmer who is somewhere between a subsistence farmer and commercial farmer. Respondent E believes that he uses water efficiently because he uses “drippers”.

Summary typology for Respondent F

Respondent F is classified as a subsistence farmer but displays tell-tale signs of a farmer who is on his way to becoming a small-scale commercial farmer. In terms of water conservation and agronomic practices Respondent F performs as follows:

Water conservation

Positive

- Irrigation method: drip irrigation – save water, labour and time
- Timing of irrigation:
- Has some information about how much water is applied to some crops but it is not clear if this is known for all crops
- Mulching used

Negative

- Poor weed control
- No limit to water use nor control over how much is used

Typology summary for Respondent F	
Type	T4
Agricultural economic practice	A subsistence farmer who displays in transition towards small scale commercial farming
Water conservation and agronomic practices	Adheres to a significant number (more than 50%) of water conservation and crop growth optimization principles
Systems of governance	Chief (PTO)
Strategic partnerships	No
Aspirations	To be a commercial farmer, be more productive and build the business
Self-classification: category of farmer	Emerging
Self-classification: using water efficiently?	Water use is responsible

- No irrigation scheduling
- Water leakage from storage tank, although no leakages in the field
- Do not apply minimum tillage

“A successful farmer is one who has already achieved their farming goals”
Respondent F (T4)

Crop growth optimization

- Practices crop rotation
- Fertilization and crop allocation to land done on basis of soil analysis

Respondent F has a PTO issued by the Chief in 2008. Before she started farming she was unemployed but knows how to farm because her parents taught her. She sees herself as an emerging farmer and understands an emerging farmer to be a farmer that is still developing, while a commercial farmer is already fully developed. Respondent F aspires to become a commercial farmer but this means she has to clear more land and build her business. She believes that she uses water efficiently – she has put in an irrigation system and has trained herself to repair and maintain it.

6.5.5 T5: The wishful thinkers

This type of emerging farmer is generally described in the typology as a subsistence farmer with vague aspirations to become commercial.

In terms of water use efficiency as scored according to agronomic attributes, we have identified three case study examples that fit under this type.

	Water use efficiency (scores in terms of agronomic attributes)				
	Highly efficient	Fairly efficient	Average	Fairly inefficient	Highly inefficient
T5: The wishful thinkers (subsistence farmers with vague aspirations to become commercial)					A, B, C

T5 Emerging farmers are generally subsistence farmers. While many of them express an aspiration to become commercial farmers, it is clear that they do not fully comprehend the realities of what would be required to become commercial, and one could argue that the aspirations expressed by these farmers are rather towards making their current farming practices easier. For example, knowing how to keep records, having the means to hire labourers and owning a tractor are some of the characteristics T5 farmers tend to apply to the label ‘commercial farmer’. Many farmers across the typology have also expressed feeling pressure from government to aspire to becoming commercial, noting that this is how one gains access to financial support from government. Farming is however not the main source of income for many of the T5 farmers, rather they rely on social grants such as the Old Age Pensioners Grant. These farmers in general do not know how much water they use, need or have access to; and to them the concept of paying for water is completely foreign. To the T5 farmers, using water efficiently is not about more efficient systems to yield

more production from less water; but rather that one should use all the water one has access to rather than wasting it.

The following is a typology summary of each of these case studies.

Summary typology for Respondent A

Respondent A is classified as an emerging subsistence farmer and produces mainly to provide for his own livelihoods. Farming is not his only form of income. He receives support from government. In terms of water conservation and agronomic practices the respondent performs as follows:

Water conservation

Positive

- Timing of irrigation: irrigate from 07:00 to 12:30 and between 16:30 and 18:00 – to minimize loss of water
- Know about mulching and sometimes use mulch, but this was not evident at the time of the visit
- Practice weed control

Negative

- Irrigation method: furrow irrigation – inefficient and wasteful of water
- Irrigate on windy days
- No windbreaks
- No calibration equipment such as gate valves, flow meters, etc. – only pvc pipes
- Does not know how much water is applied during irrigation
- No irrigation scheduling;
- Do not apply minimum tillage

“A farmer is successful if he can grow crops well and sell them, and who can sell more, bit by bit”
Respondent A (T5)

Crop growth optimization

- Spray some crops for pests and diseases on advice of extension officers
- Apply fertiliser on the basis of soil analysis
- Practise crop rotation

Typology summary for Respondent A	
Type	T5
Agricultural economic practice	Subsistence farmer
Water conservation and agronomic practices	Adheres to very few (20% and less) water conservation and crop growth optimization principles
Systems of governance	Chief (PTO)
Strategic partnerships	No
Aspirations	Have agency and be less dependent on government
Self-classification: category of farmer	Emerging
Self-classification: using water efficiently?	Do not know

Respondent A's land is part of an irrigation scheme. Irrigation schemes are predominantly restituted land. This particular respondent has a PTO with the local chief, for which he had to pay between R2000 and R3000. Respondent A considers himself to be an emerging farmer but aspires to have more agency and to be less dependent on government, because he feels that government is becoming less able to support emerging farmers and therefore that they need to stand on their own. Respondent A is not in a strategic partnership but is part of a co-operative; however, the co-operative is struggling due to a lack of funds, infrastructure and access to markets. Respondent A does not know if he is using his water efficiently, but shares a water source with the rest of the co-operative. Unfortunately, due to a lack of funds and know-how, their irrigation system, which is mostly hap-hazard piping, is in a state of disrepair.

Summary typology for Respondent B

Respondent B is classified as a subsistence farmer who produces to feed his family. "Left-overs" are sold at the local market. In terms of water conservation and agronomic practices Respondent B performs as follows:

Water conservation

Positive

- Practice weed control

Negative

- Irrigation method: Use flood/furrow irrigation (wasteful of water)
- Timing of irrigation: irrigate at any time – do not stop irrigating during hottest part of the day to reduce water loss due to evaporation
- Do not know how much water is applied during irrigation – only know duration of irrigation
- No irrigation scheduling
- Do not apply minimum tillage
- No windbreaks
- No mulching

Typology summary for Respondent B	
Type	T5
Agricultural economic practice	Subsistence farmer
Water conservation and agronomic practices	Adheres to very few (20% and less) water conservation and crop growth optimization principles
Systems of governance	Chief (PTO)
Strategic partnerships	No
Aspirations	Be more productive and have stronger networks through their co-operative
Self-classification: category of farmer	Subsistence to small scale commercial
Self-classification: using water efficiently?	Water use is responsible.

Crop growth optimization

- Fertilization not done based on soil analysis results – not explicit although soil samples seem to be taken but no evident linkage with fertilization
- Practise crop rotation
- Spray to control pests and diseases

“One can identify a successful farmer by the way he plants and the techniques he uses – one can admire his plot”
Respondent B (T5)

Respondent B is part of an irrigation scheme which has 100 members in total; however, only 25 members are active

farmers on the land. The active farmers tend to lease plots of land from other members to increase the total size of arable land available to them. The members have a PTO with the Chief and do not have title deeds. Respondent B is not in a strategic partnership, but is part of a co-operative which was recently established through the help of the local extension officer. Respondent B feels that his farming activities can be classified as mostly subsistence but with some small scale commercial activities. He thinks that subsistence farmers are mostly “cash strapped” whereas commercial farmers are good at keeping records and can access all markets. The co-operative manages water use and as a result Respondent B feels that he uses water efficiently. According to respondent B, a farmer is conserving water if he makes sure that there is no run-off; makes sure all taps, gates and canals are closed; and monitors his irrigation. Respondent B hopes to be more productive and to strengthen his networks.

Summary typology for Respondent C

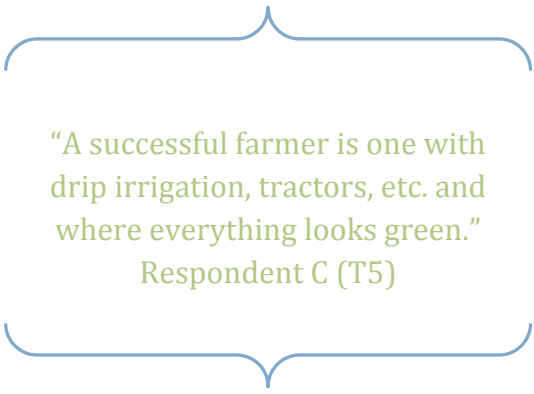
Respondent C is classified as an emerging subsistence farmer. His land is 150ha in size, but he only farms a ¼ hectare. He doesn't make use of the rest of the land due to financial problems. Farming is not his only source of income as he gets an old-age grant from government. While he sells most of his crops he cannot be considered to be a commercial farmer as his ability to make 100% use of his land is lacking. In terms of water conservation and agronomic practices Respondent C performs as follows:

Typology summary for Respondent C	
Type	T5
Agricultural economic practice	Subsistence farmer
Water conservation and agronomic practices	Adheres to very few (20% and less) water conservation and crop growth optimization principles
Systems of governance	Tribal Authority (PTO)
Strategic partnerships	No
Aspirations	Tribal Authority (PTO)
Self-classification: category of farmer	Subsistence
Self-classification: using water efficiently?	Water use is responsible.

Water conservation

Negative

- Irrigation method: Furrow irrigation – wasteful of water
- Timing of irrigation: Waters every second day for the whole day – does not avoid watering during hottest part of day – water loss to evaporation
- No gauges or calibration equipment
- Does not know how much water is applied to crops
- No irrigation scheduling
- Leaking pipe
- Poor weed control
- No minimum tillage applied



“A successful farmer is one with drip irrigation, tractors, etc. and where everything looks green.”
Respondent C (T5)

Crop growth optimization

- Practices crop rotation
- Fertilizer application not based on soil analysis

Respondent C owns his land communally under the management of a tribal authority who gave him a PTO for free in 2004. He does not think title deeds are important and is happy in the way land is distributed and managed under the Chief. He is not in a strategic partnership but hopes to become a commercial farmer one day so that he can “hire more people”, have his “own tractor”, feed his family, and help to feed other people’s families. He classifies himself as a subsistence farmer and says that he is “just playing” in comparison to the commercial farmers. Respondent C thinks that he uses water efficiently and that his water use practices are good.

6.5.6 T6: The “survivalists”

This type of emerging farmer is generally described in the typology as a subsistence farmer with no aspirations to become commercial. In our study we came across a number of people who produce minimal crops at home for their own use only. While they can be described as subsistence farmers, the patches of land they cultivate can in other terms also be described as vegetable gardens. T6 farmers have no aspiration to sell any of their crops – they might exchange some of it with their neighbours, but this is how far it goes. They have no plans in place regarding the crops they grow, rather planting as and when they have access to seeds or plants. T6 farmers generally have no irrigation strategy and their crops are mostly rain-fed. As such, using water efficiently for T6 farmers applies mostly to household use.

6.6 Summary of typologies

If one takes a holistic view of the types identified in the typology, it might not be surprising to find emerging farmers across the spectrum (see summary Table 14 below); ranging from those commercial farmers that are very efficient with their water use but who are still looking to improve; to those farmers who are still learning about what it means to farm as a business and who need a lot of support both from government and partners (be they strategic or mentoring); and lastly to those farmers who have no or only a vague notion of what it is to farm commercially or how to use water efficiently in farming.

Table 14: Summary of typologies

	Types	Water use efficiency (scores in terms of agronomic attributes)				
		Highly efficient	Fairly efficient	Average	Fairly inefficient	Highly inefficient
Beneficiaries of water and land reform also known as emerging farmers politically	T1: The “really” big players (large scale commercial farmers who do not need to be in a strategic partnership)					
	T2: The big players in training (large-scale commercial farmers but who still need to be in a strategic partnership)	J, K, L				
	T3: The entrepreneurs (small-scale commercial farmers with aspirations to grow)			G, H, I		
	T4: The transitioners (subsistence farmers well on their way to becoming commercial)			E, F	D	
	T5: The wishful thinkers (subsistence, vague aspirations to be commercial)					A, B, C
	T6: The “survivalists” (subsistence, no aspirations to be commercial)					

Within the setting of this project, where we are specifically focussing on water use efficiency within the context of both land and water reform in South Africa, it is useful to use this typology as a means to identify where one should focus efforts to improve the efficient use of water by emerging farmers. Taking into consideration the findings from the case study around current farming practices, the aspirations of farmers, as well as the local governance and socio-political context, our research indicates two important recommendations. Firstly, it seems that the types T3 and T4 might provide the most fertile ground for support from government to improve water use efficiency within the context of water and land reform. T3 and T4 emerging farmers seem to have the drive and aspiration to build their current endeavours into established and flourishing commercial ventures, and with the right kind of support can fulfil both the socio-political need for emerging farmers to succeed as a previously disadvantaged group, as well as the economic need for them to use the land productively, and to successfully contribute to the economy. Secondly, it is clear from our research with the T5 and T6 farmers that not all beneficiaries of land reform are interested in or capable of becoming large scale commercial farmers. For many of them it is enough to have a garden that supports their day-to-day needs, or at most sell a few vegetables at the

local market. In this case it might be difficult to reconcile both the socio-political and economic needs that underpin the land reform process.

CHAPTER 7: ASSESSING WATER USE EFFICIENCY

7.1 Introduction

Water conservation consists of effective and efficient use of water and the development of water as a resource. This chapter focus on water use, i.e. the effective and efficient use of water in agriculture. The chapter applies the agro-economic profile and water use profiles mentioned earlier in a water efficiency assessment. The assessment was done from two perspectives. The first was from a conventional *input-output* perspective (i.e. a ratio with regard to production outputs relative to the inputs, which is then presented as an indicator of the relative efficiency of the inputs). This method relies on financial information with regard to the farm activities and is commonly used in commercial agriculture where suitable record keeping is not a challenge. A major challenge with this approach lies within situations where there is little or no record keeping. Most respondents could not provide records of non-standard units that could be calibrated. In best case scenarios respondents could recall the container or type of transport used for inputs or marketing, but none could actually show it to the research team, which made comparison impossible. As such, no legitimate yield figures for non-commercial farmers were obtained from the fieldwork. As a second best estimates the research team applied data from standard crop enterprise budgets and irrigation needs derived from best management practises to do the assessment (see section 7.3).

However, the limitation with regard record keeping initiated some creative thought with regard to assessing water use efficiency in alternative ways. Specifically, the second perspective is based on the idea of assessing water use efficiency from an *operations* perspective; i.e., in the absence of accurate field data, this approach focuses on the *way* in which water is utilised and managed by the respondent to assess water use efficiency. It was argued that the rich descriptions, photographs and observations provided a significant amount of information which is often overlooked in the first approach (which relies on input-output data records), which could then be used to assess water use efficiency. The financial information on farm activities is thus not required for this approach, as it draws from the descriptive field data to critically reflect on the way in which water is used in the production processes of the respondents. This implies that our research team needed a horticultural expert to join the fieldwork team. This expert was able to critically reflect on water use operations of the respondents from an agronomic perspective.

The field data formed the basis for this assessment for Likert type scale scoring or simple choice options which revealed important information regarding water use efficiency. For example, “what type of irrigation do you practice on the land?” (hand watering, gravity fed flood, sprinkler by hose, sprinkler by dragline, centre pivot, micro spitter, micro jet, floppy). “What is the area that you irrigate? Are you part of an irrigation schedule? Who enforces such a schedule? Who does the maintenance of the distribution system?”, etc.

This chapter first consider water use efficiency from the first (i.e. conventional input-output) perspective where second best estimates (based on SAPWAT) were followed because of a lack of empirical data; before turning to the operations-based approach in section 7.4.

7.2 Contextualization

Jordaan and Grove (Jordaan and Grove, 2012) have indicated that by supporting farmers to become partially commercial and hence part of the formal economy, does not guarantee improvements in their water use efficiency. This implies that since not all farmers have the same (i.e. commercial) aspirations, and since different aspirations translate to different interpretations of the term “water use efficiency”, a single interpretation of “efficiency” (as interpreted within a commercial agricultural context) should not be generalized to non-commercial oriented contexts. Even within the context of food value chains, several interpretations of the term remain. This poses a dilemma when assessing water use efficiency along a single set of criteria, i.e. from an input-output perspective, because such a perspective applies to a specific type of farmer with a specific type of farming objective. Jordaan and Grove (2012) also acknowledged that further research is required to establish a “development path” that could facilitate the transition from communal farming to individual commercial farming, which will improve the integration of emerging farmers in commercial agri-food chains. They emphasised the importance of distinguishing and considering different emerging farmer typologies to identify those which are more likely to successfully be integrated in commercial farming. However, their study focuses on commercial orientated farmers, with a commercial interpretation of water use efficiency, they consequently follow through with a commercially-based approach to assess water use efficiency, where the underlying assumption is made that if emerging farmers successfully become integrated into the formal economy (as served by commercial farmers) their water use efficiency will increase. Approaches to assess water efficiency here takes either a (a) technical, allocative and economic efficiency perspective, which focuses on either increasing output while maintaining inputs constant (i.e. an output-side assessment), or decreasing input while maintaining output (i.e. an input-side assessment); or a (b) market perspective, where the assessment focuses on whether a farmer could generate higher revenue from the crops he or she is producing.

For a number of the farmers in the study area, such approaches would be inappropriate because these assessments require data inputs that do not exist. More fundamentally, the so-often-heard underlying assumption that emerging farmers are using inputs at low levels of efficiency, steers technical efficiency assessments towards assessing efficiency from the output-side (i.e. to determine the levels of output that could be realized given a certain level of input). Consequently, recommendations on how to improve water use efficiency tends to focus on the output side and often applies more to those individuals who present behaviour and aspirations aligned with a commercial intention / objectives.

However, among several respondents, we recorded no commercial aspirations, i.e. no intention to increase yields or to sell more of their produce to the market – all of these respondents were diversified in terms of their income sources. In these cases, it is inappropriate to assess efficiency from the output-side, and perhaps more appropriate to

assess from the input side, i.e. maintaining output while decreasing inputs. The focus of technical efficiency assessments thus shifts towards improvements in production practice focusing on decreasing input while maintaining output (last mentioned thus focus on changes in farming operations in order to increase efficiency). This implies that only farmers wishing to become part of the formal economy, i.e. striving to migrate towards commercial farming, who need to increase production levels (because of economies of scale requirements), should be assessed from an output perspective, while those with no such aspiration should be assessed from the input side. We therefore argue that the efficient development and use of water within the framework of food value chains for the selected water and land reform projects seems to be independent from the successful participation of emerging farmers in commercial agri-food chains. That is, successful participation in commercial-value chains is no guarantee for “efficient” water use by farmers with no commercial intention. Following through with assessing water use efficiency mainly from an input perspective, our field data indicated that the bulk of water being used in the value chain of these farmers is used on-farm. Very little, if any, water-intensive value-adding (processing) was noted in the value chains of the respondents (vegetables like sweet potatoes do receive a quick wash, although most producers believe that by washing sweet potatoes one actually decreases their shelf life; while tomatoes were not washed). With the bulk of the water being used on-farm for irrigation purposes, efforts at improving the water use efficiency throughout the value chain will have the biggest impact if the focus is on on-farm water management (irrigation and soil moisture management) of smallholders.

We consequently adopted an “operations-based” approach to assess and improve on-farm water use efficiency of farmers. As mentioned, this definition of water-use efficiency derives from an input perspective, i.e. it aims to decrease inputs while maintaining output, which comes down to incentivising water efficiency improvements by means of incentivising water savings on the farm (i.e. using less water, while maintaining output). The operations-based approach therefore focuses on water-savings which could be achieved via several strategies. This is challenging because our field observations revealed few incentives which are currently in place to motivate water savings among the farmers in the study area, mainly because of misplaced perceptions with regards to water scarcity. Such perceptions of water scarcity are pivotal in the development of water saving incentives and when water is available via an irrigation scheme does not support the notion of water being “scarce” within the reference framework of smallholders, who often perceive water as “not being scarce” because they receive water from the scheme while (generally speaking) not paying for it (as confirmed by our field data). Given that they do not pay for water (whether legally or illegally), it becomes pointless to employ market instruments to realise savings. A possible alternative is prolonged training and education, where agricultural extension officers play an important role.

Jordaan and Grove (2012) mentioned that cultural aspects and social capital of farmers could have a major influence on the behaviour and performance of emerging farmers. We can confirm this finding, which is why the impact of the social dynamics of communal tenure and the way people organise themselves on the communal land was accommodated within the operations-based approach. Accommodating the social and cultural aspects is important because we have found that some community members are suspicious of intentions of trainers and often reluctant to allow “outsiders” to enter their communities as new land users.

It should however be noted that such levels of “suspicion” are indicative of high levels of social capital, which is of course supportive of more efficient collective action, which could be harnessed to good advantage in outreach and training programmes.

All of this information fed into an improved understanding of the decision making behaviour of emerging farmers in order to allow for more effective guidebooks (see chapter 9) development. We continue by first using a traditional input-output based approach to establish a baseline estimate of water efficiency in the study area before we present the operations-based approach (section 7.4).

7.3 An input-output approach to establish a baseline estimate of water use efficiency in the study area

Although the economic value of water as used in agriculture is generally low compared to other water use sectors (Ward and Michelsen, 2002; Nieuwoudt et al., 2004); agriculture, as a primary sector, has significant multiplier effects which are crucial for the socio-economic development of a country, and for maintaining livelihoods and food security. Its value goes far beyond the contribution of the sector purely in economic terms – economic objectives often stand secondary to social and political objectives, and it would be naïve to rely on economic indicators alone to explain the relative importance of agriculture along with its water use in an economy. However, when arguing the case of water use for commercial irrigation on social grounds, one needs to take cognisance of the fact that agriculture still accounts for more than 60% of water utilisation in South Africa, and that water use efficiency remains a contentious issue in most of its enterprises. In addition, irrigation water return-flows to river systems are nutrient-enriched and cause eutrophication in the receiving river system, thereby imposing a social cost on downstream users.

Water pricing has become an important component in assessing water use efficiency and in water demand management strategies. However, past experience with water pricing as an effective water management tool for agriculture has been mixed (Tsegai et al., 2009; Lange et al., 2007; Conradie and Hoag, 2004; Tsur et al., 2004; Eberhard, 2003b; Palmer Development Group, 2000; Eberhard, 1999a; Eberhard, 1999b; Department of Water Affairs and Forestry, 1999; Nieuwoudt et al., 2004). This is particularly due to the inelastic demand for irrigation water (there are no substitutes for irrigation water) (Eberhard, 2003a). Farmers in general only have two options to respond to water price increases. The first would be to increase the efficiency of water use (i.e. to maintain output with less water, or increase output with the same water); while the second would be to cut back on production (which is likely when irrigation systems are pushing the technological boundaries, i.e. when such systems are already operating at high efficiency levels, and the scope for additional efficiency gains for such systems becomes limited). However, neither of these options guarantees significant absolute volumetric water savings, because farmers with commercial aspirations are profit maximising price takers, which limits the capability of water pricing to be an effective water demand management instrument. Nonetheless, water valuation remains an important point of departure to assess water use efficiency, because it allows comparison between farmers, which is why this part of the study focused on the monetary valuation of water for a selection of commercial crops in the study area.

The assessment took the form of a marginal product value (MPV) per cubic meter of irrigation water as applied to prominent crops of the study area. The MPV of each cubic meter is the marginal physical product attributable to the additional water, multiplied by the crop price (Gibbons, 1986). It could thus be regarded as the additional income generated for every additional cubic meter of water used to irrigate a particular crop, and is useful to simplify water management related trade-offs, by making such trade-offs more transparent (in terms of R/m³). These estimates do however need to be interpreted in the context of the underlying assumptions as used in the valuation process, and are site-specific, which means that such estimates would be applicable only for the study area.

7.3.1 Method and assumptions for this approach

Mathematical programming techniques have been adapted to irrigation water valuation over the past several decades, driven by refinement of these methods and increased computation capacity (Young, 2004). These techniques allow parametric modelling of irrigation decisions by exploring management options by means of simulating the causal relationship between physical and financial variables.

A number of water valuation studies have been conducted in South Africa, which present a broad range of valuation techniques and calculated value estimates (Conradie and Hoag, 2004). For example, Mahumani (2009) conducted parametric linear programming (LP) to determine the shadow value of irrigation groundwater for tomato and table potato respectively in the Limpopo region. The MPV of groundwater was calculated as US\$0.75/ m³ for tomatoes, and US\$0.54/ m³ for table potatoes. Williams et al. (2008) used enterprise budgets and LP, or enterprise budgets with crop water production functions for derived demand in agriculture, to simulate water demand curves in the Greater Letaba area. The water demand schedule was derived by regarding the whole study area as a single farm containing five crops under consideration, in the proportions in which they were found to be present. The MPV of water was seen to vary from US\$0.07/ m³ to some US\$0.36/ m³. Conradie (2002) has constructed LP models for 16 representative farms which present approximately 50000ha of fodder crops and citrus in the Fish-Sundays River Scheme; the marginal value for water ranged between US\$0.00004/ m³ and US\$0.03/ m³ depending on the representative farm. Hosking et al. (2002) reported that water rights in the Sundays River trade for about US\$0.03/m³. Louw (2002) developed a positive mathematical programming model to study the impacts of water markets in the Berg River basin; the capitalized marginal value of water ranged from US\$0/ m³ to as high as US\$2.86/ m³ within different sub-sectors of the basin. Bate et al. (1999) studied the trading of water in the Crocodile River basin, and observed a value of water between US\$0.026/ m³ and US\$0.03/ m³ (Nieuwoudt et al., 2004). Finally, selected willingness to pay (either stated or revealed preference) estimates calculated by other researchers in South Africa for water (at 2000 price levels) include: Backeberg (1996) – Vaalharts Scheme at US\$0.23/ m³; Armitage and Nieuwoudt (1999) – Lower Orange River at US\$0.04/ m³; and Engelbrecht (2001) – Sundays River and Fish Rivers at US\$0.03/ m³ and US\$0.02/ m³; respectively (Hosking and du Preez, 2004).

We have used a basic parametric approach to linear programming (LP) (Lindo Systems Incorporated, 2002) for this component of the study. The technique is useful for analysing optimisation problems and has the ability to test for the sensitivity of the optimal solution by varying some of the parameters in the LP model. It is a proven technique which is simple, robust and less data intensive as compared to more data-hungry models. LP allows the specification of an objective function of an enterprise (which we took as to maximise net return), subject to constraints on input variables. The technique is extremely flexible as it allows for different variables, such as soil type, different water saving technologies, and fixed costs of irrigation investment; to be incorporated in the portfolio risk (Williams et al., 2008).

