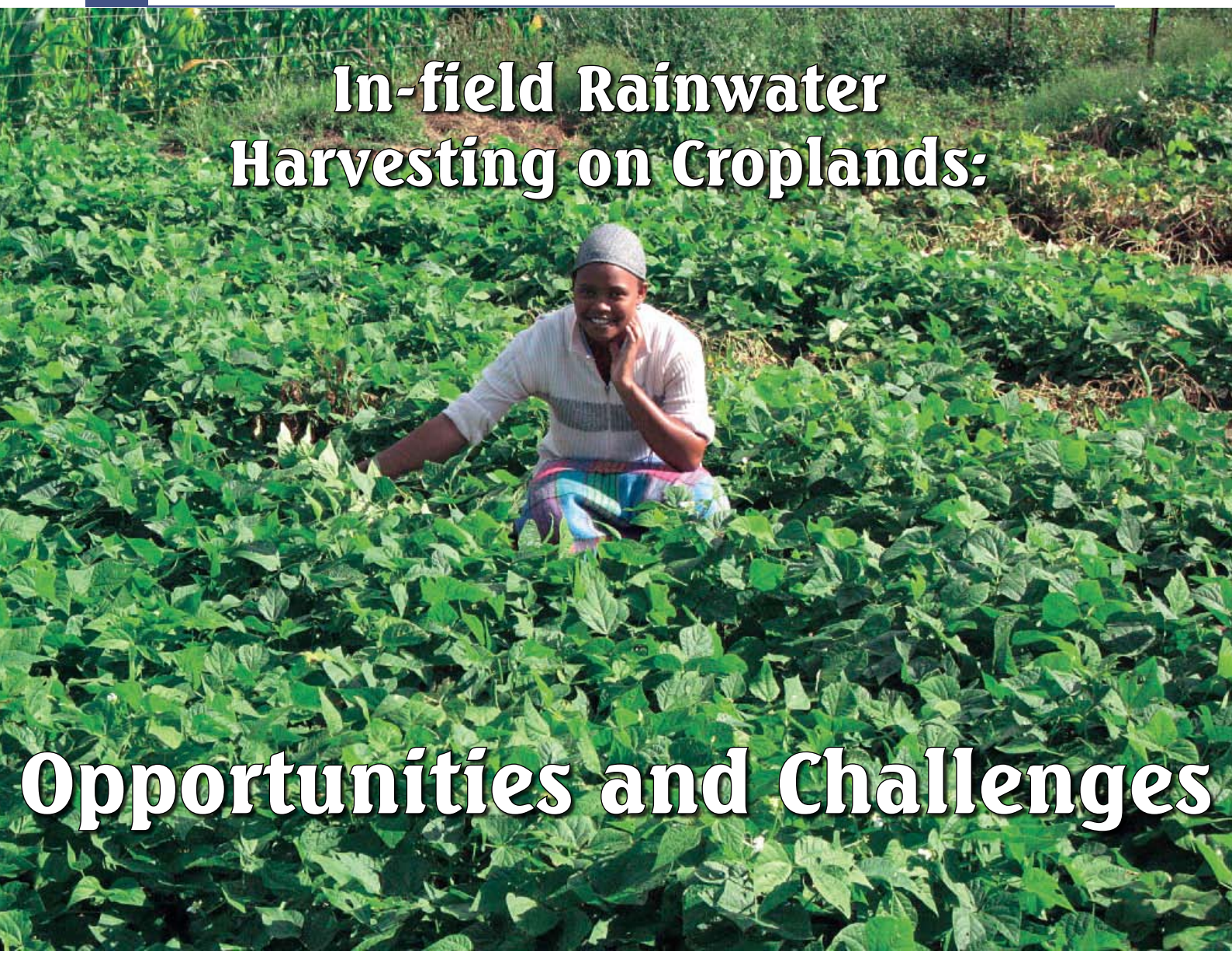


In-field Rainwater Harvesting on Croplands: Opportunities and Challenges

In-field rainwater harvesting, which has been successfully applied in backyard food gardens in several rural communities of South Africa, is now being upscaled to communal croplands. However, it will take more than technology to cure the country's food security ailments, writes Water Research Commission (WRC) Director: Water Utilisation in Agriculture, Dr Gerhard Backeberg.

Over the last 18 years the WRC has invested in a range of research projects on different aspects of rainwater harvesting. This research began with a sequence of projects by the Agricultural Research Council (ARC) Institute for Soil, Climate and Water, which led to the development and testing of the technique of infield rainwater harvesting and conservation (IRWH&C).

In general terms, IRWH can be classified as a micro-catchment, on-farm method of water harvesting with run-off strips. This new technique is now successfully applied in backyard food gardens by more than 1 000 households in 42 villages at Thaba Nchu, in the Free State.

The potential was identified for upscaling of IRWH to communal croplands.

