WRC Meets Southern Africa's Agricultural Needs

- by Edith Webster -

Ongoing and completed research funded by the Water Research Commission (WRC) is well on its way to meeting some of the agricultural needs identified by the New Partnership for Africa's Development (NEPAD) during the World Summit on Sustainable Development.

NEPAD sees, according to *Water and Sustainable Development in Africa: An African Position Paper*, "tremendous opportunities to stabilise and improve rainfed agricultural production through rainwater harvesting, low-cost micro-irrigation technologies and better land management".

"What is important here," continues the document, "is to understand that Africa needs to take a broad and innovative approach to mobilising water for agricultural production".

The WRC's Key Strategic Area of Water Utilisation in Agriculture focuses on:

- increasing the efficiency of water use for food, fibre, wood and timber production (improving the knowledge of biological, technical and economic processes of production);
- ensuring sustainable water resource use in rainfed and irrigated areas (improving the knowledge of natural processes and man-induced impacts of resource use); and
- increasing household food security and profitability of farming and, thereby, the livelihoods of people dependent on agriculture (improving the knowledge of management processes of people who are using water).

NEPAD

Extract from *Water and Sustainable Development in Africa: An African Position Paper* (published on behalf of the Africa Water Task Force by the International Water Management Institute).

"Africa faces daunting socio-economic problems that threaten to marginalise the continent from the growing process of globalisation, and finds itself caught in a trap that confines it to a vicious cycle of underdevelopment, conflict and suffering. The New Partnership for Africa's Development (NEPAD) is Africa's response to this threat. It has been launched by African heads of state as a bold attempt to free Africa from this trap and launch it on a path of sustainable development."

Dr Gerhard Backeberg, the WRC's director: Water Utilisation in Agriculture, says it is imperative that the utilisation and development of water resources in agriculture are analysed in relation to the needs and requirements of people.

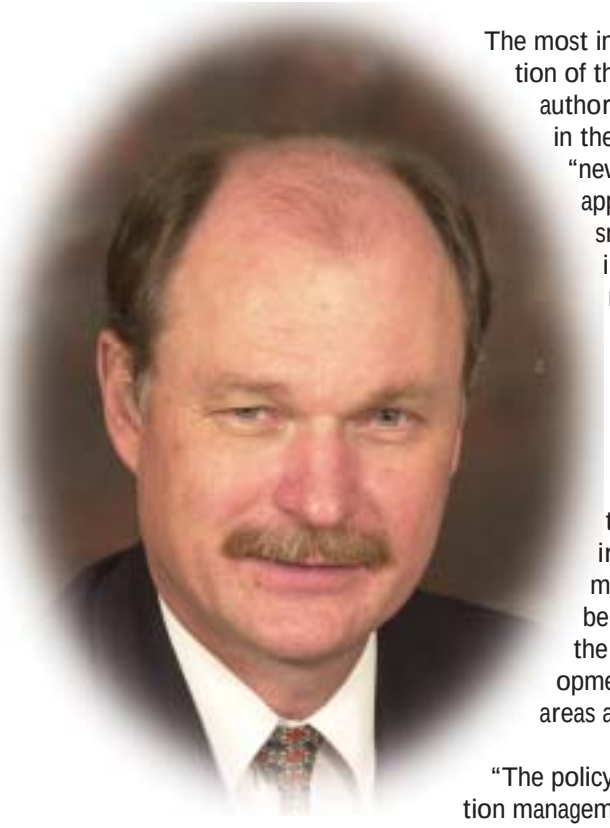
"People using water in agriculture comprise a diverse group of subsistence, emerging and commercial farmers within interrelated subsectors, including irrigated and dryland agriculture," he explains, adding that the point of departure of applied research is, therefore, the real-life problems experienced, primarily, by water users and related organisations for irrigated and rainfed crop production, fuelwood and timber production as well as livestock and fish production.

"Research as a problem-solving process must provide information, technologies and models, which can be applied by present and future generations of water users," continues Dr Backeberg.

The WRC's overall objectives, therefore, include initiation of research to enable the utilisation of scarce water resources efficiently, beneficially and sustainably to increase household food security and farming profitability and, thereby, increase economic and social welfare through efficient growth and equitable distribution of wealth on a farming, local community and regional level.

WHAT IS THE WRC DOING TO REALISE ITS OBJECTIVES?

In one direction, research is being conducted on water utilisation for food and fibre production by improving the knowledge of the processes of field, horticultural and industrial crop production. This involves a programme aimed at water-efficient production methods in relation to soils, crops and technology in rainfed and irrigated agriculture.