The method was thus chosen because the procedure provides information not only on the optimal way of allocating resources, but also on the value of various resources used in farm planning. It also provides a sensitivity analysis that shows how the shadow value of irrigation water varies with changes in season and other parameters (Boehlje and Eidman, 1984). Researchers should keep in mind the following underlying assumptions of any LP model: a) the constraints and objective function are assumed to be linear, which implies that the value of the objective function and the response of each resource expressed by the constraints, are proportional to the level of activities expressed in the variables. Furthermore, (b) linearity requires that variables of the objective function are independent. Also, (c) linear programming allows that the values of decision variables can be fractions and the model assumes that the responses to the values of the variables are exactly equal to the responses represented by the coefficients (proportionality). Some of the major limitations of this form of programming include: a) linearity in itself, b) only a single objective can be dealt with at a time, and c) parameters are assumed to be constant.

This study employed crop enterprise budgets (excel spreadsheet available on request), which combines a systematic account of the cost structure as derived from standard cultivation practice with commodity price data from industry to determine the MPV of irrigation water. The objective was to maximize net returns of a farm, subject to specified constraints (which may be economic, institutional or physical of nature, such as hectares under production, input cost, available technology, capped water volumes, and crop price). Note that instead of water costs, water supply was varied, and an LP solution is found for each quantity of water available to the farmer, all other constraints remaining constant. The shadow price for water would then be the marginal contribution to the objective function that could be attributed to an additional unit of a relevant constraint (i.e., water); hence, MPV of water would represent the shadow price of water as used for the specific crop. It is considered to be a reflection of the economic value of irrigation water from the perspective of the producer and captures diminishing marginal returns so often experienced by agricultural producers.

It should be noted that there may be significant differences between the marginal and average value of water (Hassan and Farolfi, 2005, Lange and Hassan, 2006, Young, 2004); and also that our MPV estimates are site and time-specific, because the crop production data used for the calculations were specific to the study area. The shadow values of irrigation water at various producer prices and yield levels as determined for different

growing seasons should therefore be regarded as a reflection of the economic value of irrigation water and the benefits it generates for producers in the study area at the current state of technology. These value estimates are therefore not readily generalizable to other study areas and should be repeated if a major shift in technology occurs.

7.3.2 Data collection procedures

As mentioned, the research team undertook a field visits to gather primary data in the Hoedspruit agricultural area. Here a total of twelve group discussions were held with subsistence, emerging and commercial farmers that practise various agricultural production systems, ranging from mono-cropping to diversified cropping systems. The data collection tool was a questionnaire that was administered to solicit information on: (1) general farm description, (2) farm water use profile including irrigation techniques and technology used, (3) agronomic practices with regard to water management, (4) general farm management practise, (5) land tenure status, and (6) attitudes and perceptions regarding farming. The questionnaire also captured information with regards to farm management issues such as crops grown, producer prices, variable and fixed cost outlays, yield levels on a hectare basis, as well as the typical enterprise sizes in hectares. Data was captured by writing, voice recording, and observing the signs and state of water conservation practices and infrastructure on the farms. The data sets generated from these three methods of gathering data were cross-checked and the information was transcribed for further analyses.

We complimented the field work data with industry data related to producer price, yield levels, producer price inflation rates, water use efficiency, and other management practices. We obtained up-to-date crop enterprise budgets as well as long term historic price and yield data for the study area directly from industry and the growers associations. Databases of growers associations such as the South African Mango growers association (Badenhorst, 2012) and South African Citrus growers association (Meyer, 2012) were consulted. We verified the accuracy of our irrigation water cost estimates with the Provincial Department of Agriculture at Elsenburg (Keuck, 2013). The raw data were then prepared and fed into an LP model via an Excel spreadsheet. The following is a summary of the data used for the MPV calculations:

- Water use data from the respondents of the survey
- SAPWAT crop water use estimates for the study area (Crosby, 1996; Van Heerden et al., 2008b)
- Crop enterprise budgets for citrus obtained from Citrus Growers association (Meyer, 2012 and (Citrus growers association of South Africa, 2012)
- Crop enterprise budgets productivity and yield data for mangoes obtained from the Mango Growers association (Johannesburg fresh produce market, 2012, Badenhorst, 2012)
- Crop enterprise budgets productivity and yield data for cash crops like tomatoes, beans, and cabbage obtained from (Taurayi, 2012)
- Average market prices obtained from the major fresh produce market prices (Johannesburg, Durban and the Cape Town markets.)
- Detailed capital outlay, and operating and maintenance costs for a typical borehole in the study area (Keuck, 2013).

- Annual producer price index (PPI) figures (from 1980-2011) (Statistics South Africa, 2010)

Based on the primary data, the analyses in this study were done for a total of five crops, comprising a mix of annual and perennial crops. The annual crops were green beans and tomato; while the perennial crops were avocado, orange and mango fruit. The selection of these crops was based purely on the fact that most of the respondents grow them (see Figure 3). This primary data, augmented with secondary enterprise budget data from agro-ecologically comparable regions, was used to conduct typical enterprise budget analyses for five selected crops. The result of this exercise was the compilation of typical gross margin enterprise budgets for the five crops which formed the input for the LP modelling.

7.3.3 Estimating reference point irrigation requirements

SAPWAT (South African Procedure for estimating irrigation WATER requirements) (Crosby, 1996; Van Heerden et al., 2008b) simulations were employed to determine recommended irrigation water requirements for our selection of crops in the Hoedspruit agricultural area. SAPWAT is a computer program (Crosby and Crosby, 1999; Van Heerden et al., 2001; Crosby, 1996) that is used for estimating irrigation water requirements of crops, farms and bigger areas, for the planning and management of crop and area irrigation water requirements. It is based on a paper by Allen et al. (1998), and it uses the internationally accepted Penman-Monteith approach for calculating reference evapo-transpiration (ET) (Water Research Commission, 2008). SAPWAT contains 50 years' weather data for each quaternary drainage region of South Africa, as well as the full set (3 262 weather stations) of monthly weather data from CLIMWAT, a climatic database used in combination with the computer program CROPWAT, which allows the calculation of crop water requirements, irrigation supply and irrigation scheduling for various crops for a range of climatological stations worldwide (Smith, 1993). Multi-year weather data is used to statistically estimate irrigation requirements for different water management strategies and crops. SAPWAT is particularly useful for irrigation system design, since peak irrigation requirements and cycle duration, two crucial elements in design, can be deduced from the results (Water Research Commission, 2008). It must be noted that SAPWAT estimates are time and site specific, hence, they cannot be generalised for geographically and temporally different conditions.

A total of nine simulations were run for the five crops, due to differences in irrigation systems and/or crop planting dates. Four simulations were conducted for green beans, namely two for June crops using drip and furrow irrigation respectively, and two for December crops also using both irrigation systems. Two simulations were conducted for the tomato crop, for drip and furrow irrigation respectively. The research team observed that only micro-jet irrigation was used in the perennial fruits, so each perennial fruit needed only one simulation. The typical gross margin results from the enterprise budget analyses and the SAPWAT irrigation requirements for the five crops are shown in Table 15.

Table 15: Input data for the LP runs: farming scenarios, gross margins and SAPWAT irrigation requirements

Farming scenarios	Gross Margin (R/ha)	SAPWAT ET (m³/ha/growing season)
Avocado	57 348.84	10 740
Bean (Drip in Dec)	16 342.50	1 160
Bean (Drip in Jun)	16 342.50	1 820
Bean (Flood in Dec)	30 309.76	1 710
Bean (Flood in Jun)	30 309.76	2 690
Orange	21 022.07	10 970
Mango	222 237.10	10 800
Tomato (Drip in Sep)	150 187.00	5 280
Tomato (Flood in Sep)	164 153.00	7 800

Due to differences in agricultural technology, such as the irrigation system employed, and differences in management styles such as water conservation and agronomic practices, as well as farming experience, farmers were observed to deviate from the reference irrigation water requirements. Some farmers more or less strive to adhere to SAPWAT recommendations; while others that have less effective management styles and/or technology would naturally over irrigate. Farmers with more experience, superior management styles and/or state-of-the-art irrigation technology have the greatest potential to conserve irrigation water.

LP water use efficiency simulations were conducted using the above-mentioned crop enterprise budget data and the initial SAPWAT reference irrigation recommendations to determine the shadow price of irrigation water. The SAPWAT irrigation recommendations formed the benchmark water use profile. However, in order to assess the economic implications of water use profiles that deviate from the SAPWAT irrigation recommendations (which is what was observed to typically occur in the Hoedspruit agricultural area), all other parameters were held constant, while the level of water use was scattered in two directions, namely towards more water conservation, and towards more water use. The scattering of the water use about the SAPWAT recommendations was by 10 percentage points, ranging from 50% excessive water use to 50% water conservation.

7.3.4 Discussion of MPV estimates within the context of this study

Table 16 represents the results of the LP simulations, showing how the MPV (also known as shadow price) changes at different levels of water use efficiency (changing ET levels at constant crop yields). This was purely an economic analysis, but at varying water use efficiencies. As mentioned earlier, the results of the MPV assessment are from a range of LP simulations, ranging from as high as 50% excessive irrigation water use, to as low as 50% irrigation water conservation per crop per hectare.

Conducting an assessment of the direct biophysical impacts of varied water use was beyond the scope of this study. It is however, worth noting that if an actual biophysical experiment were to be conducted, the scale of impacts could be quite different; because at a level of 50% excessive water use, the interaction of copious irrigation water with inputs such as fertiliser, and reduced aeration within the root-zone due to water-logging, will most likely impact negatively on crop productivity, and hence the MPV could be much lower than that imputed herein, if not nil. In the same vein, biophysically, deficit irrigation of up to 50% of the SAPWAT guidelines could also have detrimental effects on crop productivity, and the MPV will invariably be lower than that imputed herein. Notwithstanding this limitation, the focus of the study was to show how the economic productivity of irrigation water changes with varied irrigation water usage (i.e. the MPV elasticity of water use). We assumed that the potential biophysical impacts of reduced water use by up to 50% will be buffered by the associated agronomic water conservation practices that enhance the water holding capacity of the soil. Likewise, the potential biophysical effects of excessive water use could equally be offset in naturally or artificially well drained soils, along with other management practices like the application of foliar fertilisers that counter leaching effects.

Each LP simulation involved nine different farming scenarios, based on variations in crop type, irrigation technology, or crop planting dates. For each of these nine farming scenarios, 11 different water use profiles were analysed, which generated a total of 99 LP runs during the investigation of the economic impacts of varied irrigation water use efficiency. These results are tabulated in Table 16 and represented graphically in Figure 17.

Table 16: The variation of MPV with changing ET (SAPWAT version 2.7.1, November 2004, weather station used was “Hoedspruit Jongmansp” (station ID number: 19961))

Farming scenarios	ET (m ³ /ha/a)										
	ET+ 50%	ET+ 40%	ET+ 30%	ET+ 20%	ET+ 10%	SAPWAT ET (baseline)	ET- 10%	ET- 20%	ET- 30%	ET- 40%	ET- 50%
Avocado	16 110	15 036	13 962	12 888	11 814	10 740	9 666	8 592	7 518	6 444	5 370
MPV (R/m ³ /a)	4.77	5.11	5.51	5.97	6.51	7.16	7.96	8.95	10.23	11.93	14.32
Bean (Drip in Dec)	1 740	1 624	1 508	1 392	1 276	1 160	1 044	928	812	696	580
MPV (R/m ³ /a)	14.55	15.59	16.79	18.19	19.84	21.82	24.25	27.28	31.17	36.37	43.64

Bean (Drip in Jun)	2 730	2 548	2 366	2 184	2 002	1 820	1 638	1 456	1 274	1 092	910
MPV (R/m ³ /a)	9.27	9.93	10.7	11.59	12.64	13.91	15.45	17.39	19.87	23.18	27.82
Bean (Flood in Dec)	2 565	2 394	2 223	2 052	1 881	1 710	1 539	1 368	1 197	1 026	855
MPV (R/m ³ /a)	14.23	15.24	16.41	17.78	19.4	21.34	23.71	26.67	30.48	35.56	42.68
Bean (Flood in Jun)	4 035	3 766	3 497	3 228	2 959	2 690	2 421	2 152	1 883	1 614	1 345
MPV (R/m ³ /a)	9.04	9.69	10.43	11.3	12.33	13.56	15.07	16.96	19.38	22.61	27.13
Orange	16 455	15 358	14 261	13 164	12 067	10 970	9 873	8 776	7 679	6 582	5 485
MPV (R/m ³ /a)	2.46	2.64	2.84	3.08	3.36	3.69	4.11	4.62	5.28	6.16	7.39
Mango	16 200	15 120	14 040	12 960	11 880	10 800	9 720	8 640	7 560	6 480	5 400
MPV (R/m ³ /a)	14.89	15.96	17.18	18.62	20.31	22.34	24.82	27.93	31.91	37.23	44.68
Tomato (Drip in Sep)	7 920	7 392	6 864	6 336	5 808	5 280	4 752	4 224	3 696	3 168	2 640
MPV (R/m ³ /a)	21.75	23.3	25.1	27.19	29.66	32.62	36.25	40.78	46.61	54.37	65.25
Tomato (Flood in Sep)	11 700	10 920	10 140	9 360	8 580	7 800	7 020	6 240	5 460	4 680	3 900
MPV (R/m ³ /a)	15.68	16.8	18.09	19.6	21.38	23.52	26.13	29.4	33.6	39.19	47.03

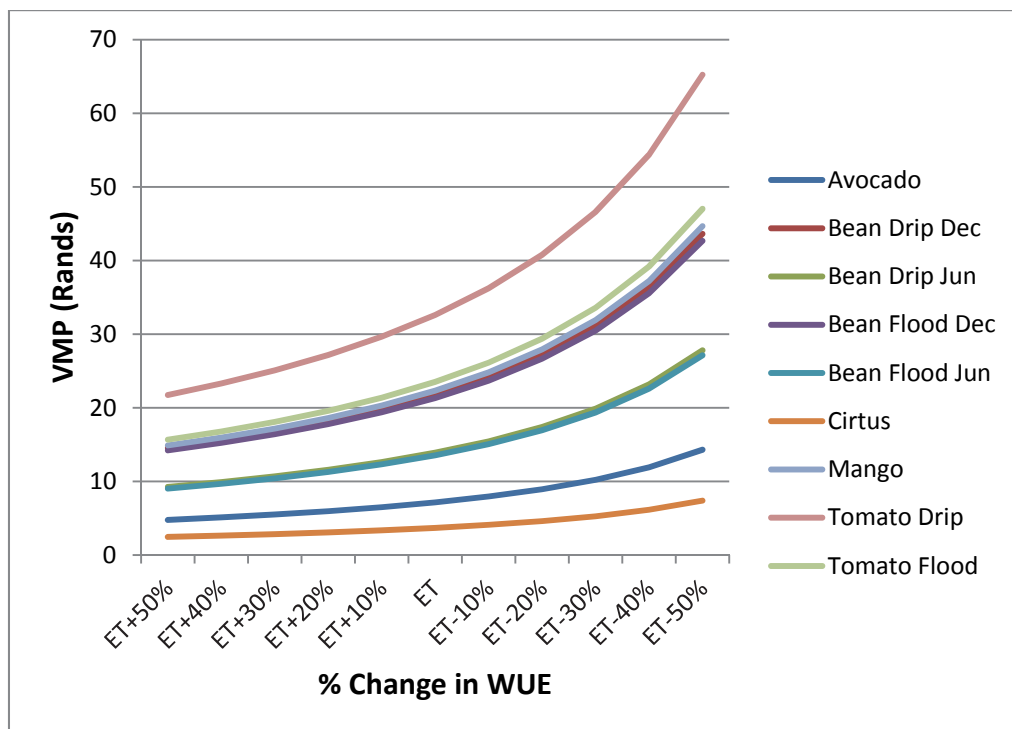


Figure 17: The MPV elasticity of water use

The actual average MPV elasticities of water use for all the farming scenarios are displayed in Table 17. A comparison of two stages of the MPV elasticity analysis (50% excess to SAPWAT and SAPWAT to 50% deficit) shows that the MPV of water use increases at an increasing rate as the conservation of water increases. In simple terms, marginally, the economic productivity of irrigation water increases at an increasing rate, hence it is financially worthwhile for farmers in the Hoedspruit agricultural area to adjust their agronomic practices towards water conservation and also to invest in water efficient irrigation technologies. This can be achieved through practices such as informed irrigation scheduling, weed control, mulching, reducing run-off and deep percolation, weed control, and other informed crop husbandry practices; as well as switching from less water efficient irrigation technologies like flood, to more efficient technologies such as drip and micro-jet irrigation. However, for perennial fruit growers, micro-jet irrigation will be the more practical of the two technologies, because it can deliver substantial water volumes when needed at critical stages of the plant growth cycle. For farmers growing annual crops, a switch to drip irrigation will enhance the economic productivity of irrigation water. It should also be noted that the theoretical exponential increase in MPV is capped by biophysical limitations (unaccounted for in this study), i.e. we cannot assume that yield will continue to increase for an ever decreasing volume of water applied, at some point the crop will be stressed with a consequent drop in yield and MPV. This implies that the graphs in Figure 17 are actually a bell-shaped curve, with different crops maximizing their MPV's at different levels of WUE (although we cannot present the whole graph in the absence of field trials).

Table 17: MPV elasticities of water use for all the farming scenarios

Farming scenarios	MPV elasticity of water use	
	50% excess to SAPWAT	SAPWAT to 50% deficit
Avocado	0.048	0.14
Bean (Drip in Dec)	0.145	0.44
Bean (Drip in Jun)	0.093	0.28
Bean (Flood in Dec)	0.142	0.42
Bean (Flood in Jun)	0.09	0.27
Orange	0.025	0.074
Mango	0.149	0.447
Tomato (Drip in Sep)	0.22	0.653
Tomato (Flood in Sep)	0.157	0.47

The tomato crop grown in September using drip irrigation displayed the highest economic productivity of irrigation water (R32.62/m³/a at SAPWAT water use recommendations). Its MPV of irrigation water at 50% conservation and at 50% excessive water use was R65.25/m³/a and R21.75/m³/a, respectively. Oranges displayed the lowest economic productivity of irrigation water (R3.69/m³/a at SAPWAT water use recommendations). The MPV of irrigation water at 50% conservation and at 50% excessive water use was R7.39/m³/a and R2.46/m³/a respectively. Although orange displayed the lowest economic productivity of irrigation water, citrus production still remains an enterprise of economic importance in South Africa. Citrus production over the past ten years has been fairly stable. In 2010 orange contributed 67% of total citrus production. It was followed by grapefruit at 16%, lemons and limes at 10% and soft citrus at 7%. The citrus industry is labour intensive and it is estimated that it employs more than 100 000 people, with large numbers of workers in the orchards and packing houses (Citrus growers association of South Africa, 2012). An unspecified number of people are employed throughout the supply chain services such as transport, port handling and allied services. It is estimated that more than a million households depend on the South African citrus industry for their livelihood (Department of Agriculture Forestry and Fisheries, 2011).

7.4 An operations-based approach to assess water use efficiency in the study area

This section presents the operations-based approach as developed within this study. It presents indicators that can be used to assess water use efficiency for those farmers who cannot be assessed in terms of an output-based approach as per the previous sub-section. Operations-based indicators focus on a critical, albeit qualitative and more subjective, assessment of the way in which water is used by farmers. We took this approach because a number of the farmers could not provide the information as required for the output-based approach; i.e., the data required for output-based indicators (i.e. indicators based on the value of output per unit of water use) to assess water use efficiency were often incomplete or did not exist for various farmers, mainly because of notoriously poor or a complete absence of recordkeeping of inputs and yields. Furthermore, Speelman et al. (2008) provide empirical evidence that profit per cubic meter of water is not always a suitable indicator of water use efficiency, especially where farmers are not primarily focused on profit maximization, i.e. commercially orientated. We argue that the operations approach should be seen as supplementary to the output-based approach mentioned in the previous sub-sections. The method was corroborated by fieldwork and formed the basis for recommendations for approaches on how to improve water use efficiency in this context. We employed the following to assess water use efficiency:

- Structured and unstructured interviews with farmers
- Direct observation
- Photographs

The operations-based approach employed the following specific variables in order to assess water use efficiency:

- Land ownership arrangements (private, communal, chief-land)
- Water governance structures. These could be formal or informal; for example, a member of an irrigation scheme or water user association vs a member of an informal small-scale scheme consisting of individual farmers sharing a water source.
- Presence of a moral hazard (e.g. no obligation to conserve water when it's the user's 'turn' to irrigate) and non-payment
- Specific on-farm water use practices
 - o Irrigation system design and employed infrastructure (e.g. sprinkler, hose, bucket)
 - o Irrigation operating methods including scheduling
 - o Irrigation system maintenance due diligence in terms of maintaining the irrigation system
- On-farm production/agronomic practices which are directly related to water utilization
 - o Evidence of minimum tillage and soil water retention
 - o Evidence of mulching
 - o Evidence of whether crop water requirements affect crop selection
 - o Crop rotation patterns
- Other factors affecting water use efficiency in these contexts:
 - o Farm size (cultivated area in ha) (to assess whether we could find evidence of the negative relationship between farm size and WUE according to Speelman et al., 2008)
 - o Fragmentation (variety of different crops grown on separate plots on the same farm)

The above mentioned criteria were applied to the respondents in order to yield a critical reflection on the water use efficiency of the respondents.

7.4.1 Crop water use efficiency in an irrigation context

Crop water use efficiency can be improved through a combination of both irrigation management and crop management strategies. Factors which influence water use efficiency are heavily affected by the choice and effective management of an irrigation method and irrigation scheduling (determining the timing, duration and the volume of water applied), based on the crop water needs (derived from a combination of evapotranspiration potential of the crop, soil water storage capacity and climatic conditions). These factors can be manipulated independently or combined to increase the water use efficiency. For example, the application rate (volume of water applied within a given time period, e.g. in mm per hour) could be varied according to infiltration potential of the soil to avoid run-off and erosion. Irrigation timing could be used to minimize direct water losses through high evaporation by avoiding irrigating during the hottest part of the day. Maintaining irrigation infrastructure to avoid loss of water through leakage and seepage conserves water, while mulching (the placement of materials on the soil surface to lower soil temperatures and reduce evaporation) also conserves water. Practices such as minimum tillage improve water infiltration into the soil and reduce runoff and water loss due to evaporation, while water loss

through transpiration can be reduced through weed control. Crop water use efficiency can also be improved via changes in farming practices geared towards improving crop water-use efficiency via crop growth. Promoting crop growth entails planting high-yielding crops (crop selection) well adapted to the local soil and climate. It also includes the creation of conditions via agronomic practices which promote healthy, vigorous crops; such as adequate tillage, fertilization and effective pest and disease control. In summary, raising water-use efficiency requires good farming practices in an integrated fashion. The following few sections critically reflect on the above-mentioned aspects of crop water use efficiency within the irrigation context for the respondents of our study area.

7.4.2 Reflections on crop water use efficiency on the different farms

7.4.2.1 Respondent A

This farm used furrow irrigation, a method which is generally considered to be comparatively inefficient and wasteful of water if not applied correctly. Irrigation was done in the morning and late afternoon and was stopped between 13:00 and 16:00 to minimize water loss through evaporation. Evidence of mulching and effective weed control was observed. Irrigation was however done on windy days (which was, given the method used, not a big problem). No windbreaks were present to shield crops from wind and reduce evaporation. Crops were irrigated on an *ad hoc* basis and the volume of water that was applied in a given time period during an irrigation event was not known. Irrigation was not scheduled and no monitoring of soil moisture and evaporation was carried out prior to irrigation. Crops were sprayed with chemicals to control pests and diseases, and crop fertilisation was informed by soil analyses. Crop rotation was practiced, which could promote healthy and vigorous crops which use water efficiently.



Photograph 1: Vegetables under furrow irrigation on respondent A's plot



Photograph 2: Signs of uneven-irrigation on respondent A's plot



Photograph 3: Furrow irrigated vegetables without mulch on respondent A's plot.

7.4.2.2 Respondent B

The irrigation method used on this farm was furrow irrigation, which is generally considered to be comparatively inefficient and wasteful of water. Irrigation was not timed to minimize losses due to evaporation, as irrigation was carried out at any time of day, including the hottest part of the day. This could be because of numerous reasons. Although the duration of irrigation events was known, the actual amount of water that was applied in a given time period during each irrigation event was unknown. Irrigation was not scheduled on the basis of crop needs, soil moisture conditions and/or evaporation. No evidence could be found with regard to practices which help to conserve soil moisture such as minimum tillage and mulching. There were no wind breaks to shield crops and reduce evaporation. Weed control was practiced and fertilizers were applied, albeit not according to soil analysis results. Soil samples were sometimes collected from the farm, but there was no evident linkage between the samples and crop fertilization. Crops were sprayed with chemicals to control pests and diseases.

7.4.2.3 Respondent C

This farm also employed a gravity fed furrow irrigation system. Crops were irrigated according to a fixed schedule every second day, irrespective of the conditions. The irrigation took place for the whole day, including the hottest part of the day, which increases water loss due to evaporation. The farmer did not know how much water was applied to crops in a

given time period. Irrigation scheduling was not practised and the timing of irrigation, its duration, and the volume of water applied were not informed by soil moisture, crop needs or climatic conditions. Water was lost through leaking pipes, which were evident on the farm. No evidence of minimum tillage practices was found and overall weed control was poor. In addition to the poor irrigation management, fertilizer application to crops was not based on soil analyses, and crop nutrient requirements are unlikely to have been met. Crop rotation was, however, practised.