For this purpose the University of the Free State developed an innovative and cost-effective procedure to delineate soils suitable for cultivation and rainwater harvesting. Experts such as Dr Malcolm Hensley are convinced that with IRWH farmers can e.g. produce enough maize for own consumption and also earn cash with the sale of surpluses.

KEY ISSUES

Observations and anecdotal evidence indicate that communal cropland (i.e. land held as common property) adjacent to these rural villages has mostly not been cultivated for about the last 25 years. This can probably be explained by the low and variable crop yields achieved with conventional ploughing and planting practices.

"Land use planning must be done in participation with plotholders and households in rural villages."

The contention is, however, that this situation of unutilised land also has to be attributed to institutional failures. This means that land rights, or rules which govern the access to land, have over time broken down. This argument is based on the institutional economic principle that secure property rights are the incentive for productive use of resource. In other words, although higher yields of up to 50% can be expected with IRWH&C, this technological innovation will not be practically applied unless it is preceded by additional institutional innovations.

If this reasoning is correct, the investment by the WRC to promote productive use of soil and rainwater will under present conditions not achieve the fullest possible impact of increased food production and reduced poverty in rural areas.

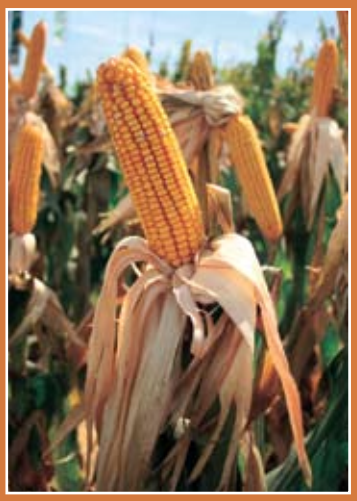
The WRC therefore initiated a pilot project with the expert inputs by Siyabu Manona of Umhlaba Consulting, to develop a land register of communal cropland for three villages in Thaba Nchu. The findings of this study confirm the near collapse of the prevalent land tenure system, i.e. the entitlements to use communal land for rainfed crop production and the organisational structures to manage the access to the land.

After consultation a participative process was started to establish representative groups in the villages and to formulate rules which are generally accepted. In order to succeed and gain momentum, this process deserves support from a number of role-players. With the knowledge generated by the available research reports it is clear that two related actions are required.

Firstly, further research must be undertaken on access to markets and finance; on institutional arrangements and organisational relationships within the traditional cultures; and on essential farmer support services in order to ensure that IRWH&C is socially acceptable and economically viable. This is being done through WRC solicited research projects by the University of the Free State, University of Fort Hare and the ARC, to enable sustainable food production in household gardens and communal croplands.

Secondly, major contributions can be made by cooperation between public servants in the Department of Water Affairs & Forestry, Agriculture, Land Affairs, Provincial and Local Government for service delivery to farmers, within the existing legal framework and implementation of various departmental strategies. In this regard, four issues should be highlighted:

- Existing land rights must be explicitly delimited so that each holder gains exclusive access to his or her own plot; that rules are enforced to prevent e.g. damage by livestock or loss through theft; and that use rights can be transferred through e.g. share-cropping or lease agreements.
- Provision must be made on departmental budgets for fencing of croplands and supporting entrepreneurs who are interested to start new business ventures such as ploughing or transport services.
- Land use planning must be done in participation with plotholders and households in rural villages.



FOOD SECURITY IN SOUTH AFRICA

Food security remains a priority issue for South Africa despite the country's national 'food secure' status. An estimated 14 million people, or about 35% of the country's population, are estimated to be vulnerable to food insecurity, while the development of as many as 1,5 million children under the age of six is reckoned to have been stunted by malnutrition. The present situation in South Africa shows that food security is not a failure of agriculture to produce sufficient food at the national level, but rather a widespread, complex failure of households to guarantee access to sufficient food. Food insecurity and malnutrition are highest in provinces with large rural populations, such as KwaZulu-Natal, Limpopo, Eastern Cape and the Free State. Overall, poor households seem to have a greater reliance on purchased food as opposed to own-produced food, with most of these poor households being dependent on social grants and/or pensions as their only income. Thus, there is a continued need to strengthen small-scale farming and community food gardening programmes.

A farmer prepares his land for planting using the in-field rainwater harvesting technique.

- Demonstration plots of IRWH must be established on communal croplands, together with practical skills training and goal directed extension programmes to reach women and men who are interested to begin with farming enterprises.