Dr Gerhard Backeberg of the Water Research Commission

"Water productivity can be increased by producing more with the same use of water or by producing the same with less use of water. This requires an understanding of water dynamics in the soil-water-plant-atmosphere continuum, the equipment used and the method of production followed. Research on all these aspects can contribute to higher water-use efficiency in agriculture," says Dr Backeberg.

The WRC's *Review of planning and design procedures applicable to small-scale farmer irrigation projects* (by CT Crosby, M de Lange, CM Stimie and I van der Stoep) evaluates the technical aspects of irrigation practised by subsistence and emerging farmers, and establishes ground rules for design methods and norms for effective planning and application of irrigation in development.

The most important contribution of this research, say the authors, has been its role in the development of a "new" participatory approach to planning small-scale farmer irrigation, which has received official recognition and is being implemented.

This research finds a paradigm shift in the approach to irrigation development, which should be viewed in terms of the economic development of deep rural areas as a whole.

"The policy is one of irrigation management transfer to the farmers on existing schemes. In the past, irrigation projects were treated as 'islands of development' in the communal land tenure areas, and they failed. Now, there must be a co-ordinated approach to land tenure, resettlement, rehabilitation, civil and traditional governance, Water User Associations, finance, infrastructure development, and marketing before irrigation management transfer can become a reality."

Another relevant activity of the WRC is its research on water utilisation for poverty reduction and wealth creation in agriculture, which explains Dr Backeberg, is geared towards improving the management processes undertaken by people using water. Here one of the programmes focuses on sustainable water-based agricultural activities in rural communities.

"Poverty, hunger and malnutrition among rural people are widely recognised as major problems. These members of rural communities, consisting mainly of women, children and the elderly, are also disadvantaged or marginalised for various social, economic and political reasons. A wide-ranging programme is required to support the sustainable development of rangeland livestock, rainfed and irrigated crop production," Dr Backeberg points out.

"Efficient use of water through a combination of agricultural activities can contribute to improving living conditions. Empowerment of rural people can further be promoted through participatory action research, which improves knowledge, farming skills and leadership capabilities," he adds.

To this end, the WRC is researching the application of globally-identified technologies in the local agricultural environment.

In the *Evaluation of the appropriateness and management requirements of micro-irrigation systems in small-scale farming* (by WRC-funded researchers FJ du Plessis and I van der Stoep) the practical application possibilities of micro- and drip-irrigation by small-scale farmers are investigated – by installing and monitoring a number of systems on farms, under the management and control of small-scale farmers, as well as field visits to several systems operated by individual farmers and various existing micro-irrigation schemes.

Du Plessis and Van der Stoep conclude that micro-irrigation could be implemented successfully in small-scale farming, provided a number of support services are in place.

"Small-scale farmers experience very few problems with the operation of the system, provided it functions properly and operational guidelines are followed satisfactorily."

The authors of *Micro-irrigation for smallholders: guidelines for funders,*

planners, designers and support staff in South Africa (FJ du Plessis, W van Averbeke and I van der Stoep) find that micro-irrigation has some distinct advantages, when compared with conventional surface and overhead systems, for small-scale farming conditions. These advantages include:

- high efficiency and the potential to save water;
- relatively low operating pressure;
- low labour requirements;
- day and night operation;
- versatility in field layout and adaptability to topography; as well as
- relatively easy movement of equipment between fields.

Researchers investigated the practical application possibilities of micro- and drip-irrigation by small-scale farmers

WHAT IS MICRO-IRRIGATION?

Micro-irrigation, according to the abovementioned publication, is a collective term for irrigation with drippers (drip irrigation) and micro sprayers (micro-spray irrigation). In both cases, only part of the soil surface is normally wetted. Irrigation takes place regularly (a short cycle is followed) and the discharge of the emitters is relatively low compared to other types of irrigation. Micro-irrigation typically requires low operating pressures and enables high irrigation efficiencies.

These researchers identify three important social factors determining the success of smallholder micro-irrigation:

The role of farming in the livelihood strategy of the farming household. Where farming forms part of a multiple livelihood strategy, and other sources of income buffer the impact of setbacks on the farm, successful micro-irrigation is less likely than in cases where the household is heavily dependent on farm income for survival. The team, therefore, concludes that an analysis of the livelihoods of farmers needs to form part of irrigation planning.