Photograph 4: Inefficient gravity fed furrow irrigation (respondent C)



Photograph 5: Poor maintenance of irrigation system (respondent C)

7.4.2.4 Respondent D

A drip irrigation system was employed on this farm. This method minimizes wastage of water, but has comparatively high maintenance requirements. Irrigation took place in the morning and late afternoon to minimize water losses due to evaporation. Although the equipment on the farm was old, it was found to be functional and no wastage of water through leakage was evident. Water management was not precise as the quantity of water applied in a given time during irrigation was unknown and irrigation was not scheduled on the basis of monitoring quantity of water applied and water losses through evaporation. No evidence of water loss minimizing practices such as minimum tillage and mulching could be found. There were also no windbreaks to shield crops from wind and decrease evaporation. Crop rotation was practised and appropriate plant spacing was applied, while fertilizer application was based on soil analyses. Although leaf discolouration (indicating presence of either a nutrient deficiency or a disease) was observed in the okra crop which was being harvested at the time of the survey, it was claimed by the farmer that crops were sprayed with chemicals to control pests and diseases and ensure healthy vigorous growth, which would promote water use efficiency.



Photograph 6: A damaged disused reservoir on respondent D's farm



Photograph 7: Pumping equipment on respondent D's farm. Irrigating directly from the borehole is expensive.



Photograph 8: A mango orchard on respondent D's farm. The orchard was established by the previous owner, but is not irrigated anymore due to shortages of water.



Photograph 9: Note the dry plant material which was used as mulch on this okra field.

7.4.2.5 Respondent E

This farm used drip and sprinkler irrigation, and these methods are less prone to water wastage and are more efficient in terms of water conservation than furrow irrigation. Infrastructure on the farm seemed to be maintained satisfactorily and there was no evidence of water losses due to leakages. Weeds were controlled by means of mechanical and chemical control. Irrigation was done in the morning and late afternoon to minimize water losses due to evaporation, while irrigation was withheld on windy days in order to minimise water losses. There were no windbreaks to shield crops from wind and reduce evaporation. Irrigation practices were not fully conducive for efficient water management, as evidenced by the farmer not knowing how much irrigation water he used and not having an irrigation schedule informed by crop needs and environmental conditions. Practices such as minimum tillage and mulching, which minimize water loss, were not used. Crop growth optimization practices on the farm included spraying crops to control pests and diseases and using soil analyses to inform fertilizer application to crops.



Photograph 10: Weeding sugar beans on respondent E's farm



Photograph 11: Signs of poorly maintained irrigation equipment on respondent E's farm



Photograph 12: A crop of cherry tomatoes under drip irrigation on respondent E's farm



Photograph 13: Water being pumped into a storage reservoir on respondent E's farm, more efficient as compared to respondent D.



Photograph 14: A crop of healthy green beans under drip irrigation on respondent E's farm

7.4.2.6 Respondent F

A drip irrigation system was employed on this farm. The farmer gave an estimate on how much water was applied to some crops, but it was evident that the amount of water applied in a given time period was unknown for all crops. Irrigation scheduling (based on monitoring soil moisture levels, crop needs and evaporation) was not practised, and there was no limit on quantities of water used. Mulching was practiced, which reduces water loss due to evaporation; however, minimum tillage was not practised and weed control was poor. Water loss through leakage from a storage tank was observed, but there were no leakages in the field. Crop rotation was practised and this encourages healthy crops which use water efficiently. Fertilization and crop allocation to land were done on the basis of soil analysis.



Photograph 15: Green beans being packed for the market (respondent F)



Photograph 16: Drip irrigation system (respondent F)



Photograph 17: Inadequate storage (respondent F)

7.4.2.7 Respondent G

This farm used drip irrigation along with other water conservation practices such as withholding irrigation on windy days, use of windbreaks to shield crops and effective weed control. Weed control was, however, not completely effective as some weedy plots were observed on the farm. Irrigation management practices were not fully conducive for water conservation as the farmer did not know the quantity of water that was applied in a given time period during irrigation events; nor was irrigation scheduled on the basis of monitoring the quantity of water applied and evaporation. The farmer could specify the time of day when irrigation was carried out. Minimum tillage and mulching were not used on the farm. In terms of crop growth optimization practices, the farm used crop rotation, appropriate plant spacing and soil analysis to inform crop fertilization. Crops were sprayed with chemicals to control pests and diseases. At the time of the survey, disease control was not completely effective, as evidence of black stem disease was observed on the tomatoes.



Photograph 18: A crop of tomatoes under drip irrigation on respondent G's farm



Photograph 19: A canal conveying water to respondent G's farm



Photograph 20: The overgrown dam from which irrigation water for respondent G's farm is pumped



Photograph 21: Sand filter bank for pumping station of respondent G's farm



Photograph 22: Prepared land ready for planting on respondent G's farm

7.4.2.8 Respondent H

This farm used a drip irrigation system, while irrigation was carried out in the morning and late afternoon to evening. Irrigating between noon and early afternoon was avoided to minimize water loss due to evaporation. The farmer was not sure of the quantity of water applied in a given time period during irrigation. There was no irrigation scheduling and irrigation was not carried out on the basis of crop water use, soil moisture or evaporation measurements. Practices such as minimum tillage and mulching, which help to minimize water loss, were not used, and water losses through leaking pipes were observed. Crop rotation was carried out and crops were fertilised on the basis of soil analyses. Fertiliser was applied through fertigation.



Photograph 23: Drip irrigation control valve on respondent H's farm



Photograph 24: Hand spraying for pesticides on green beans (respondent H)

7.4.2.9 Respondent I

This farm employed a micro jet irrigation system, which is slightly less efficient as compared to drip or furrow irrigation, but the preferred option for citrus. Irrigation scheduling was practiced; and the timing of irrigation, its duration and the amounts of water applied were informed by parameters such as soil moisture, crop needs and climatic conditions; and these were monitored on a regular basis. Windbreaks were used to shield crops and reduce evaporation. Agronomic practices followed on the farm, namely fertilizing crops on the basis of soil and foliar analysis, appropriate spacing and spraying with chemicals to control pests and diseases, are conducive to the development of healthy and vigorous crops which use water efficiently.

7.4.2.10 Respondent J

The irrigation method used on this farm was micro jet irrigation, which was managed through monitoring of soil moisture and evaporation; and this information was used to schedule irrigation. The amount of irrigation water applied in a given time was known and carefully regulated. Minimum tillage, windbreaks and weed control were used, and these reduce water loss from irrigated fields. Agronomic practices promoting healthy and vigorous crops which use water efficiently, namely appropriate crop spacing, pest and disease control and fertilization to meet crop nutrient requirements, were applied. Appropriate fertilizer levels were determined through soil and foliar analyses.

7.4.2.11 Respondent K

This farm employed a micro jet irrigation system, with the volume of irrigation water applied in a given time period carefully monitored. Irrigation was managed proactively through monitoring of evaporation and soil moisture depletion, and this information was used to schedule irrigation, and the amount of water applied during irrigation was based on evaporation and soil moisture depletion. Minimum tillage, windbreaks and effective weed control were used to minimize water loss. Agronomic practices which optimize crop growth, such as appropriate spacing and pest and disease control, were applied. Crop fertilization was done to meet crop nutrient requirements, and this was determined through soil and crop tissue (foliar) analysis.



Photograph 25: Packing citrus for export on respondent K's farm

7.4.2.12 Respondent L

This farm employed a microjet irrigation system. The system was managed through irrigation scheduling, and the schedule responded to soil moisture and weather conditions affecting evaporation. Soil moisture was routinely monitored using probes; and this monitoring was used to inform irrigation scheduling (determining the timing of irrigation, the duration of irrigation, and the amounts of water applied based on crop needs, soil water storage capacity and climatic conditions). Windbreaks and weed control were applied. Agronomic practices which optimize crop growth were applied, and these included fertilizer

application (which was done on the basis of soil, foliar and juice analysis), appropriate crop spacing and pest and disease control.



Photograph 26: Micro jet irrigation in citrus orchard (respondent L)

Table 18 presents a summary of the above-mentioned farmer profiles; and a categorization of farmers on the basis of the extent to which each farmer adheres to various water conservation and agronomic (crop growth optimization) practices.

Table 18: Summary of critical reflections on crop water use efficiency on the different farms

Profile according to water conservation and agronomic practices (crop growth optimization)	Adheres to most (90%) water conservation and crop growth optimization principles	Adheres to a significant number (more than 50%) of water conservation and crop growth optimization principles	Adheres to some (35 to 45%) of water conservation and crop growth optimization principles	Adheres to very few (20% and less) water conservation and crop growth optimization principles
Respondents	I, J, K, L	E, F, G, H	D	A, B, C
Water conservation practices				
Irrigation scheduling on basis of evaporation and/or soil moisture (scientific)	Yes	no	no	no

Profile according to water conservation and agronomic practices (crop growth optimization)	Adheres to most (90%) water conservation and crop growth optimization principles	Adheres to a significant number (more than 50%) of water conservation and crop growth optimization principles	Adheres to some (35 to 45%) of water conservation and crop growth optimization principles	Adheres to very few (20% and less) water conservation and crop growth optimization principles
Respondents	I, J, K, L	E, F, G, H	D	A, B, C
Water conservation practices				
Measured application of irrigation water – knowledge of how much water is used	Yes	no	no	no
Soil moisture monitoring	Yes	no	no	no
Minimizes losses through evaporation (time of irrigation)	Yes	yes	yes	yes and no, some irrigate at any time of day or whenever water is available
Minimizes losses through transpiration by weeds	Yes	yes	sometimes -try to control weeds but not always timely	sometimes – try to control weeds, not always timely
Minimizes losses through runoff via irrigation method e.g. drip	Yes	yes	yes	no
Mulching	No evidence	no	no	yes, sometimes
Minimizes losses through seepage via irrigation method e.g. drip	Yes	yes	yes	no
Practices which promote maximum crop growth -optimize growth conditions				
Crops adapted to local conditions	Yes	yes	yes	yes
Appropriate spacing	Yes	yes	yes	no
Crop rotation	Yes	yes	yes	yes
Correct fertilization (i.e. according to soil analyses and crop nutrient requirements)	Yes	yes	yes	sometimes – not precise, apply what they can afford
Correct and timely pest control	Yes	yes	sometimes – not precise	sometimes – not precise
Reduced tillage	No evidence	no	no	no

7.5 Assessing the water use efficiency on typology level

The above-mentioned critical reflections and photos provided some evidence for a Likert scale-based approach to compare the farmers against the adjusted SAPWAT best irrigation practice estimates as per Table 16. The approach was used to 'score' each farmer in terms of WUE, based on his or her assumed deviation from the SAPWAT best practice guidelines, determined on the basis of the above-mentioned critical reflections on each farmer. The Likert scale scores in terms of the agronomic and water use practices could range from 1, where the respondent adheres to very few (20% and less) of the water conservation and crop growth optimization principles; to 10, where most (90% or above) of the water conservation and crop growth optimization principles are adhered to. Although subjective in nature, it should be noted that the absolute values of the scores are not important; instead, the relative differences between scores are important, since these provide a ranking of the respondents, and thus allow categorization. One cannot therefore argue that respondent X performed twice as efficiently as compared to respondent Y if the score respondent X received was twice the score of respondent Y. The twelve respondents were scored in Table 19 in terms of agronomic attributes of efficient water use practice. These scores formed the basis to place the respondents in terms of the water use efficiency scale as per Table 16. We calibrated the scores and the SAPWAT estimates in the following way: A perfect score of 10 would indicate that the farmer is irrigating exactly as per the SAPWAT best management guidelines, i.e. a 0% adjustment on the SAPWAT estimate. A score of 9 would indicate that the farmer is using 10% more than the SAPWAT guideline, such that the farmer's water use estimate should be revised upward by 10% as compared to the SAPWAT estimate. Similarly, a score of 7 or 8 would correspond to a 20% adjustment over and above the SAPWAT estimate, a score of 5 or 6 would correspond to a 30% adjustment over and above the SAPWAT estimate, a score of 3 or 4 would correspond to a 40% adjustment over and above the SAPWAT estimate, and a score of 1 or 2 would correspond to a 50% increase above the SAPWAT estimate.

Table 19: Qualitative assessment of relative performance and consequent adjustment on SAPWAT estimates

Respondent #	Do they think they use water efficiently?	Aspirations	Strategic partnership?	Crops	Likert scale score (1=adheres to less than 20% of agronomic attributes, and 10=adheres to more than 90% of agronomic attributes)	Consequent SAPWAT adjustment
A	Don't know	Have agency and be less	No	Tomato, green beans,	1	+50%

Respondent #	Do they think they use water efficiently?	Aspirations	Strategic partnership?	Crops	Likert scale score (1=adheres to less than 20% of agronomic attributes, and 10=adheres to more than 90% of agronomic attributes)	Consequent SAPWAT adjustment
		dependent on Government		onions, sweet potato, chillies, spinach)		
B	The farmers generally believe that they use water responsibly. Another means of conserving water is by making sure there is no runoff; they make sure all taps, gates and canals are closed after irrigation and this is monitored	Be more productive and have stronger networks through their co-operative	No	Tomato, sweet potato and green beans	2	+40%
C	The farmer thought he uses water efficiently and that his water use practices are good – he says that using water efficiently means that when he's finished watering, he stops it running.	To be a commercial farmer	No	Green beans, tomatoes, cabbage	1	+50%
D	The farmer was of the opinion that he uses water efficiently because he uses drip irrigation. He did mention that his drip irrigation system needs improving	Grow the business	No	Tomatoes, green beans and okra	4	+30%
E	Yes because he use drip irrigation	To be a commercial farmer	No (but has white farmer as mentor)	Tomatoes, green beans	5	+30%

Respondent #	Do they think they use water efficiently?	Aspirations	Strategic partnership?	Crops	Likert scale score (1=adheres to less than 20% of agronomic attributes, and 10=adheres to more than 90% of agronomic attributes)	Consequent SAPWAT adjustment
F	Yes, she thought it is important to save water and use it efficiently. She installed the irrigation system herself and is self-trained in repair and maintenance of her irrigation system – she realized the importance of checking for leaking pipes, etc.	To be a commercial farmer, be more productive and build the business	No	Green beans, chillies	5	+30%
G	“Yes, to use drippers means you are efficient.”	To be a commercial farmer	?	Tomatoes, green beans, okra, cabbage	5	+30%
H	He believes he uses water efficiently in that drip irrigation is more efficient than furrow/furrow irrigation	Build the business and have his children inherit the farm	No	Green beans, chillies	5	+30%
I	They think they use water efficiently because they try to repair any leakages	To be a commercial farmer	Yes	Citrus	6	+20%
J	No not yet. We are currently busy consolidating the 18 title deeds into one profitable unit and thus can improve our water use efficiency quite significantly. We inherited very old and inefficient systems from some	Be more productive and grow the business. Also capacity building	Yes	Citrus and mangos	9	+10%

Respondent #	Do they think they use water efficiently?	Aspirations	Strategic partnership?	Crops	Likert scale score (1=adheres to less than 20% of agronomic attributes, and 10=adheres to more than 90% of agronomic attributes)	Consequent SAPWAT adjustment
	title deeds – consolidating these into one system takes time.					
K	Yes, because we have to be. Eskom's electricity hikes are putting immense pressure on the farmers. In terms of irrigation scheduling they are doing what they can although there is always room for improvement. The benefit of using the pipeline is that they are towards the end and don't need to boost pressure. They try to maximise their utilisation from the pipeline first before starting to pump from the river.	Grow the business and capacity building	Yes	Citrus and mangos	9	+10%
L	Their water use monitoring system is quite advanced and it instantly reports on water use at each orchard.		Yes	Citrus	9	+10%

The above-mentioned scores enabled us to estimate the water use and the corresponding MPV of each crop planted by each of the farmers (information derived from Table 16).

Table 20: Water use estimates (m³/ha/a) for different farmers across the selection of crops as per the fieldwork

Farmer	Bean (Drip in Dec)	Bean (Drip in Jun)	Bean (Flood in Dec)	Bean (Flood in Jun)	Orange	Mango	Tomato (Drip in Sep)	Tomato (Flood in Sep)
A			2565	4035				11700
B			2565	4035				11700
C			2565	4035				11700
D	1624	2548					7392	
E	1508	2366					6864	
F	1508	2366						
G	1508	2366					6864	
H	1508	2366						
I					14261			
J					12067	11880		
K					12067	11880		
L					12067			

Table 21: Associated MPV (R/m³/a) for different farmers across the selection of crops as per the fieldwork

Farmer	Bean (Drip in Dec)	Bean (Drip in Jun)	Bean (Flood in Dec)	Bean (Flood in Jun)	Orange	Mango	Tomato (Drip in Sep)	Tomato (Flood in Sep)
A			14.23	9.04				15.68
B			14.23	9.04				15.68
C			14.23	9.04				15.68
D	15.59	9.93					23.30	
E	16.79	10.70					25.10	
F	16.79	10.70						
G	16.79	10.70					25.10	
H	16.79	10.70						
I					2.84			

Farmer	Bean (Drip in Dec)	Bean (Drip in Jun)	Bean (Flood in Dec)	Bean (Flood in Jun)	Orange	Mango	Tomato (Drip in Sep)	Tomato (Flood in Sep)
J					3.36	20.31		
K					3.36	20.31		
L					3.36			

Table 21 quantifies the Rand benefit per unit of water use associated with moving from a less efficient to a more efficient irrigation system (Flood to drip).

7.6 Interpretation

According to Table 20 and Table 21, most of the respondents already employ drip irrigation, no matter the crop they grow. This is a clear indication of respondent's willingness to increase water use efficiency, which is of course an encouraging observation. A possible explanation for this phenomenon is that it is not as much the efficiency gains in itself which drives this trend, but rather the anticipated cost savings and consequent increase in profitability, which drives the investment in more efficient irrigation infrastructure. It could therefore be argued that the overriding factor which determines water use efficiency would be farming objectives (i.e. profit seeking or just farming for household use). However, in the event of an external drive to improve water use efficiency, a farmer's socio-economic circumstances and level of skill should be taken into account in determining the suitable methods of improving such efficiency. This implies that the circumstances of each farmer need to be assessed to ensure a good fit between recommendations and the farmer's circumstances. Proposed recommendations should therefore be within the reach of the respondent if these are to be effective and sustainable in the long term. This implies that extending high-tech solutions (such as irrigation scheduling, which involves monitoring soil moisture and weather conditions) to farmers such as respondents A, B and C would be futile; as their current circumstances do not allow them to harness the benefits of such technologies. Another important consideration for achievability would be the cost considerations of the intended improvements. Proposed solutions should be cost efficient, since such farmers are considerably limited with regards to financing irrigation infrastructure. This is where operations-based solutions focusing on production/agronomic practice could be more suitable, for example, the focus for these farmers should rather be to introduce mulching as a simple soil moisture conservation practice, or to re-evaluate crop selection and rotation cycles in terms of water use efficiency, before such farmers could be encouraged to try their hand at drip irrigation and the associated maintenance challenges. These operations-based changes to production methods would not necessitate significant changes to the way these farmers operate, and are thus likely to be adopted. Farmers should also be encouraged to start with a simple record-keeping system, where they keep a record of inputs and outputs of the farming enterprise – this is of paramount importance that any additional improvements to water use efficiency be based on decent record keeping.

For farmers such as respondents E, F, G and H, who have already significantly improved agronomic practices but are not managing their irrigation efficiently; the next step would be to improve irrigation management. Most of these farmers have the capacity (in terms of financial resources and skills) to understand and effectively apply irrigation scheduling. Providing technical support for these farmers to establish and operate equipment to monitor soil and climatic conditions and schedule irrigation accordingly would further improve their water use efficiency. These farmers could be introduced to irrigation scheduling through the use of simple and durable equipment and tools, and could progress to more high tech methods with time.

7.7 Summary of the operations-based approach

This section presented operations-based indicators that could be employed to assess and reflect on water utilization efficiency in cases where traditional input-output based approaches cannot be applied. Operations-based indicators focus on the way in which water is used by farmers. We took this approach because a number of the farmers could not provide the information as required for a traditional input-output based approach towards water use efficiency; i.e., the data required for output-based indicators (i.e. indicators based on the value of output per unit of water use) to assess water use efficiency were often incomplete or did not exist at all for many farmers, mainly because of notoriously poor or a complete absence of record-keeping of inputs and yields. Speelman et al. (2008) provide empirical evidence that profit per cubic meter of water is not always a suitable indicator of water use efficiency, especially when farmers are not primarily focused on profit maximization, we argue that the operations approach should be seen as supplementary to the output-based approach mentioned in the previous section. The approach was corroborated by fieldwork and formed the basis for recommendations for approaches on how to improve water use efficiency (WUE) in this context. We employed the following methods to assess water use efficiency:

- Structured and unstructured interviews with farmers
- Direct observation
- Photographs

We employed an extensive two-stage ground-truthing approach to fieldwork, comprising of extensive research in the study area, allowing for detailed and concentrated data collection. A case study research design was employed that comprised of a mixed-method data collection strategy of qualitative and quantitative methods, including questionnaires, semi-structured interviews, researcher observation and a contextual analysis. Multiple sources of information were sought to provide a holistic and comprehensive perspective of emerging farmer food value chains. Once data was collected and processed, a descriptive and reflective data analysis process was followed, with the ultimate goal of producing a mixture of summary statistics as well as a rich descriptive analysis.

The construction of a typology was important because farmers in any particular study area differ in terms of aspirations, objectives, and needs. For example, we found that not all

beneficiaries of land and water reform in the study area have commercial farming aspirations. We observed that these farmers lack record keeping systems and interpret the concept of “productivity and efficiency” in a total different way as compared to commercially orientated farmers. We consequently came to the conclusion that water use efficiencies could not be assessed and interpreted in the same way across different groupings of beneficiaries.

The construction of a suitable typology made these kind of differences more explicit and thus allowed for an improved understanding of different types of farmers and their characteristics. Fieldwork data was used to identify the set of characteristics that can be used to construct the typology. The typology has therefore emerged from the fieldwork data and was not assumed prior to the assessment, and forms the basis for addressing the remainder of the project objectives. An ‘emic’ approach was followed, involving the use of participant observation to develop and populate an “emergent” typology (typology emerging from the fieldwork). An emic approach emphasizes empathy and an understanding from within the context (as opposed to imposing an understanding from outside the context). Emphasis was placed on open ended descriptive questions to provide the researchers with “rich” descriptions of the context (no “leading questions” were used). One could argue that the typology served as a context against which to assess water use efficiency (according to an operations-based approach as explained above) and for the development of the guidelines (see appendices).

The operations-based approach employed the following specific variables in order to assess water use efficiency:

- Land ownership arrangements (private, communal, chief-land)
- Water governance structure under which the user operates. These could be formal or informal; for example, a member of an irrigation scheme or water user association vs. a member of an informal small-scale scheme consisting of individual farmers sharing a source.
- Presence of a moral hazard (e.g. no obligation to conserve water during the user’s ‘turn’ to irrigate) and non-payment
- Specific on-farm water use practices
 - o Irrigation system design and employed infrastructure (e.g. sprinkler, hose, bucket)
 - o Irrigation operating methods including scheduling
 - o Irrigation system maintenance due diligence in terms of maintaining the irrigation system
- On-farm production/agronomic practices which are directly related to water utilization
 - o Evidence of minimum tillage and soil water retention
 - o Evidence of mulching
 - o Evidence of whether crop water requirements affect crop selection
 - o Crop rotation patterns
- Other factors affecting water use efficiency in these contexts

- o Farm size (cultivated area in ha) (to assess whether we could find evidence of the negative relationship between farm size and WUE referred to by Speelman et al., 2008)
- o Fragmentation (variety of different crops grown on separate plots on the same farm)

The above mentioned criteria were applied to the respondents in order to obtain a critical reflection on the water use efficiency of the respondents, which allowed a ranking of the respondents in terms of their water use efficiency (according to the above mentioned definition of WUE). Such ranking identified several respondents with ample scope to improve their water use efficiency.

7.8 Underlying challenges

Most of the smallholders in our study area are constrained by well-documented supply chain constraints (including lack of access to credit due to insecure property rights; stringent quality requirements, which in effect regulate the distribution of products and thus the scope for vertical integration; small scale of production; high transaction costs due to poor infrastructure, lack of trust among market actors; distance to the market; and inadequate or poor market information); all of which unfold as a significant and integrated barrier to smallholders who wish to enter commercial agricultural food value chains. However, these refer only to “business” or “economic” barriers facing smallholders. We have found that far more fundamental barriers are also at play; including:

- low literacy levels (several smallholders could not read or write, which hinders the development of other basic vocational skills, including literacy and numeracy skills; although most of the farmers had a fair level of arithmetic competence)
- basic decision-making and problem solving skills
- technical skills (basic maintenance of implements and other basic agricultural skills)
- leadership, planning and management skills
- social, interpersonal and communication skills
- negotiation and facilitation skills
- critical thinking ability, which is necessary for fostering innovation and awareness of social, political and legal institutions that is necessary for effective participation in civil society

All of these skills are considered as requirements to successfully enter commercial agricultural food value chains. It should be noted that most of these skills are acquired through primary and secondary education – and we are convinced that this is where the heart of the problem (and consequently the key to improve water use efficiency) lies, since clear evidence is found throughout South Africa that the education system has failed many, especially in rural areas, leaving these individuals at a disadvantage for the rest of their lives.

Despite these constraints, there were some farmers who produced marketable surpluses, albeit on an irregular basis, that could potentially enter a formal commercial value chain. However, where surpluses are only produced irregularly, value chains can only be entered on an ad-hoc basis, which is not ideal for commercial food value chains.

7.9 Scope to improve efficiency

Crop water use efficiency could be improved through a combination of both irrigation management and crop cultivation practices.

Irrigation practices:

- Irrigation scheduling
- Reduce conveyance losses (i.e. transportation losses of water between source and point of use).
- Reduce direct evaporation during application of water
- Minimize foliar interception
- Reduce runoff losses.
- Improve soil moisture content by mulching.
- Reduce competition of weeds.

Cultivation practice:

- Select most suitable (in terms of water use) crops for the region.
- Consider timing for planting and harvesting.
- Tillage management and soil conservation
- Pest and disease control.
- Liquid fertilisation.
- Manage drainage to avoid salinization.

