Water savings: Persistence pays off at Vaalharts

Lani van Vuuren

With dedication, commitment and assistance from the Water Research Commission (WRC)'s Water Administration System (WAS), farmers at Vaalharts are proving that commercial irrigators can save water while feeding the nation. Lani van Vuuren visited the scheme.

Productive water usage in irrigated agriculture remains a critical issue. While irrigation accounts for 25% to 90% (depending on the crop) of agricultural production in South Africa, it uses about 60% of the country's surface water. It is well known, however, that relatively large volumes of water are required to produce raw material for beneficiation in the food value chain. With competition for water growing from other users such as industry and mining, farmers are under increased pressure to improve water-use efficiency while still contributing to the country's food market demands.

Water for agriculture is transported over long distances by means of rivers, canals, on-farm furrows and irrigation fields. On average, around 30% to 40% of water supplied to irrigation farms is lost in conveyance structures due to evaporation, spillage, leakage and incorrect water management with river and canal distribution. Older systems can record periodic losses of up to 70%. This means that, in most cases, significant water savings through better water loss control are possible.

VAALHARTS WATER

Situated at the confluence of the Harts and Vaal rivers on the border between North West and the Northern Cape, Vaalharts irrigation scheme was established by the government during the Great Depression years of the 1930s to curb poverty and unemployment, and remains the largest in the country. The Vaalharts Water Association (Vaalharts Water) took over the water management of the government water scheme in 2003.

Water for this scheme is sourced from the Vaalharts Weir which, in turn, is fed by water from the Bloemhof Dam on the Vaal River. Over 90% of the water supplied by Vaalharts Water is for agricultural use, with a small percentage being supplied to towns in the area.

From the weir the water is diverted into two main canals which divide into smaller canals to bring water to consumers. Apart from Vaalharts, the water user

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Constructed in the 1930s, the Vaalharts Weir has a capacity of 48,7 million m^3 and supplies the entire constituency of the Vaalharts Water User Association.

Wheat and barley are some of the main crops under irrigation at Vaalharts.

association also serves three other areas, each with its own water quota, namely Barkly West; Spitskop and Taung. There are about 1 873 abstraction points in the system.

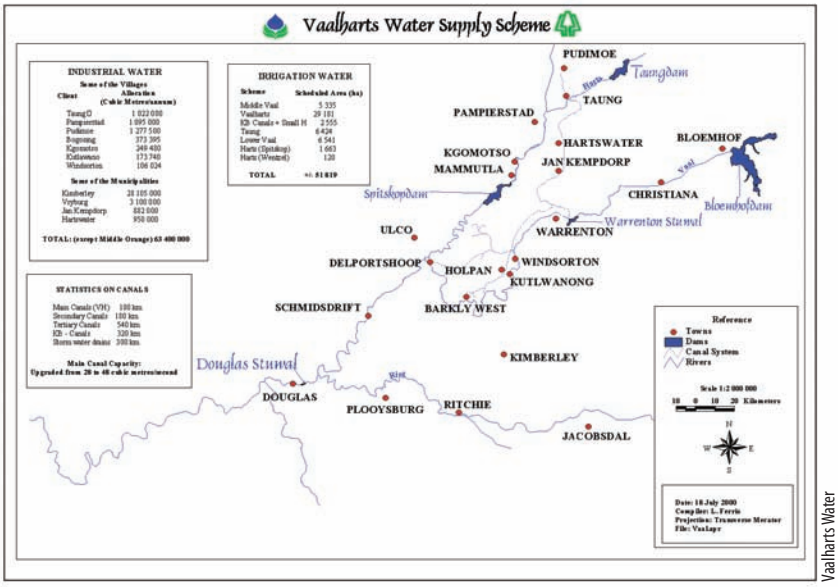
The largest served area is Vaalharts itself, which has a scheduled area of 29 181 ha. A total of 1 120 km of main canal, feeder, community and drainage canals criss-cross this area, delivering water to hundreds of commercial and emerging farmers according to a set allocation. Farmers grow mostly cash crops, including groundnuts, wheat and lucerne. A small number of farmers also grow pecan nuts, citrus and grapes for wine production. All major forms of irrigation are used, including flood irrigation, sprinkler and micro irrigation.