A number of related WRC projects are currently ongoing, and an extensive list can be found in the ***2007/08 Knowledge Review***. One such project, being undertaken by the ARC, is assessing water harvesting and conservation techniques/practices for

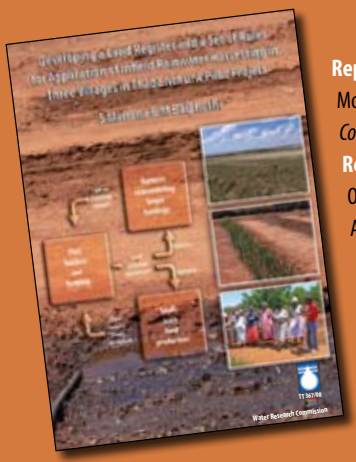
"Although higher yields of up to 50% can be expected with in-field rainwater harvesting and conservation, this technological innovation will not be practically applied unless it is preceded by additional institutional innovations."

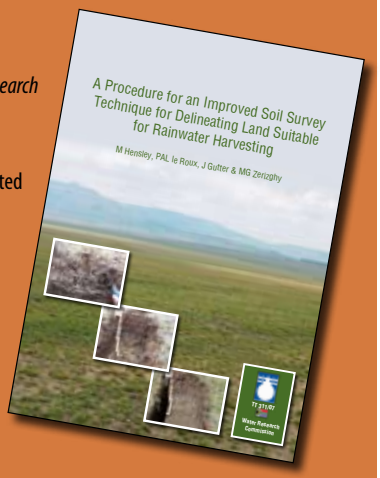
improved rangeland and cropland productivity in communal areas through on-station (controlled) and on-farm (participative) research. The project is investigating the institutional arrangements in these communities and assessing the extent to which production has been historically suppressed as a result of inappropriate working rules and how these can be improved. It is envisaged that a guideline on best management practices for IRWH&C for rangeland and croplands will be produced.

Left: *In-field rainwater harvesting can be used to cultivate a range of crops, in this case carrots.*

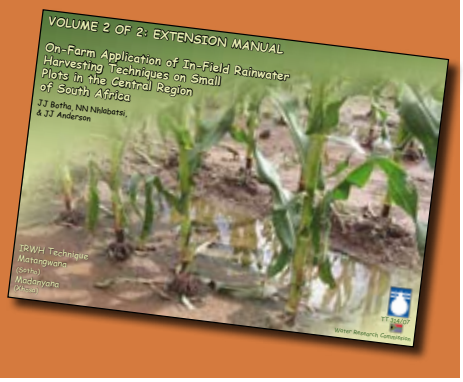
Right: *When using the in-field rainwater harvesting technique, runoff water accumulates in basins and percolates beyond the evaporation zone.*

AVAILABLE WRC RESEARCH REPORTS ON IN-FIELD RAINWATER HARVESTING AND CONSERVATION





Report No: 508/1/97
Modelling the Water Balance on Benchmark Isotopes (*Agricultural Research Council – Institute for Soil, Climate and Water*)
Report No: 878/1/00
Optimising Rainfall Use Efficiency for Developing Farmers, with Limited Access to Irrigation Water (*ARC – ISCW*)
Report No: 1176/1/03
Water Conservation Techniques on Small Plots in Semi-arid Areas to Enhance Rainfall Use Efficiency, Food Security and Sustainable Crop Production (*ARC – ISCW and University of Free State)*
Report No: 1267/1/04
Socio-economic Study on Water Conservation Techniques in Semi-arid Areas (*UFS*)
Report No: TT 313/07 (Vol 1) and TT 314/07 (Vol 2)
On-farm Application of In-field Rainwater Harvesting Techniques on Small Plots in the Central Region of South Africa (*ARC – ISCW and UFS*)
Report No: TT 311/07
A Procedure for an Improved Soil Survey Technique for Delineating Land Suitable for Rainwater Harvesting (*UFS*)
Report No: TT 367/08
Developing a Land Register and a Set of Rules for Application of Infield Rainwater Harvesting in Three Villages in Thaba Nchu: A Pilot Project (*Umhlaba Consulting Group*)



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Another project is developing a comprehensive learning package for the application of IRWH&C for household food production and poverty alleviation in rural areas. It will identify the existing unit standards for training in rainwater harvesting and fill the gaps in learning material by adopting and adapting available material and developing a comprehensive package, which will be tested in the field with trainers, facilitators and learners. Work is also continuing to assess the social and economic acceptability of rainwater harvesting and conservation practices in selected peri-urban and rural communities.

The results from completed projects are made available through reports (a list which can be found elsewhere on this page). These reports can be ordered and are distributed free of charge as part of the WRC's mandate for knowledge dissemination. The WRC is also willing to facilitate knowledge exchange sessions, led by the relevant scientists, on how best to use the information contained in the reports.

Although this research work was completed in the semi-arid region of central South Africa, the principles are applicable in different regions of all provinces. The complexities of each particular farming region will obviously have to be taken into consideration and adjustments will accordingly have to be made. Nonetheless, the implementation of these guidelines, procedures and approaches will contribute to higher food security and lower poverty among households in many more rural areas.

Concerted efforts by everyone involved in this initiative will make a difference, improve rural livelihoods and promote growth and development of agricultural production in South Africa.