Operations-based factors which influence water use efficiency are heavily affected by cropping practices, choice of irrigation method and irrigation scheduling (determining the timing, duration and the volume of water applied), based on the crop water needs (derived from a combination of evapotranspiration potential of the crop, soil water storage capacity and climatic conditions). To manage water in an efficient way effectively means that all of these factors are managed in an integrated way to optimize the water use efficiency. For example, the application rate (volume of water applied within a given time period, e.g. in mm per hour) could be varied according to infiltration potential of the soil to avoid run-off and erosion; but this affects the irrigation timing, which could be used to minimize direct water losses through high evaporation by avoiding irrigating during the hottest part of the day. Maintaining irrigation infrastructure to avoid loss of water through leakage and seepage conserves water, while mulching (the placement of materials on the soil surface to lower soil temperatures and reduce evaporation) also conserves water. Practices such as minimum tillage improve water infiltration into the soil and reduce runoff and water loss due to evaporation, while water loss through transpiration can be reduced through weed control. Crop water use efficiency can also be improved through farming and crop cultivation practices. The selection of suitable crops for the local conditions (from a biophysical perspective) is the starting point. High yielding crops which are well adapted to the local soil and climate are preferable. Crop management also includes optimizing growing conditions through agronomic practices which promote healthy, vigorous crops; such as adequate and correct tillage, fertilization and effective pest and disease control. Practices such as fertilizer application on the basis of crop requirements (determined through soil and or plant tissue analysis) ensure an optimized nutrient supply to the crop, and this improves crop growth and yield and thus crop water use efficiency. Adequate pest and disease control ensures healthy

and vigorous crops which use water efficiently. The practice of crop rotation (selecting an appropriate crop sequence) can optimize water and nutrient use and minimize disease and weed problems, and thus improve water use efficiency. In summary, improving water-use efficiency requires good farming practices from planting to harvest of a crop.

While all of these practices apply to farmers who irrigate, it should be noted that even with high spatial and temporal variability in rainfall, and significant soil evaporation losses in the study area, a large proportion of people in our study area still rely on rainfed food production; for which some of the above-mentioned practices are not relevant. Furthermore, as a result of high capital costs, and risks associated with irresponsible management and consequent limited benefits to poor rural communities, we do not foresee a significant increase in growth in support for irrigation agriculture on marginalized land with smallholders. Rain-fed agriculture will therefore continue to play an important role in food production and livelihoods in the foreseeable future. We thus argue that extension services and support should also increase their focus on increasing water use efficiency within rain-fed agriculture as a potential key to increase food security; rather than only focusing on irrigation practices. This implies a focus on cultivation practice. Extension services in rain-fed agriculture should focus on conservation agriculture; with conservation tillage practices (no tillage and reduced tillage) playing an important role in simultaneously conserving soil and water resources and reducing the energy demand of farms, while maintaining crop production. Conservation agriculture, (as defined by the Food and Agriculture Organization of the United Nations, FAO), has become an accepted umbrella term for describing agricultural farming practices that conserve ecological systems via minimization of input levels (Baudron et al., 2012). Conservation agricultural methods are regarded to be cost-effective, environmentally friendly methods of farming; with reduced emphasis on regular tillage, and fertilizing practices; towards greater emphasis on supporting the natural soil bioflora and fauna as far as possible, in order to improve and maintain soil health at the highest possible level. This form of agriculture has become important because conservation and efficient utilization of natural resources is no longer a luxury, but an imperative, and the adoption of conservation farming practices is an essential component of good farming practice (Baudron et al., 2012). It is important to note that conservation agriculture could be practiced in both commercial and non-commercial settings. The overarching strategies of conservation agriculture, within the context of crop production, focuses on soil moisture management via provisioning of ground cover, irrigation scheduling, diversified crop rotation, wind breaks, and changes to tilling regimes. The most common forms of conservation agriculture are no-tillage, direct seeding, ridge till, chisel and disc, rip-on-row and stubble mulching. All of these methods leave plant residues on the soil surface between growing seasons; which then protects against wind and water erosion, reduces evaporation losses, and consequently maximizes water retention and thus water availability to crops. In short, such practices focus on minimizing input levels and disturbance to land, while maintaining output levels. Given that the aim is not necessarily the maximization of outputs, this approach seems well adapted for the context of this project.

Different levels of conservation agriculture include:

- No (zero) tilling (also called direct seeding), where no seed bed preparation is done other than the opening via a slit or punched hole, for planting. No cultivation is

performed during the growing season. Weed control is done by means mulching, allelopathy, crop rotation, or appropriate spraying with narrow spectrum bio-friendly herbicides.

- Minimum tillage (also called reduced tillage) involves minimal soil manipulation for crop production, where the objective of tillage is limited to perform the minimum number and severity of operations necessary to optimize soil conditions, frequently differentiating between the in- and inter-row areas; and to minimize the number of trips over the field to avoid soil compaction and structural degradation.

Some commonly applied minimum tillage systems include:

- till and plant (tractor-driven equipment prepares narrow strips utilizing shallow secondary tillage after the primary tillage and just ahead of the planter)
- strip tillage (employing combination units performing strip tillage just ahead of the planter in untilled soil; usually utilizing a chisel plough, with the sole aim of improving porosity and rooting depth in the root zone)
- ridge tilling refers to planting on the ridge top, in the furrow or along both sides of a ridge. The ridges could be contoured with graded furrows which drain into a grassed waterway, or use short cross-ties to create a series of basins to store water in 'tied-ridges'.
- mulch tilling involves cutting the roots of weeds and other plants, leaving the crop residue on the surface or mixed into the top few centimeters of the soil in order to improve soil moisture retention.
- Direct mulching (mulch on the surface of the ground) shields the soil from solar radiation thereby reducing evaporation from the soil. Soil biota can increase more rapidly in a mulched soil environment thereby improving nutrient cycling and organic matter build up over a period of several years – healthy soil is the result. However, according to Mupangwa et al. (Mupangwa et al., 2007), 4 to 6 tonnes of mulch per hectare is required to improve rainwater crop productivity – not many smallholders can get close to this level, with typically about 1 tonne of mulch per hectare (mainly in the form of crop residue) observed in the study area. However, we observed that the benefits of mulching could be overstated, since the measurement of such benefits (usually measured in terms of water infiltration as a function of mulch cover) is done under controlled conditions, which typically ignores small farm conditions, where plots are generally not fenced and become communal grazing land after harvest. The land is therefore exposed to communal grazing and compaction, leaving a sparse soil cover. Furthermore, application of mulch from outside is labour intensive, and therefore costly for smallholders.

Nonetheless, physical soil properties that are influenced by conservation tillage include bulk density, infiltration and water retention. Improved infiltration of rainwater into the soil potentially increases water availability to plants, reduces surface runoff and improves groundwater recharge. Such reduced soil cultivation decreases farm energy requirements and overall farming costs, as less area has to be tilled. This is crucial for the semi-arid areas, where draught animals are often weak at a time when land preparation has to commence.

It should be clear that conservation farming requires changes to farming practice. However, most smallholders are risk averse and are hesitant to change their production practices. Shorter term production cycles (i.e. cash crops) is an effective way to hedge against harvest risk – but also an effective barrier to enter long term / perennial crops (citrus and mangoes). Income generated from these farming activities has a direct effect on investment behavior in conservation farming. However, input-output price ratios on marginalized land do not favour profitability, and hence the generation of funds for investment in conservation farming is minimal. Thus, the poor economic condition of farmers impedes their ability to make large-scale investments in conservation agriculture, and improvement of land in particular.

7.10 Farmer perceptions with regard to conservation agriculture

During the fieldwork it was observed that good agronomic practice, and in particular, adequate fertilisation and crop protection, appeared to be equally important for obtaining good yields as compared to tillage and soil mulching. As land preparation is simplified, conservation agriculture harnesses the benefits of early planting before the first effective rains, thereby reducing the risk of crop failure when receiving below-average rainfall and stabilizing yields when rains are poorly distributed. Furthermore, we observed that farmers perceived minimum-tillage and retention of a mulch of crop residues as having both positive and negative consequences on crop yields, depending on the season and soil type. For example, it was mentioned that minimum-tillage could improve soil fertility, but it can also lead to soil compaction and soil crusting in some soils. Soil type consequently plays an important role in determining whether to apply minimum tillage or not. Likewise no tillage could improve run-off, which is considered a benefit in areas where water logging is a problem, but it could also prevent water infiltration, which could be a negative impact in the dry season and in dry areas. However, these phenomena were less noticeable in poorly structured soils (sand). Similarly, mulching was thought to reduce evaporation, increase infiltration and smother weeds on one hand, but it was noted that mulch can carry weed seeds and pests and interfere with weeding activities by the farmer. Finally, legume intercropping is intended to increase soil fertility and control weeds through the formation of a closed canopy, but can also compete with crops in terms of nutrition and can also host pests.

Our fieldwork observations revealed that the advantages of adopting conservation agriculture are dependent on the soil type and rainfall regimes. Some respondents said that minimum tillage reduce water infiltration on poorly structured soils (sandy soils), which are prone to surface crusting and compaction, but to give good results on heavy clay soils, which form cracks during the dry season – clay soils are also hard to plough when wet. Also, the benefits of minimum-tillage on soils that have a tendency to crust and become compacted seems to depend on the rainy season. On these soils, ploughing leads to waterlogging and depresses yields during wet years, but maximizes water infiltration and improves yields during dry years. Therefore, minimum-tillage was perceived as a way to minimize infiltration and 'shed' 'excess water' during wet years, whilst ploughing was perceived as a way to maximize water infiltration during dry years.

It was mentioned that whilst the short-term benefits of ploughing were recognized (i.e. weed control, improved water infiltration, avoidance of compaction problems), the long-term benefits of minimum-tillage should also be acknowledged (i.e. maintenance of soil structure and soil fertility). This was said to be particularly true for sandy soils, as clay soils were 'resistant to the plough'. In order to capture both the short-term benefits of ploughing and the long-term benefits of minimum-tillage, a rotation between these two forms of land preparation was proposed: something like 1-2 years of consecutive ploughing, followed by 2-5 years of minimum-tillage (ploughing is required after every 2-5 years to avoid compaction problems).

We argue that the above-mentioned complex interactions between soil types, seasonal effects and tillage practice demonstrates the necessity of flexibility and pragmatism in the design, evaluation and diffusion of cropping systems based on the principles of conservation agriculture. These could form formidable entry barriers to emerging farmers.

7.11 Incentives and focus points for implementation

Our fieldwork has accounted for the social context of the study area by revealing the "stories" of the respondents; explaining why they use water in the way they do and why not always as "recommended". The typologies which followed were based upon groupings of similarities in terms of the field data and stories. These typologies emphasized the fact that water use assessments of "emerging" farmers need to reach beyond the actors who are directly involved in the value chains (i.e. input suppliers, farmers, hawkers, retailers, and end consumers) and need to include the underlying physical, socially-embedded, political and historical contexts if any form of support (official or unofficial, formal or informal) are to be successful.

It has become clear during the study that extension officers need to focus more on conservation farming practice and techniques instead of commercial practice and techniques. However, whilst the benefits of mulching with crop residues and minimum tillage to increase water infiltration and thereby to reduce water runoff is clear in the long term, the shorter term impact on farmers under typical smallholder conditions was less clear to the project team. I.e., the switch to conservation agriculture could bring about a short term drop in output or cashflow during the process of changing practices, which few smallholders can afford to absorb. The implementation of the longer term benefits of conservation agriculture consequently becomes difficult to promote because in the short term, minimum tillage on its own, or in combination with mulching, does not seem to consistently outperform traditional practices of overall tilling. There are several reasons for this, but it makes it difficult for extension officers to promote the longer term benefits of conservation agriculture to farmers. Consequently smallholders are easily deterred from adopting new techniques and technologies associated with conservation agriculture where short term impacts and benefits are uncertain. We thus argue that poor uptake of technologies and techniques can be improved via an improved understanding of the local context of smallholders.

It is clear that the cycle of land degradation, low productivity, poor returns and low profitability; leading to no savings and poor investment on land; and in turn to perpetual environmental degradation and poverty; needs to be broken. The literature on land degradation and incentives for adoption of conservation agriculture is abound with a multitude of factors such as input and output prices and their relationship with land degradation, policies on subsidizing the initial investment costs and incentives to conserve the soil, direct government intervention in agricultural markets and farm level incentives (Pande et al., 2011). However, the complexity of issues implies the need for context-specificity; hence, the incentive mechanism needs to account for the bio-physical and socio-economic conditions of the stakeholders – i.e. the social capital of the area. The literature has shown that the adoption of water conservation practices by small-scale farmers is determined by several factors; as summarized in the following table (Table 22).

Table 22: Summary of several studies that have sought to explain the factors contributing to the adoption of water conservation practices.

Author	Factors
Amsalu, 2007	Education, age; farm size; profitability perception; slope; soil fertility
Anley, 2007	Farm size; education; slope; age
Baidu-Forsen, 1999	Percentage of degraded land; education, profitability perception; risk attitude
Bekele, 2003	Farm size; education, extension; access to information
Pender, 1998	Education, debt; severe erosion; irrigated
Pender, 1998	Education, savings
Pender, 1998	Education; quality of land
Silebe, 2005	Education; training, perception of degradation
Silibe, 2005	Farm size; training, education, membership of farmers' organization
Tenge, 2004	Education; perception of erosion problems; security of tenure

What is striking from Table 22 is that “education” was found in each study as a factor affecting the adoption of water conservation practices. We therefore argue that an important implication is the need to create education and technical assistance programs that support farmers to adopt conservation farming practices (this seems to be stating the obvious, but it cannot be emphasized enough). Furthermore our field data has shown that social capital and current land use play a key role in the adoption of new or alternative management practices. We also observed that farmers tend to adopt conservation techniques as long as such techniques can increase the expected profitability of the farming enterprise (which indicates that making a profit is still important to these farmers, even if they are ‘small’). Here, most farmers considered the output side of their operation to identify profitability increases; very few considered the scope of cost savings as an alternative way to increase

profitability. It is therefore important to focus on and promote cost savings as an alternative way to increase profit.

We also observed that the decision to adopt alternative practices and techniques are influenced by a farmer's socio-economic status. Farmers from a "lower" status will, out of respect, allow members of higher status first choice in terms of utilizing alternative techniques.

It is clear that the adoption of new conservation technologies affects a wide range of human, biophysical, institutional, and economic variables and consequently requires considerable changes in the decision-making process. From our field observations, we have identified five categories of variables that determine a farmer's decision as to whether or not to adopt alternative farming techniques like conservation agriculture: (1) the skills, knowledge, and abilities of the farmer and workers (human capital); (2) land, water, vegetation, biodiversity (natural capital); (3) the infrastructure of the farm (manufactured capital); (4) savings and access to credit (financial capital); and (5) access to extension, farmers support networks, etc. (social capital).

Any form of support or incentive structure needs to consider the relative performance of smallholders in each of these categories when the support or incentive structure is designed. One should remember that financial capital is intuitively related to the adoption of technologies, but given that the farmers performed poorly in this category, one could argue that a technology based solution to improve water use efficiency is perhaps not the best option. Although it is true that having to pay for irrigation water could increase the adoption of conservation practices (i.e. one is more likely to conserve if one pays for something) and that the use of water pricing structures seems like an effective policy option to induce conservation; such a policy would be difficult to implement, monitor and enforce in the type of context found in our study area where affordability of such payments are questionable. It should also be mentioned that such a policy could have a regressive effect on poorer farmers. The smallholders performed best in the social capital category, which is why support structures and initiatives could potentially have more impact if such efforts focus on employing the social capital of the farmers within the implementation process. The benefits derived from improved education forms part of the foundation of improved self-esteem, self-confidence, and perseverance – all of which is required for adaptive behavior – which is an essential factor for successful implementation of support strategies.

CHAPTER 8: AGRICULTURAL VALUE CHAINS FOUND IN THE STUDY AREA

8.1 Introduction

This chapter presents some of the value chains being found in the study area. While it was originally envisaged that the focus of the study would be on citrus producers in the Maruleng area, the project team found that very few emerging farmers focus on citrus. Those that did produce citrus were either a) in a strategic partnership with a bigger commercial strategic partner, as was the case with the Moletete CPA owned farms, or b) they produced some oranges from the trees established by previous owners, but had a much more diversified basket of commodities that they were producing. Some of these crops included maize, green beans, cabbage, tomatoes, mango, avocado, citrus, butternuts, pumpkin, onion, green beans, red chillies, green squash, litchi, green papers, potato/ sweet potato, groundnuts, dry beans, beetroot, sugar beans, banana and guava. The most common agricultural products produced by beneficiaries were maize, green beans potato/sweet potato, tomato, cabbage and mango.

8.2 Interpretation of the concept of value chains within the context of this study

The Maruleng maize, green beans, tomato, potato/sweet potato, and cabbage and mango value chains are characterised by a multiplicity of potential sellers and buyers between the wholesale and retail levels of the chain, while the farm-to-wholesale parts of the chain are not relatively distinct with clearly defined channels.

From the production side there are three main actors: smallholders; large commercial farmers; and emerging farmers. From the marketing side there are a number of actors and some of the most important ones are described below. The wholesale markets in major cities are a critical link in the six selected commodity value chains. It is important to know what percentage of each of these crops pass through the wholesale markets of the area. The wholesale market usually provides the physical space where farmers, traders and retailers come together.

Possible major actors involved in wholesale trade are as follows:

a) Small wholesalers

These players usually possess their own transport vehicles, most often a two-ton minivan or a five-ton truck. These wholesalers are the major buyer at the farm level and the source of the largest volumes arriving in wholesale markets. These small traders have no fixed warehouses or depots, and are often based in major urban centres. During harvesting seasons, they travel each day to the farms that produce the six crops mentioned above. These traders either sell to wholesale markets or make deliveries directly to green market retailers. Their principal market function is to serve as the main locus for assembly and transport of the crops from the farm level to the wholesale markets. They are sometimes in competition with farmers who may perform the same function if they have access to transport.

b) Large wholesalers/ exporters

These are generally registered businesses that have a fixed warehouse in wholesale markets. These actors buy exportable agricultural products from small, medium and large farmers and use their own transport vehicles, generally trucks with a capacity of over 5 tons. These actors could be small or medium enterprises. It is possible that these actors may have other activities (e.g., agribusiness, construction, real estate) as sources of income. They usually sell agricultural products to distributors in the wholesale market or sometimes to processors and retailers.

c) Major exporters

These categories of actors are true specialists in the entire agricultural products value chain; they limit their activities to the export and wholesaling of export products. They are officially registered enterprises.

d) Distributors

These traders assemble a variety of fresh produce from different sources, including imported and local products, and offer a basket of different fruits and vegetables that meet the desired needs of retailers. They rent smaller depots inside the wholesale market or close to agricultural products exporters. These distributors compete among themselves by offering higher quality agricultural products.

e) Retail trade

These are small traders that buy agricultural products from different sources and earn a living out of this business.

f) Local retail grocery stores

These include stores with a range of products and fruits and vegetable crops.

g) Supermarket segments (e.g. Fruit and Veg)

These are large supermarket chains such as SPAR, Fruit and Veg, etc. that buy either directly from the farmers or from the various actors mentioned above.

Following on from this, several questions deserve further attention including: (a) what is the current value chain map – in the maize, green beans, tomato, cabbage, sweet potato and mango production sector of the study area; (b) what is the market share of each of these agricultural products for all these different actors?; and (c) what is the nature of relationships among the value chain members and its impact on the growers (in our case the emerging farmers') incomes and wellbeing?

The following section will describe the general value chain map for each of the six crops in the Maruleng municipality. In other words, it will map practices within existing value chains related to marketing, pricing, sourcing, sale, service delivery, organisational linkages, etc., and also identify some key constraints faced by emerging farmers.

8.3 Presentation of the value chains in which the respondents operate

A map of the value chain for each of the six crops mentioned above is shown in Figure 18 to Figure 23. The value chain map is simply a graphical representation or snapshot of the various functions in the value chain, key participants performing those functions and their dynamic inter-relationships. These are considered typical value chains in which prospective farmers will need to engage if they aim to become commercial. The mathematical description of the value added model for commercial agricultural orientated farmers is presented, but not populated due to data limitations and due to the fact that very few farmers displayed commercial aspirations.

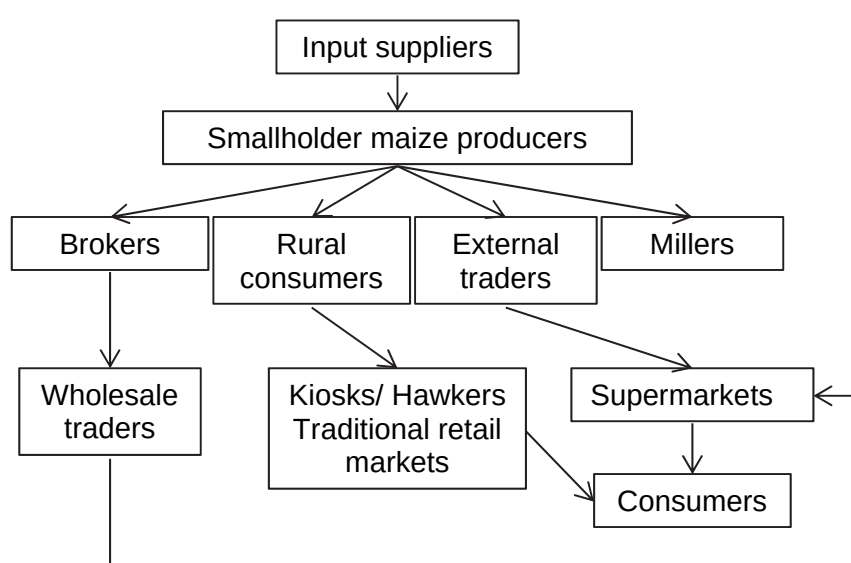


Figure 18: Emerging farmer value chain map for maize production

As can be seen from Figure 18, the value chain map for maize is a simple one. Irrigation scheme beneficiaries in Maruleng municipality produce maize primarily for home consumption. If the farmers manage to produce a surplus, they will try to dispose of it through different marketing channels. It is common for farmers to sell a part of their surplus to brokers (local assemblers) and the remaining directly to rural consumers, millers (e.g. Progress milling) and sometimes to traditional retail markets (kiosks/ hawkers). However, small scale farmers do not usually sell their surplus maize directly to external traders, wholesalers, big supermarkets or urban consumers – the volumes are too low and transactions costs are too high. It should be noted that if small scale farmers practice collective marketing, they could sell their surplus goods directly to supermarkets, wholesalers and urban consumers and thereby fetch a higher price for their produce.

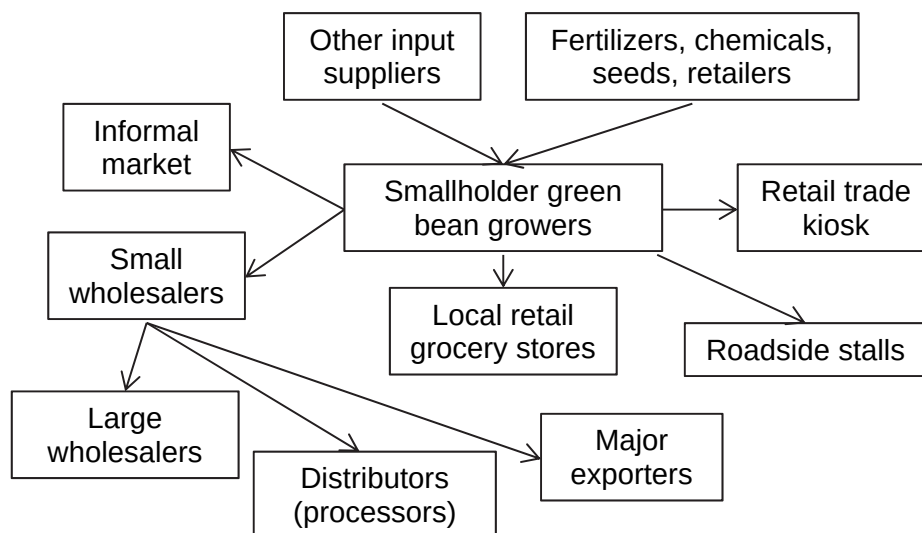


Figure 19: Emerging farmer value chain map for green beans production

As can be seen from Figure 19, small scale farmers usually grow green beans for market to get cash income to be spent on education for children, medication and other obligations. When it comes to marketing, the small green beans growers sell green beans to retail trade kiosks, road side stalls, small wholesalers, and to different informal markets. Small green bean growers have little chance to sell green beans directly to large wholesalers, distributors, and major exporters because of the small size of their yields. Again, collective marketing can play a very important role in establishing a link between small scale green beans growers and large wholesale exporters or large distributors.

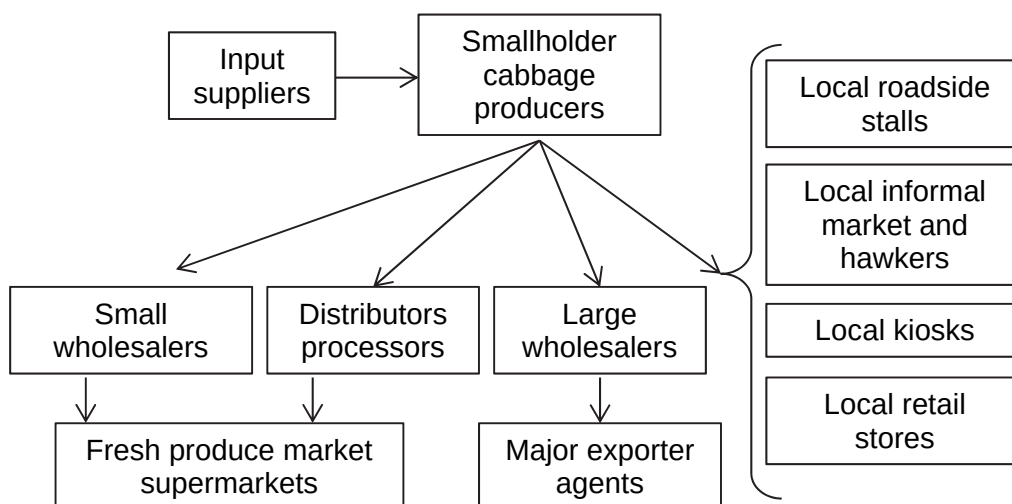


Figure 20: Emerging farmer value chain map for cabbage production

Although production of cabbage is not primarily for home consumption, small scale farmers do occasionally consume cabbage. When it comes to marketing, small scale cabbage producers sell cabbage mostly to local community roadside stalls, hawkers, kiosk and local retail groceries (Figure 20). Sometimes, there may be a possibility by which small scale

cabbage growers can sell cabbage to small wholesalers, distributors/processors and large wholesalers. However, the link between small scale cabbage growers and distributors, processors and large wholesalers is not strong due to a lack of organised marketing (e.g., collective marketing) from the producers' side.

