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The WRC operates in terms of the Water Research Act (Act 34 of 1971) and its mandate is to support water research and development as well as the building of a sustainable water research capacity in South Africa.

TECHNICAL BRIEF

Irrigated agriculture

Standards and guidelines for improved efficiency of irrigation water use from dam wall release to root zone application

A WRC-funded study developed standards and guidelines for improved efficiency of irrigation water use from dam wall release to root zone application.

Reducing agricultural water use

The water requirements of irrigated agriculture in South Africa are estimated at 56% of the total annual surface- and groundwater requirements in South Africa. Although the contribution of irrigation to total agricultural production varies according to crop type, most of this water is used for commercial food production in response to consumer demand.

With increasing water demand from the domestic, mining and industrial sectors due to urbanisation and higher standards of living, more pressure is being placed on agricultural water users to reduce consumption and so increase the amount of water available for other uses. The implication is that more productive water use in future is essential.

Water users must understand the economic value and opportunity cost of water as a scarce resource and respond to incentives to use less water, which could then reduce the demand for sources in a river catchment. For sustainable economic growth and development, the competitiveness of irrigated agriculture will continuously have to improve. This can be achieved through multifactor productivity growth. It requires that more food is produced through higher efficiency and without the use of additional inputs, including that of water. The challenge for profitable farming is finding innovative ways of improving management, technological progress and more efficient resource allocation.

In addition to water scarcity, energy and operating costs affects water management and will do so increasingly in future. Energy prices are rising, pushing up the costs of

Water use efficiency is becoming a critical element in the South African irrigated agricultural sector.

pumping water, applying fertilisers and transporting products. This will have implications for the lawful access to existing water allocations and use for irrigation.

Guideline development

The WRC already recognised in 2003 that the efficient use of water by the irrigation sector will become increasingly important in the future. For this reason the Commission launched a major project to investigate and formulate guidelines to improve the management and use of water by irrigated agriculture in South Africa.

The resultant publication, ***Standards and Guidelines for Improved Efficiency of Irrigation Water Use from Dam Wall Release to Root Zone Application***, introduces a relatively new concept, namely the water balance approach, for achieving the necessary efficiencies in irrigation.

The concept can be explained thus: The purpose of an irrigation system is to apply the desired amount of water, at the correct application rate and uniformly to the whole field, at the right time, with the least amount of losses and as economically as possible. Optimised irrigation water supply is aimed at maximising the component of water that is used beneficially (i.e. used for its intended purpose such as crop transpiration) and that is recoverable (i.e. drainage water), while reducing non-beneficial uses (e.g. evaporation) and non-recoverable fractions (e.g. water lost to saline groundwater aquifers).

The guidelines will assist both water users and authorities to obtain a better understanding of how irrigation water management can be improved, thereby building human capacity so that targeted investments can be made with fewer social and environmental costs. Various lessons learnt, best practices and technologies are introduced and illustrated as developed and tested through extensive fieldwork undertaken at irrigation schemes across the country.

The guideline modules

The guidelines consist of four modules. Each module is a standalone unit with its own table of contents, introduction and conclusion:

- **Module 1** (Fundamental concepts) introduces the concept of optimised water use, irrigation system performance and the water balance. It also touches on lawfulness of water use, demand management and appropriate technologies.
- **Module 2** (In-field irrigation systems) addresses the water balance approach at field level, and describes how each decision made during the planning, design and management of irrigation systems influences the amount of water required to irrigate the crop successfully.
- **Module 3** (On-farm conveyance systems) addresses the water balance approach at farm level, and describes how the on-farm distribution system should be planned, designed and managed to optimise water and energy requirements.
- **Module 4** (Irrigation schemes) introduces the water balance approach at irrigation scheme level, and describes how available technologies (e.g. SAPWAT, WAS, iScheme) and water measuring devices can be used to ensure greater reliability of supply to all water users on a scheme.

Further reading:
To order the reports, *Standards and Guidelines for Improved Efficiency of Irrigation Water Use from Dam Wall Release to Root Zone Applications* (**Main Report No: TT 465/10; Guidelines Report No: TT 466/10; Supplementary Report No: TT 467/10**) contact Publications at Tel: (012) 330-0340, Email: orders@wrc.org.za, or Visit: www.wrc.org.za to download a free copy.