

Smallholder irrigation

Improving productivity on smallholder irrigation schemes

A completed WRC-funded project has explored different opportunities to improve productivity and livelihood impact of smallholder irrigation schemes.

Background

In South Africa, smallholder irrigation scheme development continues to be regarded as an opportunity to trigger rural local development, even though historically these projects have not been particularly successful.

The limited productivity and livelihood impact of South African smallholder irrigation schemes has dominated the literature that assessed this type of rural investments. The main thrust of this project was aimed at testing a number of farming system innovations, but attention was also given to social resource constraints.

The research was conducted in Limpopo, which is the heartland of smallholder irrigation schemes in South Africa, more specifically canal schemes, which were the first type of schemes to be constructed. Many of these schemes remain operational indicating that they are durable and resilient.

Setting the scene

There are around 74 smallholder canal schemes left in South Africa of which 67 are operational.

The study confirmed the continued relevance of canal irrigation, and shows that gravity-fed canal schemes are more likely to be operational and to last longer than pumped schemes.

Generally, cropping intensity on smallholder schemes in Vhembe was well below the optimum values of 1.5 to 2.5 that could be achieved in the area. Water restrictions were a significant factor in determining cropping intensity.

Obligations and shared responsibility

The WRC study confirms that being part of an irrigation scheme comes with obligations, which relate to the



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essence of being a member of a scheme, and that is shared responsibility of the water distribution infrastructure.

The case study of Dzindi provides detailed evidence of a rapidly decaying water distribution system, which is at least partially due to neglect on the part of plot holders, who have allowed the collective organisation that was responsible for routine maintenance of the system to collapse.

Inadequate routine maintenance and loss of water due to leaks caused by the poor state of the concrete canals, furrows, regulating devices and the night-storage dam that supplies the large irrigation block, are directly responsible for the worsening problem of water shortage at the scheme. For this reason, an **effective routine maintenance system** was identified as a critical condition for the sustainability of canal schemes.

Trust tenure system

The trust tenure system, which applied to irrigation schemes located in the so-called 'Bantu areas' provided the state with the power to cancel the user rights of plot holders who failed to comply with the many terms and conditions for occupation of an irrigation allotment.

There were also elements in the system that provided a high degree of security. One of these was the detailed specification of exclusion rights, which served to protect occupants of irrigation schemes from 'outside' interference.

The empirical work identifies the lack of a comprehensive legal framework that enables plot holder communities to assert their land rights as an important weakness of the current tenure system on smallholder irrigation schemes in Vhembe.

The absence of such a framework has left these communities vulnerable to outside interference, and has rendered their tenure rights more insecure than before. In the case of Dzindi, land is being taken away to accommodate rising demand for residential land, for example.

This precarious situation is identified as a priority issue for government attention. If land rights in irrigation schemes are not protected, the recommendations to develop schemes in proximity to urban centres to provide access to markets, which encourages commercialisation and tends to enhance scheme productivity, has no validity.

Animal draught system

The study further explored the potential of using animal draught as alternative to tractors as a source of draught power in land cultivation. On canal schemes, animal draught enterprises tended to achieve better field efficiency and turning times than tractors, but tractor enterprises had higher work rates, field capacity, speed, ploughing width and ploughing depth than animal draught enterprises.

Improving production

Much attention was focused during the study on the issue of production. With regards to irrigation scheduling of green maize, the once-per-week irrigation schedule practiced by farmers was found to be best practice. It used less water and gave the highest irrigation water use efficiency of all the methods that were tested.

In the case of Chinese cabbage this was not the case. For optimum growth and leaf yield of non-heading Chinese cabbage the soil water content in the upper part of the profile had to be maintained at/or close to field capacity. This required the crop to be irrigated at least twice per week, which is more often than farmers have access to irrigation water.

Furthermore, research results enabled the identification of the best performing cultivar and the optimum planting density for different planting dates for maize. Maize streak virus was identified as a major constraint to year-round production of green maize in Vhembe.

Integrating crop and livestock production

The study also explored the opportunity of integrating crop and livestock production on canal schemes in Vhembe. For that purpose technology was developed to process grain on-farm for the purpose of formulating poultry diets.

It was found that the biological performance of broilers provided with diets that contained legume grains that were processed on-farm was sub-optimal compared to that of broilers on a commercial multi-phase diet. Use of the on-farm feed also reduced net operating income of broiler enterprises.

The challenge that remains is to improve the on-farm diet to such an extent that net operating income of broiler

enterprises using the on-farm diet is higher than that of enterprises using a commercial diet. Three possible ways of improving the on-farm diet were identified.

Research also showed that cowpeas can be used as the source of protein for inclusion in layer diets. However, it is not recommended as the single protein source.

Soya beans, the preferred choice of crop, because of its high protein content, performed poorly compared to elsewhere in South Africa. High temperatures and high humidity appeared to be the reason why the crop that was planted during the expected optimum planting period (September to December) performed poorly.

Cowpeas and pigeon peas were tried out as alternatives to soya beans. Both crops appeared very well adapted to conditions at Dzindi, but the grain yields that were obtained were too low to consider the introduction of either of these two grain legumes as a cash crop for smallholder irrigators. The very low grain yield obtained from pigeon peas was partly due to bird damage.

Various experiments aimed at determining the value of poultry manure contained important plant nutrients, particularly N and P, in concentrations that were higher than in many other types of animal manure.

Finally, several policy recommendations were derived from the findings. These recommendations have been structured in line with the mandates of specific departments within the South African government.

Further reading:

To order the report, *Improving plot holder livelihood and scheme productivity on smallholder canal irrigation schemes in the Vhembe district of Limpopo province*. (Report No. TT 566/1/13) contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za or Visit: www.wrc.org.za to download a free copy. Also part of the series of reports is *Growing green maize on canal schemes in Vhembe: Production guidelines* (Report No. TT 567/13); *Production guidelines for small-scale broiler enterprise* (Report No. TT 568/13) and *Guidelines on management of working animals* (Report No. 569/13)