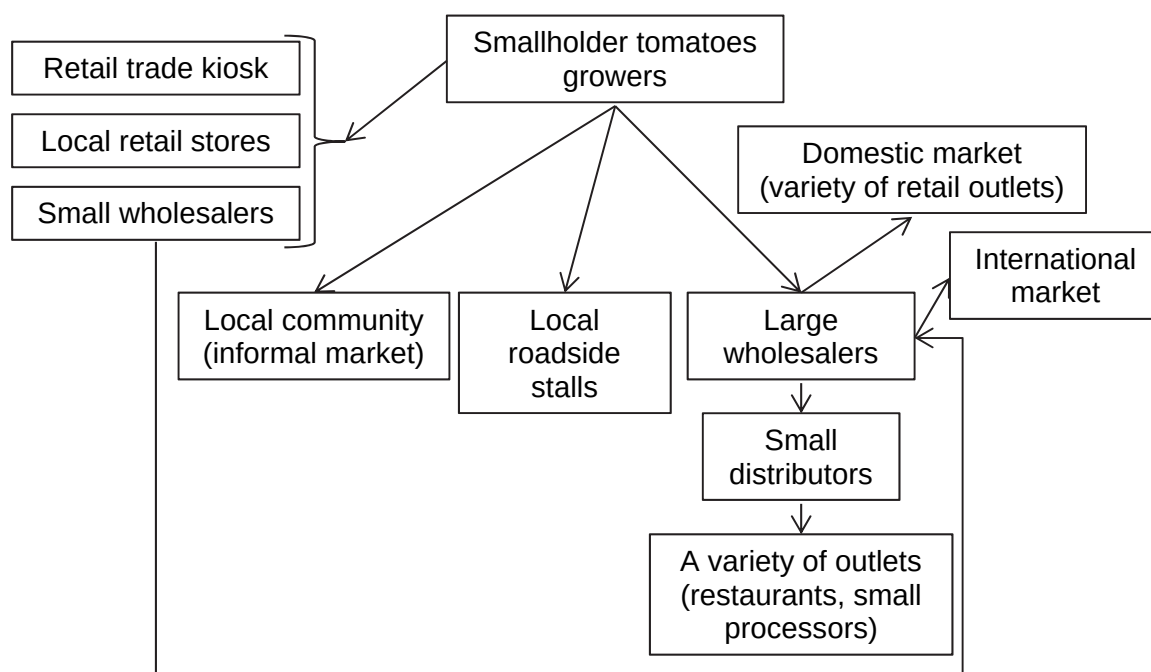


Figure 21: Emerging farmer value chain map for tomato production

Small scale farmers also produce tomatoes for both home consumption and market. As can be seen from Figure 21, small scale tomato growers sell small quantities of tomato to informal markets (local communities), roadside stalls, retail trade kiosks, grocery stores and small wholesalers. There are times when small scale tomato growers can sell tomatoes directly to large wholesalers. However, the latter marketing channel is not very commonly practiced.

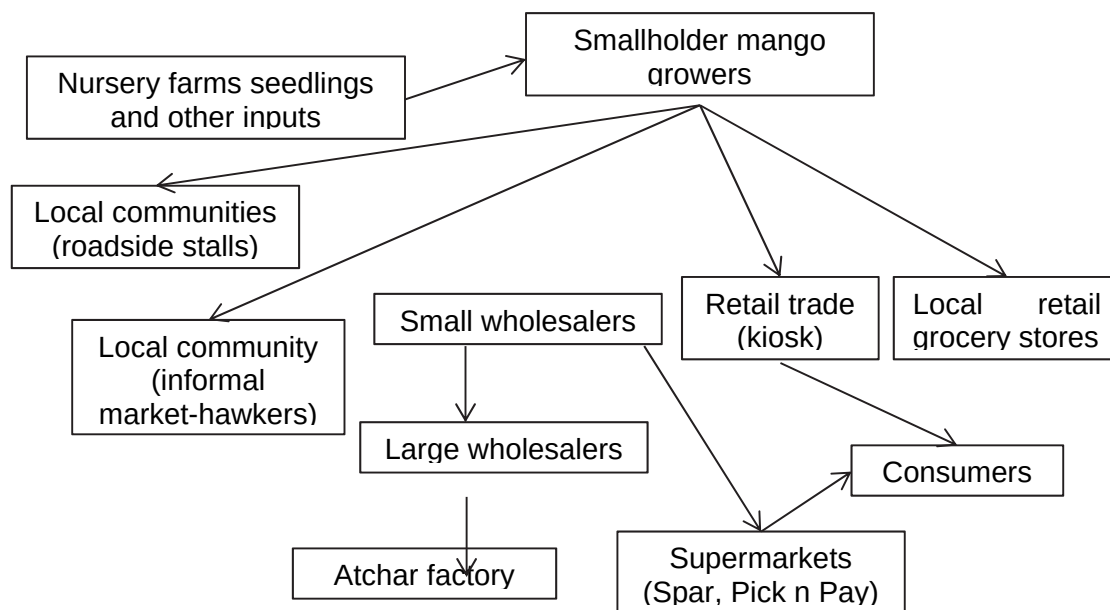


Figure 22: Emerging farmer value chain map for mango production

Mango is produced for some home consumption, but mainly for the market. As can be seen from Figure 22, small mango growers usually sell ripe or semi ripe mango to local communities such as roadside stalls, hawkers, kiosks and local retail grocery stores. Small mango growers know that if ripe mango is not sold within the shortest time possible, it will go bad. This perhaps limits small mango growers from looking for a better market such as small and large wholesalers, big supermarkets (e.g. Pick 'n Pay and SPAR), and urban consumers. Transportation is another problem that hinders small mango producers from selling mango directly to large wholesalers and atchar factories. However, the sale of green mangoes to atchar-making factories is common practice in Maruleng.

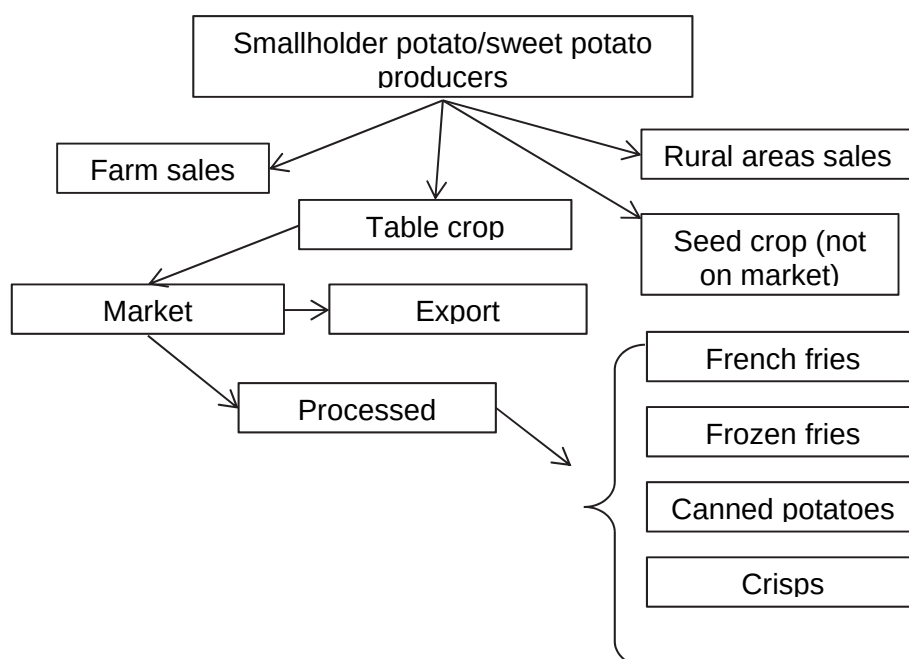


Figure 23: Emerging farmer value chain map for potato / sweet potato production

Irrigation scheme farmers grow both sweet potato and ordinary potato for home consumption as well as for market. Traditionally sweet potato is eaten in boiled form while the ordinary potato can be processed into French fries, frozen fries and crisps. Figure 23 is drawn in such a way that it roughly reflects marketing of both types of potato. Small potato growers sell potato to various markets. They sell potato to local communities as the staple crop or seed crop. The remainder is sold in various other markets including informal markets i.e. roadside stalls, kiosks, hawkers and local grocery stores. Potatoes are also sold on the farm, particularly during harvesting season. As usual, small potato growers do not have direct links to large wholesalers, export market, fresh produce market, processors and urban consumers.

8.4 *Analysing value chains*

As is evident from the various emerging farmer value chains illustrated, as a product moves from the producer to the consumer, a number of transformations and transactions take place along a chain of interrelated activities, and value is added successively at each stage of the chain. The term value chain is therefore used to characterise the set of interconnected and coordinated linkages that take place as a product moves from the primary production unit to the final consumer. Kaplinsky and Morris (2001) define a value chain as the full range of activities that are required to bring a product from conception, through the intermediary stages of transformation, delivery to final consumers, and final disposal after use.

Production, processing, and distribution of agricultural products are increasingly being organised into value chains, where flows of inputs, products, financial and information resources take place among farmers, processors, retailers and other economic actors. Value chains do not evolve in a deterministic process, but adapt and respond to local conditions, the policy and institutional environment, market power, and consumer preferences, among other things. Some of these factors shaping value chain evolution may not be optimal from a social welfare standpoint.

The aim of value chain analyses, therefore, is to analyse the organisation and behaviour of all participants in the value chain, to diagnose the constraints and problems that they face, and to identify public actions that may enhance the performance of the value chain and contribute to national policy objectives. It is recognised that the meaning of performance and national policy objectives may vary, sometimes greatly, among different groups and stakeholders in society. Value chain analyses recognise that different arrangements of actors may affect outcomes along the chain by influencing capabilities and levels of bargaining of the actors.

A rigorous value chain analysis requires good quality quantitative data (either time series or cross section data). Econometric models usually used to do value chain analyses include the Stochastic Frontier Trans Log Production Function, Stochastic Frontier Production Function and Data Envelopment Analysis (Aigner et al., 1977; Battese, 1992; Battese and Coelli, 1995; and Hazarika and Subramanian, 1999). For this report, the Stochastic Frontier Trans Log Production function would have been considered. The advantage of this model is that it also takes consideration of interaction effects among the independent variables. It should

however be noted that given the data limitations as experienced in this project, the value chain analysis was limited to the mapping of the chains. No quantitative assessment is presented.

8.4.1 Specification of the Stochastic Frontier Translog (value added) model for cabbage production

The functional form of the stochastic frontier translog production model (assuming that time series data is available) is defined as:

$$\ln(Y_{it}) = B_0 + B_1T + B_2\ln A_{it} + B_{12}\ln A_{it}^*T + B_{13}\ln L_{it}^*T + B_3\ln L_{it}^* + \frac{1}{2}(B_{11}T^2 + B_{22}\ln A_{it}^2 + B_{33}\ln L_{it}^2) + B_{23}\ln A_{it}^*\ln L_{it} + V_{it} - U_{it}$$

Where:

- The subscripts i and t represents the i -th (for example cabbage industry) and the t -th year observation;
- Y_{it} denotes the output variables (value added) of the i -th cabbage industry in the t -th period in values (Rand);
- T represents time;
- A_{it} denotes area of the i th cabbage industry in the t -th period;
- L_{it} represents labour of i th cabbage industry in the t -th period;
- “Ln” refers to the natural logarithm; the B_i 's are unknown parameters to be estimated; V_{it} follows $N(0, \sigma_v^2)$ and U_{it} follows a truncations at zero of the $N(\mu, \sigma_u^2)$ distribution and guarantees inefficiency to be positive only.

8.4.2 Identifying sources of technical inefficiency

As an example, the cabbage industry's specific inefficiency is considered as a function of some explanatory variables and the inefficiency effects model is defined as:

$$U_{it} = \sigma_0 + \sigma_1 Z_1 + \sigma_2 Z_2 + \sigma_3 Z_3 + W_{it}$$

Where:

- σ_0 is the intercept term and σ_j ($j = 1, 2, 3$) is the parameter for the i -th explanatory variable
- Z_1 = Temperature
- Z_2 = Rainfall
- Z_3 = Water
- W_{it} = some other factors (E.g., age, education, etc.)

It is important to note that the same mathematical model can be applied for the other agricultural products (maize, mango, potato/sweet potato, tomato, and green beans) considered in this study if the data is available.

8.4.3 How do food value chains help to alleviate the “lack” of productivity experienced by some beneficiaries?

The major advantage of being part of a food value chain is that it opens up opportunities for emerging farmers, to access markets and thus to diversify towards commodities that have a strong potential for higher returns to land, labour and capital (Birthal et al., 2007). However,

low levels of productivity by some emerging farmers in Maruleng inhibit them from participating effectively and meaningfully in the food value chain; lack of or limited market access, labour, and/or technology; high cost of inputs; lack of access to finance and/or the lack of extension services. Some of the ways in which food value chains can help to alleviate the lack of productivity amongst emerging farmers include:

- ***Diversification of agricultural income sources***

Participating in food value chains can diversify income and improve productivity of emerging farmers by spreading the risk among multiple income generating activities and increasing the regularity of cash inflows into the farm household. In Maruleng, emerging farmers rely primarily upon the irregular income from the sale of a few staple crops. There are times in the year when they have no income and as such, they are unable to afford inputs such as high yield seed, pesticides, or herbicides; or to pay for upkeep costs of tractors and other equipment as well as labour costs. The seasonal nature and hence irregular income generated from crop sales is a cause of low productivity. Participating in food value chains (e.g. grading and packaging of tomatoes) ensures that emerging farmers obtain additional income that can be used to purchase all the necessary inputs required to improve agricultural productivity.

- ***Diversification of income into non-agricultural value chains***

Diversifying income into non-agricultural value chains can often be complementary to agricultural activities. It has been found that non-cropping income is an 'indirect determinant' of on-farm productivity because of its effects on input purchases and farm investments (Reardon et al., 1996).

- ***Improvement in access to agricultural credit***

The agricultural sector is influenced by the accessibility of productive services such as credit due to seasonal variations in the farmer returns and a need to move from subsistence towards commercial production. Credit can therefore provide an opportunity to increase farmer' return and improve their level of productivity. Although credit is not a direct tool or factor of production, it can help to improve productivity of emerging farmers by removing financial backlogs and accelerating access to improved technologies. Since most emerging farmers cannot afford to repay the loans from financial organisations, the additional income obtained from the food value chain can assist farmers to repay their loans.

8.5 Requirements of participating in commercial value chains

8.5.1 Improve the existing infrastructure

Inadequate infrastructure and incomplete markets in rural areas are often the reasons for high food prices. Poor road infrastructure may raise transport costs. In cases where processing takes place outside the Maruleng Municipality, food will then be brought back to the area at high cost. Therefore there is a need to upgrade and improve existing market and

road infrastructure in the area so as to increase emerging farmers' participation along the food value chain.

8.5.2 Encourage value chain relationships that enable the sale of surplus food production

For farmers who are new to agriculture, surplus crop production typically occurs in small quantities. This limits the potential to market their surpluses. Value chain relationships that can create new market opportunities for these farmers to be involved in food value chains should be encouraged. For example, a value project that focuses on linking farmers with transporters, processors, wholesalers, retailers and final consumers; and training farmers to pool their resources; will create more income and thereby encourage farmers to participate more fully along the value chain.

8.5.3 Improve access to storage and packaging services

Access to storage facilities by emerging farmers will reduce post-harvest loss. Therefore, there is a need for establishing a warehouse receipt system that enabled farmers to store and package crops (thereby adding value) when they would otherwise be forced to sell earlier. Such systems will support income smoothing and assist farmers to manage risks associated with variations in production between the harvesting season and the off season.

8.5.4 Engage in value adding

Development of an agro-processing industry in the area can improve the productivity of food production. Such an industry should focus on improving access to improved varieties of seed, access to market, capacity building, and linking producers to markets. An agro-processing industry could also assist farmers in the area to engage in actual food production, processing, manufacturing, packaging and distribution, so that farmers participate fully in the food value chain.

8.5.5 Engage in collective marketing

There is increasing evidence from both research and practice that one way for small scale farmers to overcome market failures and maintain their market position is through organisation into farmer groups or producer's organization (Hazell et al., 2007; Meinzen et al., 2009; Shepherd, 2007; Weatherspoon and Reardon, 2003). Acting collectively, small scale farmers would be better positioned to reduce transaction costs for their market exchanges, obtain necessary market information, secure access to new technologies, and tap into higher-value markets allowing them to compete more effectively with large farmers and agribusinesses.

It should however be noted that in order to enable small scale farmer groups to compete in markets effectively, certain basics need to be in place. These should include improving rural infrastructure, providing extension services, making credit markets accessible to the poor, and making relevant market information available. Since the main challenge for small scale farmers to engage in markets is high transaction costs, such interventions would lower the costs for farmer groups to participate in markets, creating additional incentives for them to organise around an appropriate marketing activity. In addition, simplifying the registration process would facilitate the smooth formation and operation of a group in situations where formal registration is required to access inputs and services.

While collective marketing presents a viable opportunity for emerging farmers, only 5 respondents confirmed that they practice collective marketing (i.e. where they join other farmers to market their goods, purchase inputs, coordinate farming techniques, or use collective transport). The reason for this observation can be debated, but it is possible that the informal nature of the relations between farmers as well as the absence of a formal record keeping and book keeping systems and agreements limit farmers in verbal agreements, which does support to trust relationships to the same extent as compared to formal agreements underpinned by formal record keeping and management. Consequently, farmers find it difficult to build long term relationships which is crucial for the organisation structures of collective marketing. However, if small scale farmers practiced collective marketing, they would have been able to sell any surplus produced directly to supermarkets, wholesalers and urban consumers, and thereby fetch a higher price for their produce. Additionally, they would be able to collectively address the high transport costs of getting goods to market. This option is particularly beneficial in the event of smaller yields. Farms could then pool particular commodities and transport and sell their goods elsewhere rather than flood informal markets in the local community.

8.5.6 Increase access to credit

The Land Bank is a dedicated agricultural development financial organisation, which makes it the most prominent credit provider for emerging farmers. The Bank's main mandate is to develop the agricultural sector – the role of emerging farmers is critical in this regard, particularly in the context of past inequalities, which has led to a developed commercial sector and a developing emerging sector. The role of emerging farmers in seeking equity of participation in agriculture cannot be over-emphasized, and the Land Bank is obliged to continue support, but also to monitor their financial conditions, progress and success. It is pertinent to clarify what is meant by “success” (from the perspective of the Land Bank) in an emerging-farmer context. As such, success can be defined according to the following benchmarks:

- **Net farm income** – to reflect low, medium and high profitability
- **Profit** – positive profit is a success and negative profit is a failure
- **Production and value of production** benchmarks
- **Net farm yield** – to reflect productivity

It is clear that the Bank consider success from a financial perspective. The Bank argues that the servicing of loan is to a large extent a reflection of the underlying success of a farming enterprise. However it does not reflect on other dimensions of farming, which is problematic for those who farm because of other than commercial reasons.

8.6 *Building farmer capacity and viable farms via clustering*

Those emerging farmers with commercial aspirations have mostly struggled to be competitive in formal marketing sectors. This is due to a myriad of reasons, of which the lack of experience, skills and resources to farm on a commercial scale and to access formal marketing chains are probably the most prominent. Furthermore, formal marketing chains increasingly prefer larger suppliers in order to reduce administration and costs, which presents a problem to small-scale producers. Strategies are therefore required to improve the competitiveness of small-scale producers in South Africa through addressing these types of constraints, particularly those related to economies of scale. This section focuses on the idea of *clustering* as a form of cooperative governance and possible way to create economies of scale among stallholders, and on determining the suitability of implementing this concept in the informal agricultural sector.

8.6.1 Rationale for clustering of smallholders

In terms of number of farmers, small-scale farmers make up a significant portion of South Africa's farming community. It is estimated that more than 98% of South Africa's farmers can be classified as "non-commercial", "emerging", "resource poor" or "smallholder farmers", while the marketable output of this "majority group" contributes to only 5 % of the total formally marketed produce in South Africa (National Department of Agriculture, 2011). Small-scale and resource poor farmers struggle to supply formal markets in South Africa successfully. However, the government of South Africa has made it clear that at least 30 % of agricultural land should be transferred from white farmers to previously disadvantaged farmers by 2014, which, in theory, should increase the market share of emerging farmers.

Although the land transformation process often provides previously resource poor farmers with access to developed, large scale, commercial farms; many farmers that are beneficiaries of the land restitution programme are inexperienced in terms of commercial farming. Generally speaking, these farmers were previously employed on commercial farms or were involved in subsistence farming and in selling any overproduction on an informal basis to friends and neighbors. With little or no previous experience in large-scale, commercial farming, or experience in dealing with formal markets, it can be expected that these farmers will struggle at first, which would inevitably result in a decline in output quantity and quality of produce compared to what was previously cultivated on the land. The challenge is thus to maintain these farms' productivity and profitability, even though they have been transferred to individuals and/or communities with a traditional subsistence or family farming system background, and who generally lack the resources and experience in large scale commercial agriculture. Analysing the so-called "marketing constraints" faced by resource poor farmers in South Africa, the following are some of the main challenges preventing these farmers from participating in formal markets:

- The lack of access to credit and cash flow constraints;
- Land tenure problems (including access to land and ownership of land for collateral);
- The lack of appropriate technology and products for combating pests and diseases;
- The lack of commercial production experience;
- The lack of access to equipment; and
- The lack of access to better-yielding plant varieties.

In addition to the above constraints, supermarkets prefer bigger suppliers who can reliably supply produce according to order volumes and timeframes (and adhering to certain quality standards), rather than from small scale and emerging farmers (Lundy et al., 2004, Biénabe and Vermeulen, 2007). Furthermore, procurement from numerous smallholders rather than from a few bigger farmers increases transaction costs for buyers (Sartorius and Kirsten, 2004).

It is clear that smallholders need to increase their economies of scale, which would enable suppliers to offer better prices and services to the farmers, and would encourage larger formal buyers to enter into negotiations with them. However, despite the perception that “bigger is better”, small farm systems can be more efficient than large farms (van Zyl and Vink, 1998) due to factors such as lower land and labour-related costs (smallholders often farm themselves or make use of family labour), as well as simplified management structures and thus smaller overheads. A further strength that has a positive impact on the cost effectiveness and efficiency of smallholders, although difficult to quantify, is the improved motivation level, where self-employed and family workers generally have a larger stake in the operation and are therefore generally more motivated than hired labour (van der Meer, 2004).

A number of studies regarding the growth, improved competitiveness, productivity and efficiency of small firms have found that the clustering of small firms can create a competitive advantage for the particular industry, and for the individual small firm that is part of a cluster (Schmitz, 1995, Schmitz and Nadvi, 1999, McCormick, 1999, Humphrey and Shmitz, 1996). Most of these studies, however, have focused specifically on the co-operation and clustering of small manufacturing firms – very little data or strategic models specifically considering the clustering or collective efficiency of emerging farmers were found. However, the major constraints smallholders face, as mentioned earlier, correlate with Schmitz’s findings of the major constraints faced by small firms in the manufacturing industry, including:

- Low levels of product and process technology;
- Small product markets;
- Lack of access to capital;
- Lack of physical infrastructure; and
- Weak institutional frameworks for addressing constraints.

This correlation suggests that these models are also appropriate to investigate the competitiveness of the small-scale and “low technology level” sub-sector of agriculture.

8.6.2 Clustering as a concept: Harnessing the benefits of being small

According to Neven and Dröge's (Neven and Dröge, 2001) assessment of three theoretical models to study the co-operation of clustered small enterprises in the agri-food sector, Porter's Diamond Model of Competitiveness (Porter, 1998) has been identified as one of the most appropriate models to analyse clusters in the agri-food sector. In this model, Porter describes the success of a particular sector in an international context by arguing that although certain nations have gained a competitive advantage over others in certain sectors; it is individual firms that compete, not nations. The competitive advantage of an individual enterprise is developed through the way in which the enterprise organises and performs discrete activities in the value chain. Over and above the organisation of an enterprise's value chain, which is related to the internal economies that influence a firm's competitiveness, the environment in which it functions and operates can also contribute to its success or failure. Porter illustrates the main attributes that play a role in the environment in which a firm competes with other firms (locally or internationally) in his Diamond of Competitiveness Model, which include:

- Factor conditions, i.e. conditions associated with factors of production in the industry;
- Demand conditions, i.e. the local demand for products or services that are produced by the industry;
- Related and supporting industries, i.e. the presence, quality and competitiveness of suppliers and related industries;
- Firm strategy, structure, and rivalry, i.e. the way companies are created, organised and managed in the nation and industry, as well as the nature of rivalry within the industry;
- The role of Government, i.e. the influence of policies and regulation on the business environment of the industry; and
- The role of chance, i.e. the events outside the control of firms, which include phenomena such as climate/weather, pure inventions, breakthroughs in basic technology, wars, external political developments, and major shifts in foreign market demand.

Porter (1998) is of the opinion that the above six items are the essential element that dictate the competitiveness of a firm or an industry on a regional or international level, and that the clustering or grouping of firms could address the environment in which the individuals partake to such an extent that it improves their collective and individual competitiveness. In their analyses of the success of small firms in Europe and developing countries, Humphrey and Schmitz (Humphrey and Shmitz, 1996) argue that co-operation and clustering of small firms increases their competitiveness. They conclude that a customer-orientated, collective and cumulative approach (a "Triple C" approach) should be followed to promote clustering and networking of small firms for improved competitiveness. The rationale for this approach is summarised below:

- Focus and public support to small firms and groups of firms should be from a demand perspective (customer-orientated) rather than a supply perspective – in other words, more attention should be given to providing marketing assistance, markets, fairs, open days and other methods to encourage interaction of buyers with small suppliers.

