

Improved water distribution management

Lower Vaal River Catchment, South Africa

water scarcity impact

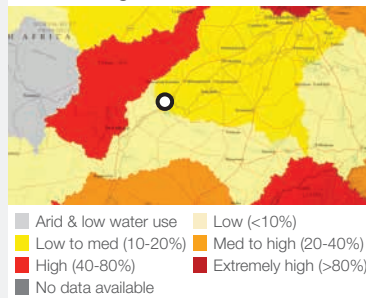
Reduced withdrawal	●
Reduced consumption	
Improved water quality	
Increased productivity	●
Net basin benefit	●

volumetric impact
14 150 000 m³/yr

capital cost
\$148 000

estimated unit cost of water
<5 ¢/m³

Water Stress ●
Vaalharts irrigation scheme, South Africa



Water Stress Map:
Gassert, F., M. Landis, M. Luck, P. Reig, and T. Shiao. 2013. "Aqueduct Global Maps 2.0."

Confidence level
● Low ● Medium ● High

Water Scarcity Impact Key
● Main ● Minor

Project Overview

The 29 181ha Vaalharts irrigation scheme is the largest in South Africa and is situated on the confluence of the Harts and Vaal Rivers in the Lower Vaal River catchment. It draws water from the Vaalharts weir which is fed by water released from Bloemhof Dam. Any savings that can be made on demand from the Vaal River are critical. Implementation of further inter-basin transfers from the Senqu River in Lesotho in order to augment the stretched resources of the Vaal River are planned, but this will take at least ten years. In the meantime, there is major drive to reduce pressure on this important water source which supplies water to much of South Africa's industrial and commercial heartland.

The Water Use Association (WUA) manages the distribution of irrigation water to hundreds of farmers via over 1 120km of ageing canals and 1 873 abstraction points. As one of the first irrigation schemes to be handed over by the Government to the private sector, the WUA faced the challenge of self-sufficiency in a testing environment. Difficult institutional reform combined with critical self examination of operation and management practices have led to improved efficiency and significant water savings when faced with a lack of adequate funding for more expensive infrastructure improvements.

Farmers are allocated 9 140m³/ha with an abstraction permit based on their hectare entitlement and in order to meet this demand the WUA had to release 12 065m³/ha into the irrigation system. The WUA implemented a Water Administration System (WAS) tailored for the management of irrigation scheme water distribution systems to reduce losses and this enabled the water released into the system to be reduced to 11 580m³/ha, a saving of 14 150 000 m³/year.

Key Elements

- Legal and institutional reform driving self-sufficiency and on-farm sustainability.
- Implementation of WAS, an integrated water management system for irrigation schemes.
- Improved accuracy of monitoring.
- Introduction of improved water scheduling by farmers.

Key Outcomes

- Improved competitiveness of overall irrigation scheme and sustainability of WUA.
- Reduction in water used by existing irrigation scheme.
- Improved crop yields and productive use per unit of water abstracted.
- WUA personnel freed up for more critical day to day tasks.



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Intervention Features

- Irrigation metering
- Irrigation scheduling
- Remote monitoring and sensing
- Sprinkler irrigation systems
- Fertigation systems
- Micro jet irrigation
- Drip irrigation systems
- Institutional reform
- Stakeholder engagement

Project Levers

(1) Water Use Associations:

WUAs are effectively cooperative associations of water users wishing to undertake water-related activities for mutual benefit. The WUA must cover the full financial costs of providing access to water and thus there is an onus on the WUA to be sustainable. This can only be achieved through increasing productivity and improving efficiency at both the scheme and farm level.

(2) Improved water distribution management:

The WAS was developed for irrigation schemes in South Africa such as the Vaalharts scheme. It assists WUAs to manage their water accounts and their water supply to farmers. Prior to its implementation all water orders and balances were captured and calculated manually. The WAS provides seven modules: administration, water order, measured data, water release, crop water use, accounts and reporting modules. For the system to work properly the monitoring system had to be improved and automated with the installation of continuous water level recorders installed at canal tail ends and in most feeder canals. This enables water to be released at the right time for the chosen crops and its use to be monitored and enforced.

(3) Irrigation scheduling and systems:

Transfer of the irrigation scheme to a WUA and the concomitant need to be self-sufficient has forced farmers to become much more efficient. Implementation of the WAS has made it possible for farmers to greatly improve their water scheduling practices since they can place their water orders more precisely and more frequently. 60% of the farmers have moved away from flood irrigation with 40% remaining under this system. 40% now use centre-pivot and 20% use other systems such as micro and drip irrigation. This has allowed irrigators to introduce fertigation systems, and while water savings may not be significant, crop yields have increased substantially. Due to salinity problems in some areas it is likely that flood irrigation will remain the only viable system for many farmers since it is only this method that can leach out the salts. Where flood irrigation is still practised, the careful laser levelling of fields has increasingly become the norm ensuring that irrigation water is evenly distributed around the fields.

Outcomes and Challenges

The main outcome of introduction of the WAS and associated measures has been more accurate and efficient irrigation scheduling and this has led to a reduction of between 4% and 5% in the overall water abstracted from the Bloemhof Dam, estimated at 14 150 000m³/year. Other benefits include:

- increased productivity as a result of improved scheduling;
- improved practices including increased use of fertigation systems and the replacement of flood irrigation by overhead, microjet and drip irrigation systems where possible;
- greater accountability of the WUA resulting from a much improved monitoring system;
- increased level of awareness and expertise amongst irrigators;
- demonstration of best practices which can be taken up by other water user associations.

The challenges encountered include:

- keeping infrastructure maintenance up with technological improvements. Most of the scheme's infrastructure is more than sixty years old and leaking canals are a huge issue. Finding the required capital injection is a major challenge but the WUA has a prioritised schedule to implement when the required financing can be sourced;
- maintaining the required levels of technical expertise within the WUA management team.



Above: Start of a 113km canal in the Lower Vaal River Catchment (© Vaalharts Water User Association)