"Research as a problem-solving process must provide information, technologies and models, which can be applied by present and future generations of water users"

The person or people responsible for daily farming activities. Whereas the head of the household is responsible for decisions on the farm, another member of the family or hired help often conducts work on the farm. The person who executes farming activities needs to be a prime target for training. An analysis of the relationship between this person and the head of the household is important, especially in terms of the rewards the person receives for working on the farm. When the rewards are perceived to be inadequate, it is likely that this person will leave the farm as soon as a more rewarding opportunity presents itself. Whenever this happens there is usually a collapse of the micro-irrigation enterprise (gone with the person is the knowledge of the enterprise). In cases where a person other than the household head is responsible for day-to-day farming, it is important to extend training to more than just that person.

The relationship of the farming household with the community. Close relationships with other community members allow farmers to claim time and expertise from some of these members. Teachers, for example, are approached to explain

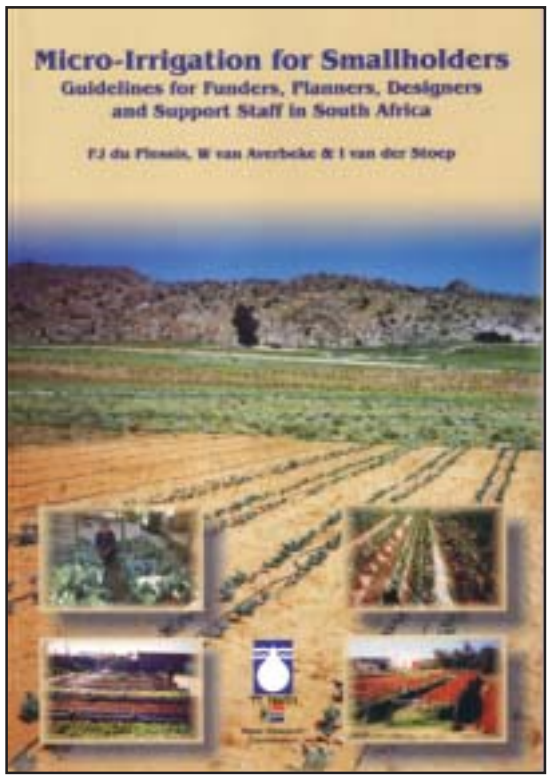
written information or act as translators. Where farmers relate well to their community, the situation is generally more favourable for farming, particularly for micro-irrigation.

WHERE TO NOW?

Research that formed these guidelines, cautions Dr Backeberg, shows micro-irrigation is not a panacea for all the limitations and constraints of smallholder irrigation. Quoting from the report, he continues: "On occasion, the installation of micro-irrigation on a smallholding leaves farmers worse off than they were before. This emphasises the need for careful planning by the engineer or designer of the system. Before encouraging smallholders to invest in a micro-irrigation system, there is a need to assess the full range of factors, which combine into an overall degree of risk. Only when the degree of risk is manageable and accepted by the farmer should planning and design of the project proceed."

Among the technical factors affecting successful smallholder micro-irrigation, mentions Dr Backeberg, adequacy and reliability of the water supply have been identified as the most critical. "Among the human factors, training is the most critical. In several cases, lack of training causes project failure".

For most, adds Dr Backeberg (again quoting from the report), "participation in the initiation, development and implementation of a micro-irrigation project represents a period of intense learning. Farmers, particularly, are exposed to a wide range of unfamiliar concepts during this period. Building the farmers' confidence throughout this learning process is important for long-term success. The trainer plays an important role in supporting the process – the trainer must carefully tailor the programme to the evolving needs of the farmer". He says the guidelines are aimed at providing trainers with insight into the range of important issues associated with micro-irrigation, and helping them decide on the content of their programmes.



The following research reports (relevant to this article) can be obtained from the Water Research Commission, Private Bag X03, Gezina, 0031:

- **Report TT164/01**: *Micro-irrigation for smallholders: guidelines for funders, planners, designers and support staff in South Africa*
- **Report 768/1/01**: *Evaluation of the appropriateness and management requirements of micro-irrigation systems in small-scale farming*
- **Report 578/2/00**: *A review of planning and design procedures applicable to small-scale farmer irrigation projects*
- **Report 689/1/00**: *Irrigation requirements of selected crops under small-scale production: linking on-farm and on-station research*
- **Report 774/1/00**: *Developing sustainable small-scale farmer irrigation in poor rural communities: guidelines and checklists for trainers and development facilitators*