- Customer-orientated and collective support to groups of small firms can achieve cumulative improvements in the competitiveness of these firms.
- Clustering provides a conduit for cost-efficient assistance to small firms (whether through public or private funding), which lowers overall transaction costs by providing assistance to a collective group rather than to individual firms.
- Small firms can give more attention to the quality and the design of their final product rather than the volume of the product, which enables the supply of products to niche markets. Niche markets provide these firms with a higher return per unit of final product on a lower volume of products, exempting them from trying to reach high volumes and high turnover.
- Smaller firms usually have simpler management structures, and in some cases decisions can be made immediately by the responsible party, which results in faster responses to market signals and requirements from buyers.
- Smaller firms in co-operation can assist one another to supply markets and “large buyers”. It could happen that a firm is not able to fulfil an order from a large client, and since the products of other “collaborative” firms are similar, products can be bought in from another firm to honour the contract and to keep the contract with the buyer.
- The clustering of small firms results in collective efficiency, which, over time, allows small firms and their employees to specialise, and this in turn attracts suppliers and buyers.

In summary, Humphrey and Schmitz (1996) believe that the result of the Triple C approach is that small and medium enterprises (SME“s) should not be at a disadvantage when compared to large firms, as long as they are able to benefit from the advantages of clustering and joint action. The principles listed above are all relevant in the small-scale agricultural industry. One factor worth highlighting though is the fact that buyers and consumers ideally would want access to the whole spectrum of fruit and vegetables for the entire year on a continuous basis (for instance delivering on a weekly basis), even though in most cases the supply season of one particular small scale farmer is typically only a few days or at most weeks of the year. The high risk involved with agriculture (due to, amongst other factors, the uncertainty of weather and markets) could be managed to a degree when farmers co-operate to supply a market collectively, rather than individually (the risk is shared and the potential impact on each individual farmer thus lowered).

In another study of particular importance to the agricultural sector in South Africa, McCormick (McCormick, 1999) identified three characteristics of clustering that specifically assist small firms to attain economic growth, namely:

- Clustering gives rise to collective efficiency, which enhances a firm’s competitive advantage;
- Clustering facilitates growth in small steps, making it more sustainable; and
- Clustering makes it easier for small firms to respond to opportunities and crises.

McCormick also highlights four benefits of clustering (which results in collective efficiency) within an African context that surfaced during her studies:

- Clusters improve market access for small firms, and in the process allow firms to increase production. Most large buyers of agricultural produce, especially the supermarket groups, require a continuous supply of a minimum value of fresh produce

from a farmer in order to be considered as a supplier. Joint action between farmers creates the opportunity to supply these volumes, and once a supply contract has been secured, the farmers have a market for their products and can increase production with less risk.

- Clusters improve the potential for technological upgrades between firms and in the sector in general by creating a platform for Government and other organisations to provide infrastructure for higher technologies. This point correlates with Humphrey and Schmitz's (1996) comment that the clustering of firms provides a conduit for better support to resource poor firms – in the agricultural sector, this would imply that individual farmers can share the technology or infrastructure required to enter or sustain markets.
- Clusters encourage joint action, which could help small firms to deal with external shocks. Even though McCormick (1999) refers mostly to non-perishable product sectors, the statement is also true for exporting firms of high value agri-food products that have a limited shelf life. Since there is a relatively limited market for high quality fruit and vegetable products in South Africa, based on the relatively low disposable income per household (Van Deventer, 2006), "First World" markets (mostly Europe and North America) are the preferred marketing channels for these products. Changes in exchange rates, demand, transport routes and available timeslots, product specifications or even packaging requirements could result in a supplier's non-compliance to export contract requirements, which could ruin a smallholder. However, the "virtual" economies of scale that are created by farmers that co-operate could result in less risk for each individual through sharing risk, and by enabling the collective to supply more than one market.
- Clusters enable firms to make good use of relatively small amounts of resources. Small-scale, co-operating firms can share equipment and infrastructure, and in effect, intensive capital investments are optimally utilised, subject to good organisation and communication between the firms.

McCormick's case studies and results regarding the clustering of small firms in Africa substantiate that with clustering, small firms create a collective efficiency that, as a strategy, could overcome the many obstacles small firms face. Although the sectors studied by McCormick do not focus on agriculture, the results of her study are topical since they apply clustering theory and collective efficiency in an African (resource-poor) economy context.

8.6.3 Clustering and organized co-operation in the agricultural sector

Co-operation, collective action or grouping of farmers bears a close resemblance to clustering. It can also be compared to the South African Agriculture co-operatives, which improved the competitiveness of "commercial" agriculture in South Africa in the 1900's by providing essential facilities, services and technical economic information in an organised manner to farmers, and reduced their risks by pooling resources and creating economies of scale (Van Rooyen, 1998, Carney and Van Rooyen, 1998). According to Van Rooyen (Van Rooyen, 1998), the concept of farmer unions or co-operatives in South Africa can be described as vehicles operating as agents for their members in purchasing and selling products, and creating economies of scale by grouping farmers.

In this regard, a natural question that arises is why co-operatives have not been implemented as "competitiveness development mechanisms" in the emerging farming sector of South Africa? Vink (Vink, 2000, Van Zyl and Vink, 1998) notes that agricultural co-

operatives did exist among resource poor farmers in the less developed areas of South Africa during the 1980's and 1990's, but most of them dismantled as a result of the lack of management experience, inadequate capital resources, disloyalty of members and non-performance by government agencies. Despite previous failures of co-operatives for resource poor farmers in South Africa, Van Rooyen (Van Rooyen, 1998) is of the opinion that co-operatives are endowed with the properties that could act as a development agency to mobilise resource-poor farmers in South Africa once more. Others (Carney & Van Rooyen, 1998) agree that creating improved efficiency through collective action is the most logical route to the empowerment and improvement of the competitiveness of resource-poor farmers in South Africa. In an attempt to define the determinants of competitiveness of South African Agriculture in the agro-food and fibre complex industries with the assistance of Porter's Diamond model, Esterhuizen and others (Esterhuizen et al., 2012) identified the major factors that influence this sector, which are listed in Table 23.

Table 23: Factors that influence competitiveness of agricultural firms

Production factors	Demand conditions	Related and supporting industries	Firm strategy	Government support	Chance
Cost of production, Cost, quality and availability of labour, Natural resources, Capital, Production knowledge and experience	Market size, Market information, Quality of products, Availability, Cost,	Financial organisations, Research organisations, Transport companies, Suppliers of packaging material, Electricity suppliers, Agricultural suppliers, Competitiveness	Adaptability, Culture, Structure, Flexibility, Pricing structure, Managerial capabilities, Market power of suppliers, Market power of buyers, Threat of substitutes, Threat of new entrants	Indirect support, Trade policies, Land reform policy, Labour Fiscal policy	Economic stability, HIV-Aids, Political stability, Price stability, Crime

Although the determinants in Table 23 were originally developed for the South African agricultural industry as a whole, and not for the competitiveness of individual farmers, they do provide a good indication of the factors that should be analysed towards the development of a strategy for improved competitiveness of emerging farmers. The table furthermore completes the link between the concept of clustering (originally developed and implemented mainly in the small-scale manufacturing industry) and the competitiveness of farmers. By clustering or grouping farmers and agri-businesses to supply, produce and/or market collectively, the environment in which these firms compete and operate can be improved to such an extent that their individual and collective competitiveness improves. We are of the opinion that the above mentioned determinants indicate the elements that influence competitiveness, and can be used to analyse not only industries, but also clusters or emerging farmers. In most cases, the pathway to improving the competitiveness of a farmer would be by addressing one or more of the determinants listed in the table, and in the case of small-scale farmers, collective action or clustering could create the economies of scale required to address these determinants.

8.7 A framework for the improved competitiveness of resource poor farmers

Subsistence and commercial farming styles are distinguished by substantial differences in complexity in all of the categories of activity and skills essential for the farming process. It has been shown by Van Averbeke (2005) that the development pathway from subsistence farming towards commercial farming is everything but linear. Approaches targeting support to emerging farmers and a change towards more competitive and risky, market oriented production strategies, demands a structured approach, including farmer selection and intensive training and mentoring over long timelines:

Table 24: Framework for the improved competitiveness of resource poor farmers

Stage		Process	Mechanism
Step I: define	a)	Define a focus area and logical cluster unit	Investigations and interviews
	b)	Identify potential role players and stakeholders (incl. potential partners, markets, infrastructure)	Value chain analysis
	c)	Determine the competitiveness of a sample of individual farmers that are part of the focus area	Production cost analysis
	d)	Determine the potential key factors (along the same lines as Table 7) that could be focused on to improve competitiveness.	Key success identification through cluster analysis and analysis of major determinants (including production cost analysis)
Step II: analyse	e)	Develop a draft strategy based on the preceding analysis to address the critical factors affecting competitiveness.	Work sessions drawing data from step II.
Step III: develop	f)	Define the roles and responsibilities of all stakeholders and role players.	Work sessions drawing data from step II.
Step IV: implement	g)	Determine the potential for improved competitiveness derived from the strategy (including a sensitivity analysis).	Comparison of production cost analysis
	h)	Discuss the draft strategy with stakeholders for inputs and refinements.	Work sessions
	i)	Obtain buy-in and commitment from farmers by starting with production planning and scheduling process and implement the refined strategy.	Implementation

This framework was compiled through investigations from literature related to small firm competitiveness and was an attempt to provide a suggested way to improve competitiveness and growth of the South African emerging farmer sector, and to create opportunities for including emerging farmers in the food value chain. The purpose thereof should be seen as a guideline to be used in the analysis and development of strategies for emerging farmers. It is anticipated that the framework could be refined to improve the competitiveness and market access of emerging farmers.

Unfortunately, given the competitive realities of commercial scale consumer markets, where consumer choice dictates sales volumes and quality standards, following through with this suggested approach will come as a reality check in terms of healthy business principles (e.g. decent record keeping and expenditure frugality) for the emerging farmers, who quite often

display unrealistic expectations about commercial farming. It is suggested that such farmers should be confronted with the requirements and realities of commercial farming in order to adjust their high expectations. A realistic-skeptical, yet empathic approach could be used for this purpose, which prompts these farmers to think beyond the envisaged rewards of commercial agriculture and to help them design their pathway to achieve such rewards. During such a process, the realities of commercial agriculture are likely to dawn upon them, possibly making the ideal of commercial agriculture seem less attractive. The above-mentioned approach will be only be helpful to those emerging farmers who prevail with determination and a willingness to work the land and who will not be intimidated by the factors and requirements to improve their competitiveness. We have observed this natural filtering process in our study area, with several of our respondents already making an effort to start undertaking the necessary steps.

CHAPTER 9: KNOWLEDGE DISSEMINATION: GUIDANCE ON WATER CONSERVATION IN FOOD VALUE CHAINS

9.1 *Introduction and rationale for the guidance*

This chapter summarizes the work that has been done under research question 5 (section 3.1) and should be read in conjunction with the three dedicated guidebooks for respectively emerging farmers, extension officers and policy-makers as presented as three separate parts of volume two of this report.

The first guidebook focuses on emerging farmers. This target audience includes both subsistence farmers and emerging farmers with commercial farming aspirations, with a specific focus on the project's case study area. This guidebook is not aimed at large scale commercial farming enterprises.

The second guidebook focuses on extension officers working in the case study area. Extension officers need to be made aware of how emerging farmers understand various issues around water conservation in relation to their position in food value chains within the context of water allocation reform and land reform and how they can help them overcome the problems and challenges they face on a day-to-day basis. The extension officers' guidebook is closely linked to first guidebook but has a particular focus on questions and information that are likely to be relevant for extension officers.

The third guidebook focused on policy-makers working at the national Department of Agriculture, Forestry and Fisheries, and the Department of Rural Development and Land Reform. From the project team's interviews with government officials at these departments, it became clear that confusion exists about ambiguous terms such as "emerging farmer", "commercial farming", "water use efficiency". etc. It also became clear that government expects beneficiaries of water allocation reform and land reform to use the land and water allocated to them "productively" which (according to them) implies that they need to farm commercially. The guidebook for policy-makers aims to shed some light on the typologies developed in this project (i.e. the existence of different kinds of "beneficiary" farmers with different farming aspirations), on how emerging farmers themselves perceive the ambiguous terms mentioned above, and on the challenges they face regarding water conservation related to their position in food value chains, all within the context of water allocation reform and land reform. The project team expects that policy-makers will benefit from these insights when making decisions regarding water allocation reform and land reform, formulating new policy, or amending existing policy.

The focus of each of the three guidebooks is primarily on issues related to the concept of water conservation related to emerging farmers' positions in food value chains set within the broader context of water allocation reform and land reform in South Africa. For the purposes of these guidebooks, water conservation was defined as using water sparingly, i.e. using as

little water as possible for any particular agricultural application. The book argues that water conservation can be improved in two ways: The first way is through water use effectiveness, which is described as “doing the correct thing”, i.e. making use of the correct type of irrigation system or water use application for the kind of agricultural activity that is being practiced. The second way of improving water conservation is through water use efficiency, which refers to “doing things the correct way”. If a specific irrigation or water use application has been decided upon, spillage or wastage of water must be kept to a minimum. The need for water conservation is seen against the background of increasing scarcity of South Africa's water resources due to various socio-economic and climate change related pressures (Nieuwoudt et al., 2004; Maharaj and Pietersen, 2004; Department of Water Affairs and Forestry, 2004; Basson et al., 2010; De Lange et al., 2009; Dabrowski et al., 2009; Van Heerden et al., 2008a; Department of Water Affairs and Forestry, 2005).

For the purpose of these guidebooks, the project team employed food value chains that are representative of the Maruleng Municipal Area where the research was conducted.

9.2 Part 1: Guidebook for emerging farmers

During the project team's field work it became apparent that many of the emerging farmers in the study area do not understand what 'water conservation' means, or why using water effectively and efficiently is important for their farming enterprises. This is one of the issues that this guidebook tries to address by means of simple, straight-forward language and clear examples.

A second issue that came to the project team's attention is that many of the emerging farmers interviewed are not aware of the need to register their water use or apply for a water use licence. This focus ties in with the WRC project's broader focus on beneficiaries of water allocation reform and land reform. As water users in post-apartheid South Africa, emerging farmers are required to register their water use and to investigate whether they need to apply for water use licences. Again, this ties in with the government's aim of bringing about water allocation reform and ensuring that historically disadvantaged individuals (HDIs) and the poor take ownership of their water, participate in water resource management directly, and also that licences and general authorisations are processed to support the uptake of water by HDIs (DWA, 2014). The guidebook for emerging farmers also addresses this pertinent issue.

Lastly, the project team found that many of the emerging farmers in the case study area have very short planning timeframes and do not actively engage in long term strategic decision-making with regard to farming and water conservation. This finding is particularly important within the project's broader focus on land reform and, as stated above, the government's drive to improve the productive use of land that has been given or leased to HDIs (Hall, 2013). With the emphasis on the productive use of land in mind, the project team also focused on food value chains as a way of farmers knowing where they are in their current chain and where they might want to aim to be in future. Planning for the future is therefore the third key area that the proposed guidebook for emerging farmers addresses.

9.3 *Part 2: Guidebook for extension officers*

The extension officers' guidebook is closely linked to the farmers' guidebook but has a particular focus on questions and information that are likely to be relevant for extension officers.

The first section of the guidebook for extension officers explains the water allocation reform, land reform processes and agricultural support programmes in the Maruleng Municipal Area. The second section of the guidebook focuses on water conservation and giving advice to extension officers about ways to enable emerging farmers to improve their water conservation practices. Again, ability of these farmers to practice water conservation needs to be understood within the context of water allocation reform and land reform, and the government's expectation of both emerging farmers and extension officers that land that has been redistributed to emerging farmers should be farmed productively.

The third section of the guidebook focused on how to help emerging farmers register their water use or apply for a water use licence. This is because the project team found that the extension officers in the case study area seemed unsure of what is legally required of emerging farmers in terms of water use registration and licensing.

The fourth section of the guidebook focuses on advice to extension officers to help emerging farmers plan for the future. This focus is important in the context of land reform, and the government's focus on the productive use of land that has been redistributed as part of the land reform process. This section specifically also focuses on the advantage of using the concept of a food value chain to establish where farmers in the Maruleng Municipal Area are currently situated within their own food value chain, and where they could aim to move towards. In addition, advice is given to extension officers about what can be done to help emerging farmers increase their participation in the food value chain that is specific to the case study area and move further along it.

9.4 *Part 3: Guidebook for policy-makers*

The guidebook for policy advisors aims to shed some light on the successes and challenges of water allocation reform and land reform initiatives in the Maruleng Municipal Area, on typologies developed in this project (i.e. the existence of different kinds of "beneficiary" farmers with different farming aspirations), on how emerging farmers themselves perceive the ambiguous terms mentioned above, and on the challenges they face regarding water conservation related to their position in food value chains, all within the context of water allocation reform and land reform. The project team hopes that policy advisors will benefit from these insights when making decisions regarding water allocation reform and land reform, formulating new policy, or amending existing policy.

This guidebook makes policy advisors aware of some of the challenges that emerging farmers in the case study area face, and what could possibly be done to assist them in overcoming these challenges. These challenges are also placed in the context of emerging farmers' positions in the particular food value chain that was identified for the Maruleng

Municipal Area, and suggestions are given for interventions that are required to enable emerging farmers to progress along the food value chain.

CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS

10.1 Conclusions

The benefits from conserving water constitute a “public good.” Agriculture is often regarded as a “vehicle of development” – a recent United Nations report suggests that agricultural development is essential for achieving broad-based economic development, and that investments in smallholder agriculture will go a long way towards eradicating poverty and improving rural livelihoods within a reasonable time-frame (FAO, 2008). However, within sub-Saharan Africa, the past decade has been one of increasing agro-pessimism. Eicher (1982) said more than thirty years ago that “Africa’s inability to feed itself amid vast amounts of unused land and record levels of foreign aid is, on the surface, one of the major paradoxes of Third World development.” Not much has changed since then: past legacies of colonialism are still not completely shaken, democracies are fragile, and several countries are still victimized by dictatorial grabs with locals suffering wherever valuable natural resources (e.g. ivory, rubber, gold, diamonds) are found. Widespread poverty is still common and educational levels are extremely low. Not even the information age has brought about a noticeable change in the status-quo. This pessimism seems to coincide with pessimism about Sub-Saharan Africa (SSA) in general, where the hope was that economic development would be brought about by agricultural development. After the success of the Green Revolution in Asia, the hope was that a similar agricultural drive would transform African economies. But the promises of agricultural development in Africa do not seem to be materializing – agricultural productivity has not increased significantly in sub-Saharan Africa. At the same time, the negative effects of the Green revolution in Asia have become more apparent, such as pesticide overuse and subsequent pollution; while increases in yields have tapered off.

Several arguments can be put forward as to why agriculture is no longer an engine of growth. For one, the liberalisation of agricultural trade in the 1990s and the resultant greater openness in the trade of agricultural commodities has contributed to a reduction in the economic potential of the rural sector. The effect of cheap imports, particularly from China, has had the effect of outcompeting locally produced inputs, and although this has resulted in a slight drop in input costs, rapid global technical change and increasingly integrated markets have caused a situation where yield increases have not kept pace with the decrease in real commodity prices. This has had the result that incomes derived from agricultural activities have decreased in spite of productivity gains – forcing economies of scale upon producers just in order to survive. Furthermore, urbanisation has seen healthy young people move out of agriculture, leaving behind the old and the dependent. It is often also the men who move to urban areas, leaving women in charge of farming activities.

Within this context, it becomes clear that few traditional smallholders are adequately equipped to meet the level of production and demanding product specifications of sophisticated value chains and the timeliness of delivery required by expanding markets. Furthermore, the natural resource base on which agriculture depends is deteriorating and productivity growth is increasingly more difficult to achieve. The aggregate of all of these

factors has had a negative impact on the multiplier effect of agriculture on economic development that economies have grown accustomed to in the past. It has become clear that a focus on increasing agricultural productivity is simply not enough to spark sustained economic growth, and that a more integrated approach towards economic development is required, with agriculture's main function focusing on reducing poverty. Such an approach needs to account for the fact that urbanization has led to increased competition for scarce resources like water and energy. Growing cities and industries demand more of these resources, and given their ability to pay high prices, such resources are increasingly allocated towards urban use. This is especially true for water, and given that the agricultural sector accounts for roughly 63% of total annual water utilization in South Africa, increased volumes of water are being allocated towards urban use. This phenomenon is however not unique to South Africa, but is found throughout the world. The only way to stem the tide of reallocation is for agriculture to increase its water use efficiency (albeit according to different definitions of this complex term). Efficient management of water at the farm level is therefore critical to the future sustainability of regional agriculture. This requirement stands in stark contrast to the large number of smallholders in South Africa, where there is a long history of farmers in rural areas using rivers and streams to irrigate small plots for vegetables and grains, with virtually no economies of scale and comparatively low levels of 'efficiency.' According to SANCID, the share of smallholders relative to the total irrigation capacity in South Africa is small (Table 25). However, against the background of past inequalities, there is clear political pressure (based on equity principles) aiming towards significantly increasing the future share of smallholders in agriculture in South Africa (albeit the explicit meaning of this goal remains obscure). It should nonetheless be clear that such schemes will face challenges with respect to competitive markets, increased competition for scarce resources like water, emerging environmental issues, persistent food insecurity, poverty and financial strain at an increased level of intensity in the future.

Table 25: Distribution of irrigation capacity

Type of scheme	Land area (ha)	Notes
Private	550 000	Owner development for direct extraction of water from weirs, boreholes and farm dams.
Irrigation Board (IB)	400 000	Development through government grants and loan subsidies. Later transferred to WUAs.
Government	350 000	Built and operated by government. Operating costs charged to farmers at subsidised rates. Also to be transferred to WUAs.
Smallholder Farmer	75 000	Currently operating below capacity. To be handed over to WUAs.

Smallholder irrigation schemes currently represent only about 4% of South Africa's irrigated land, but it is expected that this share will increase in future, since such schemes hold the potential to aid rural development and poverty alleviation through income and employment

opportunities and food security. However, past support efforts, which were based mainly on conventional neo-classical models of the farm-household, do not allow an explicit analysis of non-market production aspects of farm-household behavior, and have become consequently limited in their applicability in analyzing household behavior with regards to food security concerns in Southern Africa. Consequently past support efforts had mixed results, which is why new ideas and alternative approaches are required to support this target group more effectively. As early as 1986, Low (1986) has argued for a 'systems-type' approach; which caters for diversified income structures where most of the income is earned off-farm but where households maintain a rural base for social and food security purposes; where non-market production of staples could be practiced. Overall household welfare is often maximized by maintaining a rural base even though farm production is reduced due to outmigration and labor shortages at the farm-household. A key aspect of the approach is that the researcher enters a study area with an "open mind" (i.e. not with the objective of applying a theory or model) to obtain insight into the context of the study area. However, progress in this approach has been comparatively slow.

This study emphasized the fact that increasing water use efficiency of the farmers is only part of an integrated problem of general smallholder upliftment, including improved access to markets and credit, a focus on higher value crops, improved extension services and technical support, investments in innovative smallholder technologies, clarifying land tenure arrangements, encouragement of farm equity schemes, and providing necessary supports through mentoring. These require interventions extending beyond the irrigation sector. And the success of these initiatives depends on human and social capacity developmental levels of smallholder irrigators and is thus considered a pre-condition for effective support strategies. However, a basic education underlies all of these requirements, and given our failing educational system is seemingly the root cause of challenges before water efficiency improvement initiatives. The provisioning of these training services became the mandate of public extension services more than 15 years ago (after provincial departments of agriculture withdrawn this function). Basic education of farmers and renewed training of farmers is needed in basic cultivation and irrigation support practice. We are of the opinion that the need for support services is universal, even though it varies between farmers and schemes. To date, tertiary education responsible for the training of extension staff and managers, agricultural research organisations responsible for innovation in smallholder irrigation, and public extension responsible to guide and support farmer development, have all fallen short of fulfilling their mandates. The guidelines as developed in this project (among other) aims to support these extension personnel in training activities specifically associated with water use efficiency. Thus far, it has been shown that improving water use efficiency of the beneficiaries of land claims requires an integrated approach because of the case specificity and complexity associated with the socio-biophysical entity called "emerging farmer". It has hopefully been shown that a focus on the improvement of the physical infrastructure of the farm entity does not guarantee increases in water use efficiency on the medium and longer term. Clearly there is a need for more a comprehensive approach, that harness the potential of social capital to improve water use efficiency.

This project has implemented some components of a systems approach to engage the research questions of the project. It started off by asking the question where does water use efficiency fit into the role of agriculture safeguarding food security in the absence of market structures, and is it part of the solution of uplifting Africa? Given the emphasis on food security, we argued that, an improvement in water use efficiency for agricultural production should be part of an integrated process of improving food security in Africa. It is hereafter from where the design of the solution to observed challenges starts. With the help of some social anthropologists, this approach was followed by the study team in this project which allowed a richer interpretation of the context of emerging farmers in the study area. Field observations had presented several farming objectives, which were interpreted and used to design an alternative approach to assess water use efficiency of emerging farmers. The approach was operationalized in the form of dedicated guidelines to different target audiences in an effort to achieve what critics argued cannot be done since it is a fundamentally flawed concept – i.e. assess and guide improvements in water use efficiency of beneficiaries of land claims and other smallholders of seemingly “uneconomical” patches of agricultural land which is too small to be farmed “successfully”. We differentiated between different groupings of farmers, since each group (subsistence, emerging and commercial) requires different types of guidelines focusing on different challenges within each user’s context. The differentiation and grouping of farmers for the guideline development process was firstly driven by the hopes and aspirations of farmers (but grounded by a set of technical and financial requirements) and secondly in on farming styles as found within the same study area. The consequent development of guidelines for improving water use efficiency was based on farming styles all found within the study area. From a content perspective, the guidelines for farmers focused on water management in a broader sense as opposed to a narrow focus on irrigation management. The guidelines directed at government were structured in two parts. The guidelines for extension officers focused on how best they can advise farmers and how they can overcome the challenges they face in this regard. The guidelines directed at policy-makers aims to sensitize policy-makers in terms of the challenges farmers face in practice, and how decision-making based on current and future policy should take this complexity into account. However, one should caution against a relentless drive to improve water use efficiency at all cost, since improved efficiency in practice lowers the cost of water per unit output, which could increase the total demand for water in the medium to long-term at the industry level. It is thus possible that efficiency gains at the individual farmer level could increase water usage at industry level. This argument is particularly relevant in situations where water management authorities expect to be able to increase supply to urban users as a result of volumetric savings from agriculture; because it is unlikely that the envisaged volumetric savings will be realized, since such savings will first be used to expand the hectares under production, therefore maintaining water use levels while increasing production levels.

Furthermore, what remain worrisome is that this and many other land reform farms are failing partly as a result of water either temporary or permanently not being available for production (Groenewald, 2004). A commonly cited reason for the limited success of water allocation in land reform farms in South Africa is the uncoordinated nature of policy implementation of this reform initiative. While the South African government has put in place several trans-sectoral instruments, procedures and principles to accommodate dual sectoral

policy objectives, these two sectoral reforms (water and land) still seem to operate in relative isolation of each other. The problem has been that attempts at integration between the water allocation and land reform processes have been fraught with difficulties, often linked to the structure and mandate and operations of the different government departments (Funke and Jacobs, 2011).

Difficulties include poor coordination of funds which is housed in different departments and a lack of post implementation monitoring capacity to establish how well the programmes are being implemented. There is also a lack of awareness among emerging farmers about which funding options are available to them (Funke and Jacobs, 2011). Last mentioned is often the result of poor communication between government departments resulting in poor insight in the activities of sister departments. The substantial amount of bureaucratic red tape that South African government departments are characterised by along with the rigidity of bureaucratic structures and top-down approach of management structures, also add to the problem (Funke and Jacobs, 2011).

There is therefore a need to align land and water reform programmes at both the policy and programme level, as both programmes are the cornerstones of the South African rural development strategy (Greenberg, 2010). A potential solution may be for one of the three government departments involved in governing water allocation and land reform (DRDLR, DAFF or DWAS) to take on the mandate of leading the coordination of these reform processes. The question remains as to which of these departments is best qualified or capacitated to take on this key role.

10.2 Recommendations in terms of the objectives

The overall objective of the project was “to support efficient and sustainable conservation of water as a production input in food value chains following equitable allocation of water resources in irrigated agriculture” which was broken down in five specific objectives, which were assessed by means of five research questions, which in effect have directed the research. The following section returns to these five specific objectives and discuss the project findings in terms of each, while presenting some recommendations within the context of each specific objective.

10.2.1 Specific objective 1

This objective was *“to review the social, cultural, institutional, economic and political variables influencing water allocation reform and land reform programmes and projects, with particular reference to apportionment and/or transfer of water use entitlements in relation to land use rights”*.

The project has uncovered substantial variety in the social, cultural, institutional, economic and political variables influencing water conservation in food value chains. For example, it was observed that not all farmers have commercial aspirations. Consequently, it was

evident that the current institutional framework on water and land reform does not adequately accommodate this observed variety, which pointed towards the need for increased customization in the institutions governing the land and water reform process and water conservation in food value chains.

It is recommended that a certain level of customization in communication strategies will greatly improve the uptake of institutions to diverse audiences. A typology development protocol could assist in this process. This project has illustrated that it is possible to use such a protocol to allow the emergence of types or groupings representing different stakeholder groups within a target area, and then to customize essentially the same message in different terms, in order to improve accessibility and uptake.

A remaining challenge is to assess the generalizability (or otherwise) of such types or groupings from one target area to another. Here, the similarities between contexts would be an important determining factor.

10.2.2 Specific objective 2

This objective was *“to assess the efficient development and use of water within the framework of food value chains for selected water and land reform projects”*.

The study uncovered a spectrum of interpretations of water use efficiency. This pointed towards the need to assess water use efficiency from different perspectives, but in such a way that any such assessment of water use efficiency remains comparable with another (replicability). The study used a meta-analysis based approach in an attempt to identify alternative indicators of water use efficiency. Efficiency was assessed both in terms of second best estimates of the required variables for input-output based approaches, and an operations-based approach where the study team employed interviews, observations and photographs to assess efficiencies. The typology development process involved the creation of an alternative common language in which to translate the relative performance of water use efficiency of different types of users. This arose as the only viable alternative to allow a fair comparison of the water use efficiency across a spectrum of farmers with varying levels of record-keeping and other key characteristics, making traditional input-output based approaches non-viable.

It is recommended that the operations-based approach as developed in this project needs to be refined and developed further as a viable alternative to traditional input-output based approaches, in terms of suitable indicators.

10.2.3 Specific objective 3

This objective was *“to analyse alternative opportunities for including the beneficiaries of selected water and land reform projects in the food value chain”*.

Cooperative governance seems to be one of the few options for emerging smallholders to gain economies of scale in agriculture. However, this study found little evidence of this level of collaboration in the study area. Possible reasons for this could be mutual distrust, which again is grounded in the diversity of farmers. Cooperative governance could be facilitated via the current communal property associations. However, the efficiency of these associations varies greatly and is prone to empire building and internal corruption. An appropriate constitution for each association is the first necessary but not sufficient step for success.

It is recommended that such associations should be supported in terms of designing and drafting such a document that will provide the legal ground which will support the levels of mutual trust required for improved cooperative governance.

10.2.4 Specific objective 4

This objective was *“to evaluate the economic and social costs and benefits of efficient development and use of water in food value chains”*.

While the terms of reference of this study anticipated a quantitative assessment of the socio-economic benefits and costs of improved water use efficiency, the study soon revealed serious data limitations in the form of a lack of or complete absence of record keeping systems. This implied that a traditional quantitative assessment with field data was not possible, since such an assessment requires comprehensive quantitative information as derived from farm record keeping systems. As such, instead of using ‘guestimates,’ the study made use of second best estimates employing SAPWAT to assess direct costs and benefits. However, it did not satisfy the requirements of a quantitative field evaluation on the economic and social costs of the study area, and thus from this point of view, this objective was not achieved. These data limitations were however the main reason for the development of the alternative operations-based approach as discussed previously, which included a qualitative discussion on the benefits and costs of improved water use efficiency.

It is recommended that a dedicated study be launched focusing on the creation of baseline information in order to quantify the benefits and costs of efficient development and use of water in food value chains. In practise this comes down to a longitudinal study where the researchers record the farming operations and practice of participants in detail – something which has not been done before. These records will form the basis to calibrate non-standardised input and output quantities (for example a “bakkie” load of fertilizer) with standardised measures (i.e. 800kg of fertilizer); and will form the basis to compare such farming practice with best management practices.

10.2.5 Specific objective 5

This objective was *“to develop guidelines for the sustainable development and use of water in food value chains with water allocation reform projects”*.

This study has reemphasized the importance of effective communication as a determinant of water use efficiency. The study has illustrated this finding by communicating essentially the same message with regard to water resource management and utilization in three different 'languages' to three different target audiences. During feedback sessions it was clear that the finer nuances of communication should not be underestimated in the development and communication of guidelines and recommendations. This implies that the way in which a message is communicated is as important as the content of the message.

It is recommended that a renewed effort is made towards repackaging the guidelines and recommendations of studies which have focused on the effective and efficient use of water in agriculture and rural development. It is argued that since a significant amount of knowledge is not communicated because it is not accessible / understandable by the intended user, a renewed effort is required to effectively communicate scientific knowledge to the intended users.

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GLOSSARY

It should be noted that the approach for this glossary of selected terms was to deliberately present different interpretations of key concepts in an effort to make the scope of the different interpretations and (mis)understandings of the concepts explicit. The glossary played an important role in facilitating mutual understanding and consensus seeking regarding key concepts in communicating the guidelines and potential negotiations following the implementation of suggested actions which may flow from the guidelines. The glossary is thus considered pivotal in using the correct terms in guideline development.

Field work requirements for this glossary included a constant awareness and documentation of controversial terms – a gradual process, which run throughout the duration of the project. We present the glossary in tabularized alphabetical format. From a practical perspective it was impossible to present all definitions of contentious concepts. Consequently, interpretations were presented according to groups who were sharing similar interpretations with regards to the understanding and meaning of the concepts. It should be noted that this glossary is not meant to present the working definitions of the mentioned concepts as used throughout the study, but rather to present the range of different interpretations of different groupings on a particular concept.

TERM	AS DEFINED BY GOVERNMENT/ POLICY/ LEGISLATION	AS DEFINED BY ACADEMIA	AS DEFINED BY RESPONDENTS IN THE CASE AREA
Emerging farmer	In its Strategic Plan of 2010-2013, the DRDLR refers to "emergent black farmers" as one of its core clients. It does not, however, provide a definition for this term (DRDLR, 2010). The White Paper on Agriculture (DoA, 1995) refers to "resource-poor farmers". Although this term is not defined, the White Paper recognises the need to direct financial resources towards these farmers in order to enable them to purchase land and agricultural inputs. The Integrated Growth and Development Plan (2012) also uses such terms as emerging farmers, emerging producers, resource-poor/beginner farmers and emerging growers and emerging black entrepreneurs, particularly in relation to the forestry sector. All of these terms are however used without definitions The Department of Water Affairs' 2004 Policy on Financial Assistance of Resource Poor Irrigation Farmers (DWAFF, 2004) uses the term "resource poor farmers" to refer to farmers who are South African citizens and members of historically disadvantaged population groups. The Land Bank's (2011) research report on "Addressing challenges of financing emerging farmers", defines the term as "those farmers who were "previously excluded from mainstream agriculture based on their skin colour, and who are now accessing resources and farming for the market". Jari (2009) cites the Department of Agriculture (now DAFF) as stating that emerging farmer is a relatively new term used to define previously underprivileged farmers who	"An ambiguous, yet widely used term describing black farmers who receive support to engage in agriculture" (Denison and Manona, 2007). Denison and Manona (2007) argue that the parameters for this ambiguous group of people have not been defined, and as a result it is unclear as to when the "emerging process" can be said to have been successful or completed. Van Averbek (2008) notes that "the concept of 'emerging farmer' is understood to refer to farmers who have a 'desire' to increasingly commercialise their production" Lahiff <i>et al.</i> (2012) define emerging farmers as "a new (or 'emerging') group of workers, shareholders, smallholders, entrepreneurs or community members with limited commercial experience and little or no access to finance or leading-edge markets". Boonzaier (2009) use the term "small, resource-poor farmers" as synonymous with emerging farmers. These definitions, however, ignore some elements of the important socio-political context which is critical to understanding the position of this group in the South African agricultural sector. The definition should in fact be applied to a specific group of farmers who through the historical injustices of the past are classified as "previously disadvantaged"; in other words, black South Africans.	One who makes little money from farming. Someone who starts farming but doesn't have knowledge or money. They want to become commercial. Someone who wants to farm on commercial scale. A subsistence farmer who display a transition towards commercial farming

TERM	AS DEFINED BY GOVERNMENT/ POLICY/ LEGISLATION	AS DEFINED BY ACADEMIA	AS DEFINED BY RESPONDENTS IN THE CASE AREA
	are determined to enter the commercial farming space. Also referred to as “developing farmers”.		
Subsistence farmer	The White Paper on Agriculture (DoA, 1995) refers to subsistence farmers as, who engage in agricultural activities primarily for their own consumption	Farmers engaging in more diverse livelihoods of which farming is one part which is geared towards production for own use. A farmer who produce mainly for own use (livelihoods). This form of farming is mostly found in situations where people cannot afford to buy food (affordability), or if no food is available to buy (absence of formal / informal markets). The range of crops/animals if necessarily broader as compared to commercial farmers. Regular purchases in the market place is not a prerequisite, however subsistence farmers will trade their surpluses if the opportunity presents itself. Van Averbek (2008) argues that subsistence farming in the strict sense of farmers not producing any marketable surplus has become a very rare phenomenon. While subsistence farming has mainly been identified with the production of sufficient food and fibre to satisfy the needs of the farming family.	“If you do not sell your crop” Subsistence farmers do not contribute to the economy – they do not sell produce or employ people.
Commercial farmer	The White Paper on Agriculture (DoA, 1995) refers to Commercial farmers as being predominantly white farmers who occupy about 82 million hectares. It is believed that they produce above 95% of the country's formal marketed agricultural output	A farmer focussing on production for cash sale (both formal and informal). Profit seeking business focusing on agricultural production. Makhura <i>et al.</i> (1998) identify a number of criteria being used to characterize the degree of ‘commercialization’: percentage of crops produced being sold (farmers producing more than 200% of their own consumption are defined as ‘commercial’); number or percentage of produce consumed (e.g. households or farms who consume less than	One who makes a lot of money from farming. They see themselves as commercial If you make lots of money. If you're not running short of things and can meet all of your requirements. He sees himself as a commercial farmer. If you produce large scale and sell 80% of your produce to the market You need to have large farms to make things work as a commercial farmer –

TERM	AS DEFINED BY GOVERNMENT/ POLICY/ LEGISLATION	AS DEFINED BY ACADEMIA	AS DEFINED BY RESPONDENTS IN THE CASE AREA
		50% of their total production); market related activity (e.g. displaying a focused effort to sell the crop); proportion of area planted with marketable crops; and volume of produce and household resources (Makhura <i>et al.</i> , 1998).	it's about economies of scale!
Water use efficiency	No official definition could be found on this term.	A multi-perspective concept used to reflect on the way water is used aiming to evaluate the relative performance in terms of "doing things the correct way" within the context of water utilisation. From a production (input-output) perspective it refers to the volume of water being used per unit input or output. An increase in efficiency could be realised by either increasing the output with the same input, or by decreasing the input while maintaining the output. From an operations perspective it simply refer to wasting as little water possible in any particular application. It is a measure of efficiency of water use which is context specific and for a defined user type. It is expressed without units (i.e. as a percentage).	Pumping from borehole. Applying water to the plants with irrigation equipment Watering your crops. Rain can be irrigation too, but watering from pipes is also irrigation When drip irrigation is practised.
Water use effectiveness	No official definition could found on this term.	A multi-perspective concept used to reflect on the choice of water application technique aiming to evaluate the relative performance in terms of "doing the right thing" within the context of water utilisation.	Is the same as water use efficiency.
Irrigation		Artificial application of water to crops or pastures.	Watering plants "Using water to irrigate/water a plant". Rain is not irrigation. Applying water to the plants with irrigation equipment Watering your crops. Rain can be irrigation too, but watering from pipes is also irrigation
Irrigation efficiency		Irrigation efficiency is a measure of efficiency specifically for irrigation practice. Unlike productivity	Is considered the same as water use efficiency.

TERM	AS DEFINED BY GOVERNMENT/ POLICY/ LEGISLATION	AS DEFINED BY ACADEMIA	AS DEFINED BY RESPONDENTS IN THE CASE AREA
		(which has units), efficiency is expressed as a % use.	
Irrigation productivity		A unit-specific measure of the gain from the use of a unit of irrigation water specifically (for example kg/m^3 or R/m^3 or kg/mm).	
Water use productivity		A unit-specific measure of water use efficiency. For example the amount of output produced with certain volume of water. A unit-specific measure of the gain from the use of a unit of water specifically (for example kg/m^3 or R/m^3 or kg/mm).	Good use of water
Water conservation		Another multi-perspective term which could refer to decreasing the volume of water used for a certain level of output, i.e. using less water, or to the ecological conservation of water resources.	To save water.
Water use right		Legal permission to utilize a water source.	When you are allowed to irrigate. Permission to use water The right to use the water Permission to use land
Farmers		People who are actively engaged in the farming enterprise through investment or direct labour and who manage production processes and marketing. People who cultivate crops and keeping animals.	People who work the land.
Food value chain		Presentation of the value adding process of products from producer to final consumer. Required activities to take product from producer to consumer.	
Financial feasibility		Financial return on investment as reflected the finances of a business. The extent to which the cash flow, balance statements,	

TERM	AS DEFINED BY GOVERNMENT/ LEGISLATION	AS DEFINED BY ACADEMIA	AS DEFINED BY RESPONDENTS IN THE CASE AREA
		financing and risk profile of an individual farmer support the farming operation.	
Economic viability		The social return on the investment to the broader economy rather than the feasibility of the individual farm venture. It excludes the actual cost of subsidies, grants and enables decision makers to compare the economic impact of any proposed project in any sector.	To stay in business.
Profitability		The extent to which an investment of capital and management will result in a positive return.	To make more money than you spend.
Sustainable livelihoods		A 'livelihood' comprises the many dimensions of an individual's or family's survival strategies to achieve material and social well-being. It comprise of the capabilities, assets, resources and activities needed for a living. It is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets and preserve livelihood opportunities for the next generation.	
Strategic partnership	An agreement aiming towards agricultural mentoring, risk sharing and profit sharing.	A mutual beneficial agreement between parties relating strategic planning.	
Successful farmer		Farmers who achieve their short, medium and long term goals.	One who makes money – one who looks after his/her things and produces quality. Farmers generally felt that a successful farmer is one that uses conventional planting patterns, modern techniques and whose crop is admirable at a large scale. He sees a successful farmer as one with drip irrigation, tractors, etc.; and where everything looks 'green.' 'Successful' farmers have greenhouses, etc.

TERM	AS DEFINED BY GOVERNMENT/ LEGISLATION	AS DEFINED BY ACADEMIA	AS DEFINED BY RESPONDENTS IN THE CASE AREA
			A 'successful farmer' is one who has already achieved their big farming goals,
Farm input productivity		A unit specific measure of the amount of output generated with a given amount of input.	To use resources effectively Productivity speaks to the scale of harvest, income generated from sales and admirability of the crop. Being able to produce more. Productive means you are progressive in your thinking If you produce a variety of products Someone who plants a big piece of land with one crop and is able to sell it.

APPENDICES

Data collected as part of this project is archived in electronic and hard copy in report number CSIR report number CSIR/NRE/GES/ER/2014/0012/A and is available from:

CSIR

11 Jan Cilliers street

Stellenbosch

Appendix 1: Open-ended Interview Guide and List of Interview Participants

Open-ended Interview Guide

Purpose of Interview: The purpose of this interview is to provide clarity and insights on the productivity of emerging farmers in relation to their water use and other inputs. Specifically, the findings of our consultation process (comprising of semi-structured interviews and a stakeholder consultation workshop) will form one input into our four-year WRC-funded project investigating water conservation or water use efficiency in food value chains by beneficiaries of water allocation reform AS WELL AS land reform programmes in South Africa. In so doing, the CSIR research team aims to investigate how we get emerging farmers into the core of the economy and improve the productivity of water use.

Interview Themes

Keywords/statements:

- The productivity of farmers in relation to their water use and other inputs
- How can we get black farmers into the core of the economy and improve the productivity of water use?
- water licenses (water use entitlement), water use authorisation, and/or water use rights

Core Responsibilities

- What are the key areas within which your Directorate/Sub-Directorate/Unit works (main responsibilities) and your role within your specific job description?
- If applicable, share experience working on/coordinating/overseeing specific support programme(s) provided to beneficiaries of land reform or water allocation reform.

Synergies between land use rights and water use entitlements

- How does water apportionment (handed over, or a subset of allocation) and/or transfer of water use entitlements fit into land use rights? What are the synergies between the two?
- How would you rate the level of coordination of water allocation reform (water use entitlement) policies and programmes with land reform programmes? Coordination between different governmental departments e.g. DWA and Dept of Rural Development?
- To what extent have land AS WELL AS water use entitlements been apportioned to emerging/subsistence farmers and have the individuals concerned (mostly women) working the land obtained the necessary security and incentives?
- To what extent has an actual paper been given i.e. proof of water licenses to beneficiaries of land reform?

Water Use Licensing

- What are the standard operating procedures in terms of water licensing for emerging farmers?, e.g. people involved, type of farming, portion of use rights.
- When water use entitlements are given out, is there any priority given to a particular type of farming i.e. sugar cane, or a particular type of farmer i.e. commercial?

Land Use

- How is land viewed, land is not just for farming, it is a tool for power, a social asset?
- Get clarity on property rights

Monitoring

- Monitoring and Regulatory Mechanisms to manage water use entitlements/licenses
- Monitoring and Regulatory Mechanisms to review effectiveness of different property rights related to different land reform programmes.

Areas where water allocation reform and land reform coincide

- Describe/share experiences relating to particular study sites

Emerging themes

- Follow up on key issues emerging from the interview
- Follow up on key issues emerging from previous interviews.

List of Interview Participants

#	Name	Organisational Affiliation	Type of Interview	Date Interviewed
1	Mr. Sithembiso Gumbi	Directorate of Tenure Systems Reform: Department of Rural Development and Land Reform, Pretoria	Individual, semi-structured	27 Jan 2011
2	Ms. Marna de Lange	Marna de Lange (Pr Eng) Socio-Technical Interfacing, Polokwane	Individual, semi-structured	31 Jan 2011
3	Mr. Avhashoni Nicholas Magada	Limpopo Provincial Land Reform Office, Department of Rural Development and Land Reform, Polokwane	Individual, semi-structured	1 Feb 2011

4	Ms. Nomsa Mpangane	Directorate of Land Settlement, National Department of Agriculture, Forestry and Fisheries, Pretoria	Individual, semi-structured	2 Feb 2011
5	Mr. Samfana Mahlangu	Directorate of Land Acquisition and Warehousing, National Department of Rural Development and Land Reform, Pretoria	Individual, semi-structured	7 Feb 2011
6	Anonymous	Cane Producers, Kwazulu-Natal	Email response to questions	
7	Ms Deborah Mothlihi	Chief Directorate of Water Use Authorisation, Department of Water Affairs, Pretoria	Pair, semi-structured	15 Feb 2011
8	Mr. Charles M'Marete	Directorate of Water Use, Department of Water Affairs, Pretoria	Pair, semi-structured	15 Feb 2011
9	Dr. Sharmla Govender Van Wyk	Chief Directorate of Policy Research and Legislation Development, Department of Rural Development and Land Reform, Pretoria	Individual, semi-structured	21 Feb 2011
10	Ms. Puleng Mofukeng	New Irrigation Schemes Unit, Chief Directorate of Water Use and Irrigation Development, National Department of Agriculture Forestry and Fisheries, Pretoria	Individual, semi-structured	22 Feb 2011
11	Mr. Freeman Raholane	Sub-Directorate of Land Administration, Land Settlement Directorate, National Department of Agriculture Forestry and Fisheries, Pretoria	Pair, semi-structured	24 Feb 2011
12	Mr. Vonani Baloyi	Sub-Directorate of Land Administration, Land Settlement Directorate, National Department of Agriculture Forestry and Fisheries, Pretoria	Pair, semi-structured	24 Feb 2011
13	Mr. Davison Saurchera	CIRAD/ Post Graduate School of Agriculture and Rural Development, University of Pretoria	Individual, Semi-structured	25 Feb 2011

Appendix 2: Questionnaire for 2011 fieldtrip

Community/Village/town (name)	
Community/Farm Code	
Household number and respondent name	
Male/Female	
Time and date of the interview	

Hello, my name is and I am carrying out interviews with randomly selected local residents on behalf of the Water Research Commission which is a government research parastatal. Do you have 30 minutes time to answer some questions? The questionnaire is meant to collect information about how farmers use water for food production and the challenges they face in terms of water and land use rights, so that we can better understand what could be done to improve emerging farmer productivity and get emerging farmers into the core economy. For this purpose we would like to ask you some questions about your land use and your access to water and also your access to markets, your main sources of income and so on. Your answers will be treated as completely confidential; we will not tell anyone what answers you gave. The findings from this study will be used to inform policy-makers. Your effort in answering the questions would be highly appreciated. Thank you very much.

Household = All persons in the household who eat from the same cooking pot/kitchen and who are normally resident at least 15 days per month
Landholding = An area of land that someone owns or rents
Farm = A tract of land cultivated for the purpose of agricultural production

1. Please list the household members with their age, sex, literacy and occupation (Please don't read all categories aloud, but ask the respondent about the different household members with their age, sex, literacy and occupation, and mark the answers below)

Household member No.	Age	Sex M/ F	Literacy Yes/No	Current occup.	Sector	Current occupation codes
						00= child below 6 years
						01= child (>6) not going to school
						02= school/education
						03= self-employed
						04= temporary labour
Respondent						05= permanent
02						06= non-employed
03						07=household tasks

04						08= retired
05						09= other (specify)
07						Sector codes (link to occupation)
08						01=agriculture/livestock
09						02=forestry/fishing/mining/etc.
10						03= tourism/craft making & selling
11						04=commercial/construction/other
12						05= government, public sector
13						06= other (specify)

2. Has the household been in the community for the last 20 years, and if not where is it from?

01= yes	02= no, displaced (protected area)	03= no, displaced (dam)	04= no, immigrant regional/national	05= no, immigrant international	06= no Land claim

OWNERSHIP AND SCALE

3. Could you tell me how many (read out the relevant type of livestock) you own and for what purpose they are used (for example own consumption or production for the market or own ploughing or to rent out)? Also, could you tell me how you feed your livestock (free grazing, own pasture, crop residue)?

Type of livestock	Number	Purpose	Feed	Main purpose codes	Feed codes (multiple answers possible)
Cattle-plough				01=household consumption	01= free grazing
Cattle-dairy				02= selling to market	02= own pasture
Cattle-meat				03= market+ consumption	03= crop residue
Goat				04= manure	04= community pasture
Sheep				05= transport	05= buy feed
Pig				06= asset/savings	06= household waste
Horse/donke				07=ploughing	07= other (specify)

y					
Fish (ponds)				08= rent to others	00= not applicable
Chicken/duck				09=other (specify)	

4. Could you tell me the total size of your landholding and how much of it has access to irrigation (water for crops)? And do you own this land, do you rent it or is it communal land? Finally, what are the main crops you grow on your land?

Size (hectares)	With irrigation (hectares)	Owner ship	Crop	Ownership codes	Crop codes (multiple answers possible)
				01=private ownership	01= maize
				02=communal land	02=beans
				03= rented land	03=cabbage
				04= no entitlement	04=tomatoes
				05= other (specify)	05= mango
					06=avocado
					07=citrus
					08=other (please specify)

5. If you DO NOT own the land, please describe the nature of your lease (who owns it, number or years, lease payment per year, conditions, etc.)

Who owns it?	How long is your lease?	Lease payment per year?	Conditions

6. If you own the land, how did you obtain it?

1	2	3	4	5	6
Private purchase	Land Claim (restituted land)	Land Claim (other)	Inheritance	Land given by chief	Other (please specify)

**7. If you own the land, are you the only owner or do you form part of a group of owners?
Collective or individual ownership?**

1	2
Individual	Collective

8. Is there a community legal entity that manages land use of your farm area? YES/NO

9. If so, what type of community legal entity is it?

1	2	3	4
Tribal Authority	CPA	Trust	Other (please specify)

10. Which of the following sources of labour have you used for your farming operation in the last 12 months? You can choose more than one.

1	2	3	4
Family labour	Hired labour	Friends and relatives	Others (please specify)

11. If family, how many family members assist in farming?

12. If hired, indicate method of payment.

1	2	3	4
Own cash	Credit	Farm income	Others

13. How much do you pay your labourers in Rands (Please specify the unit e.g. per hour, per day, per month)?

PRODUCTION: SIZE AND SCALE

14. What is the make-up of your land i.e. cultivated land, forest, pastures? Rank them in terms of biggest portion used to least portion used. (1=biggest portion, 2 = second biggest portion...5 = smallest portion)

Cultivated land	Forest	Pastures	Dwelling	Other (please specify)

15. Could you tell me the total size of your landholding and how much of it has access to irrigation (water for crops)? And do you own this land, do you rent it or is it communal land? Finally, what are the main crops you grow on your land?

Size (hectares)	With irrigation (hectares)	Crop type (use codes)	Quantities for each crop or % differences	Crop codes (multiple answers possible)
				01= maize
				02=beans
				03=cabbage
				04=tomatoes
				05= mango
				06=avocado
				07=citrus

16. What do you on average produce (kg/hectare) (or plot)? What is the product/s' volume price

Crop	Yield: Kg/hectare	Volume Price: R/Kg	Gross return per crop: R/Kg

17. Do you grow to sell? If so, who do you sell to?

Major Actors	% of total yield	Specific location	Destination i.e.
Local community: roadside stalls			
Local community: informal markets			
Retail trade			

Local retail grocery stores		
Small wholesalers		
Distributors		
Large Wholesalers/Exporters		
Major agricultural products (e.g. citrus) exporters (specialist export)		

18. Are you happy with the price that your agricultural products fetch from each of the buyers mentioned above? YES/NO

19. If not, indicate the factors that are responsible for your unhappiness regarding prices of agricultural products, and rank them in order of importance

1	Factor contributing to all unhappiness	
2	Factor contributing to the most unhappiness	
3	Factor contributing to some unhappiness	

20. Do you have any other sources of income e.g. salon, state grant, crafts, etc.?

21. Do you practice collective marketing where you join other farmers to market your goods, purchase your inputs and co-ordinate your farming techniques? YES/NO

22. If yes, please specify the type of collective arrangement.

23. If not, why not?

CITRUS FARMERS

24. If you are a citrus farmer, do you use traditional or improved citrus varieties? YES/NO. Explain why or why not.

25. If you are a citrus farmer, have you thought of adding value to your citrus production by considering, for example, a citrus juice processing plant? YES/NO. Explain why or why not.

TRANSPORT

26. How far is the closest urban centre from you?

1	2	3	4	5
>5 km	5-10km	10-20km	20-50km	50-100km

27. Who transports the products from the farm to final destination?

1	2	3	4	5	6
Processor	Transporter	Self transport	Buyer transport for themselves	Co-operate transport	Others (please specify)

WATER AND ENERGY USE

28. What is your main source of water for irrigation?

	Rainy season	Dry season
Individual tap	01	01
Collective tap	02	02
Water carrier/tanker	03	03
Borehole/well	04	04

River	05	05
Dam	06	06
Rain	07	07
Other (please specify)	08	08

29. What is your water use per crop?

Crop	L/hectare

Water for irrigation

30. What difficulties have you experienced in obtaining water? Please specify (no water, water scarcity, too little water, no piping, no dam, no irrigation equipment, no water license, water services too expensive, etc.)

31. Do you use rainwater for irrigation? YES/NO

32. Do you use water more than once (recycle water)? YES/NO

33. If yes, how do you recycle water for irrigation?

34. In the past year, how often did you experience a lack of water for irrigation?

35. How do you store water for irrigation?

36. Do you get enough water from the current water delivery system for irrigation? YES/NO

Payment for Water

37. Do you pay for water for irrigation? How much?

Water License

38. Do you have a water license? YES/NO

39. If yes, what type do you have?

40. If yes, how did you get it?

41. If not, why not?

42. When your crop fails, or you lose your main income source, how do you cope? (more choices possible) (Please don't read out all categories, but ask the question and mark the answers below)

01= we eat less, more poor	02=we sell land, livestock, assets	03= we depend on family	04=we depend on the community	05= we depend on the government	99=refuse to answer

43. Does the household have access to electricity? YES/NO

44. How much do you pay for electricity per month?

TECHNOLOGIES

45. Do you use improved technologies (eg., drip irrigation) so that production cost is reasonable? YES/NO

46. If yes, what types of improved technologies do you use?

SUPPORT SERVICES

47. Is there any government driven agricultural project in the study area that helps farmers in the following:

Type of Support Service	YES/NO
Pre-Production and Input Supply	
Production	
Increasing Productivity	
Water Use Efficiency	
Post-production	
Industrial Processing	
Distribution and Marketing	

48. Have you gone on any training provided by government or other organisations? YES/NO

49. If so, describe the training (duration, type of course, how many farmers)?

50. Have you gone on any water use efficiency training provided by government or other organisations? YES/NO

51. If so, describe the training (duration, type of course, how many farmers)?

QUESTIONS FOR CITRUS PROCESSORS ONLY

52. What is the name of this factory/ agro-processing firm?

53. When was this factory/ agro-processing firm established, in years?

54. How many people are employed in this factory?

55. How many litres of juice do you normally produce?

Day(litres)	Week (litres)	Month(litres)	Season(litres)	Year(litres)

56. At what price do you charge to process?

1	2	3	4	5
1 litre	2 litres	5 litres	10liters	>litres

57. What is the percentage of profitability of making orange juice?

Thank you very much for you cooperation and we'll be back to present the results!

Appendix 3: Questionnaire for 2011 fieldtrip

Section A: Socioeconomic Characteristics

1. Name (or pseudonym) of household head

2. Age of the household head

3. Gender of household head 1.**Male** 2.**Female** (Circle applicable answer)

4. Level of education of household head

1	2	3	4	5
Never went to school	Completed primary school	Completed secondary school	Completed tertiary school(degree and above)	Abet

5. What is the main occupation of household head?

1	2	3	4	5	6	7
Full time farmer	Part-time farmer	Government Employee	Employed-company	Pensioner	Unemployed	Self-employed

6. What is the source of income of household head?

1	2	3	4	5	6
Salary	Farming	Pension	Grant	Remittance	Other

7: if others, please specify

8. What is the income of the household head per month?

1	2	3	4
<1000	1000-5000	5000-10000	>10000

SECTION B: DETAILS OF LABOUR

1. How many people live with you including head of household?

No	Age group	Number
1	Children <10 years	
2	Boys (10-17 years)	
3	Girls (10-17 years)	
4	Adults male(18 and above)	
5	Adult female (18 and above)	
TOTAL		

2. How many family members assist in farming?

3. Which of the following sources of labor have you used for your farming operation in the last 12 months?

1	2	3	4
Family labour	Hired labour	Friends and relatives	Others

4. If others please specify

5. If hired indicates method of payment.

1	2	3	4
Own cash	Credit	farm income	Others

6. If others please specify

7. Did you face labour shortage during the year? 1. YES 2.NO (circle right answer)

SECTION C: TOTAL LAND HOLDING SIZE

1. Do you own land? 1. YES 2. NO (circle right answer).

2. If yes, how far is your farm from your home in hours?

3. What is the size of your farm in hectares?

4. What is your tenure status?

1	2	3	4	5	6
Own	Inherited	Rented in	Share cropped in	Bought	Others

5. If others please specify

SECTION D: ANIMAL PRODUCTION.

1. Livestock holding of the household during the last 12 months

Species	Number owned	Number sold
Cattle		
Goats		
Donkeys		
Chickens		
Sheep		
Pigs		
Others (specify)		
Total		

2. What was the purpose of the income from animals sold?

1	2	3	4	5	6
Purchase of farm inputs	Hiring labour	Household expenses(food, clothes, etc.)	For loan repayment	Household expenses(food, clothes, etc.)	Others

3. If others, please specify

SECTION E: EXTENSION INFORMATION

1. Do you get extension services? 1. YES 2. NO (Circle right answer)

2. If yes, for how long have you been getting the service? ____ Years

3. Who provides the extension service?

1	2	3	4
Government departments	Non-governmental organization	Development agent	Others

4. If others please specify

5. How many times were you visited by extension officer in the last 12 months?

SECTION F: CREDIT ACCESS

1. Do you have access to formal agricultural credit? 1. YES.2 NO

2. If yes, what was the main purpose of borrowing?

1	2	3	4	5	6	7	8	9	10
Purchase of farm fertilizer, seed, pesticides	Purchase of farm implements	Purchase of land	Payments of rented tractor	Purchase of livestock	Purchase household goods	Debt repayment	Education expenses	Health expenses	Others, specify

(Note: farm implements may include tractor, spade, etc.).

3. If others, please specify

4. What is your source of credit?

1	2	3	4	5	6	7
Commercial banks	Government	Money lender	Relative or friend	Neighbour	Cooperatives	Others, specify

5. If others please specify

6. How much did you borrow in rands?

7. Was the amount borrowed sufficient? 1. YES 2.NO (circle right answer).

8. For how many years did you use credit?

9. Were you able to repay the loan? 1. YES 2.NO (Circle right answer)

10. If no, what were the reasons for non-payment?

11. How far is your home from the nearest lending organisation? In hours

12. In your view, is borrowing from formal financial sources risky? 1. YES 2. NO (Circle right answer)

13. What is your view on the constraints and difficulties to access credit from the formal financial services sources?

14. Will you demand credit if the level interest rate increases? 1. YES 2.NO (Circle right answer).

SECTION G: CITRUS PRODUCTION

1. How long have you been involved in citrus farming (years)?

What kinds/ variety of citrus do you produce currently?

1	2	3	4	5	6	7
Oranges	Lemon	Grapefruit	naartjie	Lime	mandadrin	others

2. If others, please specify

2. How many hectares do you use to produce citrus?

3. What was the motive for citrus production?

1	2	3	4	5
Income generation	Home consumption	Employment creation	Commercial purpose	Others

4. If others please specify

5. How many bags of citrus do you normally produce in a year?

6. How many bags of citrus do you normally produce per hectare?

7. Do you hire labour for citrus production? 1. YES 2.NO (circle right answer).

8. If yes how many labourers do you normally hire?

9. How much do you pay them per month?

10. How many bags of citrus did one labourer harvest per year?

11. Do you normally hire a tractor for citrus production? YES 2.NO (circle right answer). IF NO, SKIP TO QUESTION 50

12. If yes how much does it cost per ha?

13. If no how do you compensate for the tractor?

14. Do you apply fertilizer for citrus production? YES 2.NO (circle right answer).

15. If yes how many kg do you apply per ha?

16. How much do you spent on fertiliser?

17. If no how do you compensate for the fertilizer?

18. Do you normally use any type of pesticides for citrus production? YES 2.NO (circle right answer).

19. If yes how much does it cost per ha?

20. If no, do you compensate for the pesticides?

21. How many kg of seed do you normally use per hectare of citrus?

22. Do you purchase hybrid seed? YES 2.NO (circle right answer). IF NO SKIP TO QUESTION 61

23. If yes how much does it cost per kg?

24. What problem do you have with citrus production in the area?

Water use efficiency

1. What is your main source of water for citrus irrigation?

1	2	3	4	5	6
River	Dams	Taps	Boreholes	Rain	others

2. If others, please specify

3. How many hectares of citrus is under irrigation?

4. How much water, do you use to irrigate one hectare of citrus in liters'?

5. Do you produce more citrus with less water?

6. Does water affect your productivity as a farmer?

7. If you had more water what would you do with it?

1	2	3	4	5
Plant more crops	Store it for future use	Use more of it	Use it like before	others

8. If others please specify

SECTION: CITRUS VALUE CHAIN

Marketing

1. Where do you sell your citrus?

1	2	3	4	5	6	6	7	8
Hawkers	Factory	Wholesaler	Middlemen	Retailer	Local supermarket	Directly to final consumers	International market	others

2. If others, please specify

3. How do you sell your citrus?

1	2	3	4
Contract	Salesmen	Buyers coming by themselves	others

4. If others, please specify

5. Who transport the products from the farm to final destination?

1	2	3	4	5	6
processor	transporter	Self transport	Buyer transport for themselves	Co-operate transport	others

6. If others, please specify

7. How many oranges do you normally sell?

Day	Week	Month	Season	Year

8. At what price, do you sell your oranges?

< 10KG	10KG	20	30	40	>40KG

9. In case of surplus, what do you do with the products?

1	2	3	4	5
Store	Sell at low price	Dump	Give-away	Others

10. If others, please specify

11. Is there any government driven agricultural project in the study area that helps farmers in the production and marketing of citrus?

12. If yes, what is the name of the project?

13. When was it formed?

14. How did the project help you in marketing of your products?

Citrus processor

1. What is the name of this factory/ agro-processing firm?

2. When was this factory/ agro-processing firm established, in years?

3. What is the size of the factory?

4. When did this factory start to process products?

5. How many people are employed in this factory, including management and technical staff

6. How many litres of juice do you normally produce?

Day(litres)	Week (litres)	Month(litres)	Season(litres)	Year(litres)

7. At what price do you charge to process?

1	2	3	4	5
1 litre	2 litres	5 litres	10liters	>litres

8. What is the percentage of profitability of making orange juice?

Appendix 4: Questionnaire for 2012 fieldtrip

	Section 1		
1	Interview	How big is your farm (total hectares)?	
2	Interview	How many arable hectares do you have? (I.e. how many hectares can POTENTIALLY be cultivated)	
3	Interview	How many hectares do you actually cultivate? (hectares under cultivation?)	
4	Interview	What crops do you grow?	
5	Interview	Why do you grow these crops?	
6	Observation	Observe what crops are currently in the field.	
	Section 2		
7	Interview	What do you understand by the term 'irrigation'?	
8	Interview	Where does your water come from?	
9	Interview	How do you water your crops?	
10	Interview	Why do you water your crops in this way?	
11	Interview	How often do you water your crops?	
12	Interview	At what time of day do you water?	
13	Interview	For how long do you water?	
14	Interview	Do you water on windy days?	
15	Observation	Do you use wind breaks to shield your crops from wind to decrease evaporation?	
16	Interview	Can you see any calibration equipment on the premise (gate valves, flow meters and pressure gauges) ?	
17	Interview	Can you tell me how much water do you use per application?	
18	Interview	What does "using water efficiently" mean to you?	
19	Interview	Do you think you use water efficiently? Please explain.	
20	Interview	What is water conservation?	
21	Interview	Do you think people should pay for water ?	

22	Interview	Do you pay for water ?	
23	Interview	How much do you pay for your water? (fixed water charge?)	
24	Interview	To whom do you pay for your water?	
25	Interview	Do you have a water use licence?	
26	Interview	Do you belong to an irrigation scheme?	
27	Interview	Has your source of water changed during the past couple of years?	
28	Observation	Can you observe any water storage infrastructure like tanks or dams?	
29	Observation	What water provision infrastructure can you observe? (canals, dams, irrigation structures, pumps, etc.)	
30	Observation	Observe the state of the infrastructure (e.g. is the canal overgrown with grass, leaks, in disrepair?).	
31	Interview	Who repair and maintain your irrigation equipment?	
32	Interview	Do you and your neighbours take turns to use the water or can everybody use water whenever they want?	
33	Observation	Can the respondent produce an irrigation schedule which states his share of water with their neighbours?	
34	Interview	Do you have a limit of the volume of water that you are allowed to use?	
35	Interview	Who checks that people stick to the rules (schedule)?	
36	Interview	How do you resolve conflict?	
37	Interview	Do you use recycled (grey) water from the house to irrigate?	
38	Interview	Do you catch, store and re-use runoff (tail end) water?	
	Section 3		
39	Observation	Observe what tillage practice is used. (ploughing, ridging and potholing)	
40	Interview	Are you familiar with the idea of minimum tillage?	
41	Interview	Do you use rotation cycles?	
42	Interview	Do you allow your soil to rest between cycles? (fallow land)	
43	Interview	Do you apply mulching to retain soil moisture?	
44	Observation	Observe current soil quality (barren or rich and fertile).	
45	Observation	Observe contours / ridges relative to slope (i.e. do you plant across or along the slope)?	

46	Observation	Evidence of ground cover and mulching?	
47	Interview	How many times do you plant per year?	
48	Interview	When do you plant and harvest (depending on crop)?	
49	Observation	Is appropriate plant spacing applied (crop dependent)?	
50	Interview	Do you spray for pests and disease?	
51	Interview	Do you use fertiliser?	
52	Interview	If yes, what kind and how much?	
53	Interview	How often do you apply fertiliser?	
54	Interview	Do you make use of soil analyses?	
55	Interview	Are fertilizers used based on soil analysis results?	
56	Interview	List the inputs, amount of each input used, and the cost per unit of each input	
57	Interview	Do you access to electricity from ESKOM?	
58	Interview	Do you own a vehicle?	
59	Interview	Please estimate your total production cost of your crop?	
60	Interview	What is your pumping costs? (running + maintenance) (if applicable)	
61	Interview	Do you have a record keeping system? (If yes, how does it work?)	
62	Interview	Do you farm and manage your land yourself?	
63	Interview	Who works on your land (family or hired labour)?	
64	Interview	What is your yield? (if the respondent cannot tell, ask him to show his harvest bags – take photo for scale)	
65	Interview	What is the marketable unit (kg or tonne or “bag”)	
66	Interview	Who buys your harvest (Where do you sell it?)	
67	Interview	For how much do you sell it? (R/unit)	
68	Interview	How much of your harvest do you sell? (% of harvest sold give clue to whether he is subsistence or commercial orientated)	
69	Interview	How much of your harvest is consumed by your household?	
70	Interview	What is the income from your farm per year?	
71	Interview	How many income sources do you have apart from farming?	
72	Interview	Do you perceive farming as a business?	

73	Interview	Do you have a bank account?	
74	Interview	Do you have a loan for your farm? Who is it from (e.g. the bank?)	
75	Interview	Do you belong to a CPA/traditional authority?	
76	Interview	Are you in a strategic partnership with regard to your farming activities?	
	Section 4		
77	Interview	What do you understand by 'land and water use rights'?	
78	Interview	What is your perception with regard to water and land reform and have these perceptions influenced your farming in any way?	
79	Interview	Do you own this land? I.e. Do you have a title deed? Or, is the land leased to you?	
80	Interview	How did you get your land? Who gave it to you, or who are you leasing it from?	
81	Interview	What do you want to achieve with your land? (not just agricultural related?)	
82	Interview	What are your biggest obstacles to achieving this?	
83	Interview	What do you need to overcome these obstacles?	
84	Interview	In what ways do you expect government to support you in achieving your farming objectives?	
85	Interview	What is the source of this expectation? (Why do you expect this?)	
86	Interview	Has government delivered on these expectations?	
87	Interview	Do you intend to remain on the land? For how long?	
88	Interview	What would make you want to leave the land?	
89	Interview	Do you want your children to inherit your land and continue farming here? (Why?)	
90	Interview	Can your children inherit the land even if you lease the land from the chief?	
	Section 5		
91	Interview	What do you think is a successful farmer?	
92	Interview	What do you think is a "subsistence farmer" ?	
93	Interview	What do you think is an "emerging farmer" ?	

94	Interview	What do you think is a "commercial farmer"?	
95	Observation	Does the respondent understand the concept of a value chain, value-adding, upstream and downstream linkages, etc.	
96	Observation	Does the respondent understand what it entails to become an active player in commercial value chains? (I.e. the requirements, responsibilities and risks of venturing further down the value chain?)	
97	Interview	What do you understand by the term "productivity"?	
98	Interview	Have you gone on any training provided by government or other organisations?	

Appendix 5: Observation sheet 2011/2012 fieldtrip

Community/Village/town (name)	
Community/Farm Code	
Household number and respondent name	
Male/Female	
Time and date of observation	
Observer	

Ownership and scale

1. Can I see any clear demarcations of the property i.e. fences?
2. Are there any labourer houses, and in what condition are they?

Production: size and scale

3. Does it look like the crop is in a good condition?
4. Is there any machinery (tractors, irrigation infrastructure, water pumps) and in what condition are they?
5. Is there activity on the farm or does it look abandoned?

Transport

6. Access road to the farm: how far is it and is it in a good condition?

Water and Energy Use

7. Does the farm look well irrigated or dry?
8. Do you notice any extensive irrigation structures or is it mostly rainfed?
9. Irrigation infrastructure: is it in working order?
10. Pump: is it in working order?

Appendix 6: Capacity building

The project has contributed to building the capacity of the beneficiaries of land and water reform, regulators of water and land reform programmes, and students and educational institutions; in various ways, albeit to different levels of success.

Department of Agricultural Economics, University of Limpopo

This project has supported two masters students from the University of Limpopo. However only one Masters theses was successfully completed with one publication in an academic journal from this thesis.

Student name:

Lefophane Mapula Hildah

Title of the dissertation:

“Comparative analysis of technical efficiency levels of emerging maize and green beans farmers with and without access to formal agricultural credit along food value chains in Maruleng Municipality, Limpopo Province of south Africa”

Summary:

Access to credit has long been argued to be an engine of agricultural development across the world. The inaccessibility of agricultural credit is a central problem which has an indirect impact on other production factors that in turn negatively affect farmers' output and efficiency. Therefore, the influence of credit access on technical efficiency of emerging farmers cannot be overestimated. The main question to ask is whether credit accessibility is really necessary to improve farmers' technical efficiency.

The aim of the study was to compare technical efficiency levels of emerging farmers with and without access to formal agricultural credit in Maruleng Local Municipality in Limpopo Province. The main objectives of the study were to determine socio-economic characteristics and factors to access formal agricultural credit and to compare technical efficiency levels of emerging maize and green beans farmers. In this regard, maize and green beans were the two crops used in the study. The study further mapped maize and green beans value chains in Maruleng Municipality.

The study used primary data which was collected through face to face interviews using structured questionnaires. The study employed stratified random sampling in its data collection strategy due to the fact that some farmers had access to credit while others did not. Emerging farmers were classified as borrowers and non-borrowers of formal agricultural credit and farmers were stratified according to gender. The total sample size comprised 72 emerging farmers across Maruleng Municipality.

The Probit regression model was used to analyse variables which were considered to have an influence on the probability of accessing formal agricultural credit while the Cobb-Douglas production function was used to compare technical efficiency levels of borrowers and non-borrowers of credit. For analytical purposes, data was captured into the Statistical Package of Social Sciences (SPSS), and a regression analysis was carried out.

Results from the Probit regression analysis indicated that the level of education of the household head, land ownership, size of the farm, off-farm income, as well as credit repayment records have a significant positive influence on the probability of accessing formal agricultural credit. In addition, gender of the household head, total livestock of the household, credit awareness and farming experience had insignificant positive influence. On the other hand, age of the household head, family labour and level of interest rate have a significant negative influence on the probability of accessing credit. Similarly, the existence of an extension service had insignificant negative influence.

Results from the Cobb-Douglas regression analysis revealed that the technical efficiency level of borrowers of formal agricultural credit was significantly higher than those of non-borrowers. The results also revealed that the level of technical efficiencies varies widely, being 9.843 for green beans borrowers of formal agricultural credit farmers and 2.892 for maize non-borrowers of formal agricultural credit. The results further indicated that overall, the technical efficiency level of green beans and maize borrowers is higher than their non-borrowers counterparts.

Estimates from the Cobb-Douglas analysis on the use of irrigation water were found to be insignificant for maize producers (both borrowers and non-borrowers) and negative but statistically significant for green beans producers (that is; both borrowers and non-borrowers). The non-significant result for maize is true since farmers in the sample produced maize under dry land condition. The negative elasticity of estimate for irrigation water implies that as more and more hectares of land is being irrigated, output tends to decline. These results are in accordance with the fact that majority of emerging farmers in the sample size shared water from the irrigation schemes and as such they tended to compete amongst each other for water, resulting in over-utilization of irrigation water.

The study recommended that existing agricultural credit programmes should be reviewed to accommodate the needs of emerging farmers, be refocused, more accessible, and be accommodative of younger farmers. Based on the food value chain maps for maize and green beans in Maruleng Municipality, it is recommended that future researchers should focus on determining the margin share for each of the role players in the food value chain. In addition, future researchers should also determine how much value is added at each stage of the food value chain.

Beneficiaries of Land and Water Allocation Reform

Direct capacity building of beneficiaries commenced when the project team initiated field work during 2011, which was followed up in 2012/13. During interviews and contact sessions, information started flowing between researchers and farmers, which increased the

mutual level of awareness of the realities and practical achievability of potentially unrealistic expectations fostered by beneficiaries and/or researchers. This could be considered as capacity building in its broadest sense. Beneficiaries were made aware of the implications of current water use practices and the potential gains to be derived from changes to such practices. Social, cultural and political variables were also brought to the fore, which often revealed the limitations of commercial-orientated approaches to achieve a particular form of beneficiation. Although it is difficult to measure “progress” here, this is considered as an important achievement, and one should not forget that the overarching objective of guidelines that will be developed towards the end of the project focuses on beneficiation of these groupings. One of the guidelines focusses specifically on this group.

Government officials

Junior and intern extension officers from the Department of Agriculture Forestry and Fisheries gained valuable experience during the fieldwork sessions. The research team split up into smaller teams, each accompanied by a DAFF officer, whose role it was to facilitate dialogue between the research team and the farmers in an effective way. These junior officials were on occasion joined by senior officers to provide guidance in terms of proper facilitation. This experience counted towards the examination of two intern extension officers, which were on training during the project team’s visit in the area. Both of these are now working independently for the Department. One of the guidebooks is focused on this group individuals.

Regulators

The project team maintained their consultative and collaborative relationships with governmental departments such as DAFF, Department of Water Affairs (DWA) and Department of Rural Development and Land Reform (DRDLR). These relationships have (albeit to a limited extent) promoted ownership and sharing of knowledge between the researchers and decision-makers throughout the duration of the project. The need to supplement mainstream land and water reform support approaches which focus on commercial agriculture, with customised and diverse approaches suitable to the local context, became evident once more. There is one guidebook specially designed with this group in mind.