Like many irrigation schemes in South Africa, Vaalharts works on the demand system, i.e. farmers only receive water once they order it. Farmers order water from Vaalharts Water through a 'segman' (spokesperson). This system is quite unique in South Africa. There are 240 such 'segsmanne' or spokespeople at Vaalharts.

THE WAS PROGRAM

WAS is a uniquely South African water administration system aimed at increasing the productivity of water use in irrigated agriculture. Developed by Dr Nico Benadé with funding mainly from the WRC, WAS essentially provides irrigation schemes with decision support for effective and efficient water management. The program assists water user associations to manage their water accounts as well as their water supply to clients through rivers, canal networks and pipelines.

WAS makes use of seven modules: the administration, water order, measured data, water release, crop water use, accounts and report modules. These



Vaalharts Water

The Vaalharts Water management area.

Dam 6 which feeds the Taung Irrigation Scheme, served by Vaalharts Water. The water user association stocked the dam with grass carp to control aquatic weeds.

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modules are fully integrated, making it possible to cross-reference relevant data and information. The system can be installed on a single computer or on a server for use over a network.

Among its many capabilities, the program is able to calculate water releases into rivers and canal networks, taking lag times and various water losses into account. Monthly invoices are generated automatically from water usage and scheduled area information captured in the database. WAS also promotes efficient water use at farm level by enabling water supply of the required volume at the requested time.

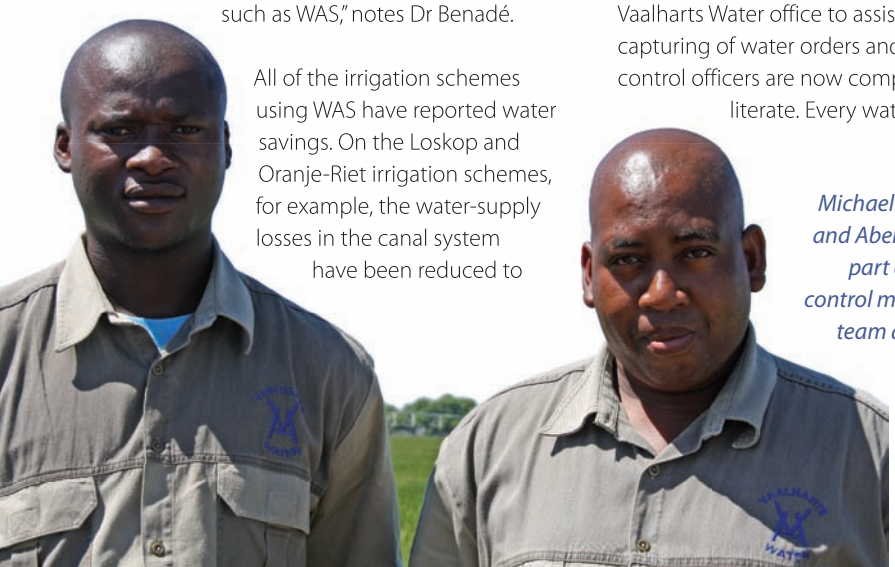
The program is currently being used by all major irrigation schemes on a total of 143 000 ha. This includes 9 500 abstraction points, with a total water allocation of 1 163 million m^3. "Effective water loss control can only be achieved through a comprehensive management system such as WAS," notes Dr Benadé.

All of the irrigation schemes using WAS have reported water savings. On the Loskop and Oranje-Riet irrigation schemes, for example, the water-supply losses in the canal system have been reduced to 20% per year and lower over a number of years. In general, water losses of 20% and below are considered extremely good for irrigation schemes. In 2006, Dr Benadé received the WatSave Innovative Water Management Award from the International Commission on Irrigation and Drainage for his development and continued implementation of the WAS.

FROM MANUAL TO DIGITAL

According to Vaalharts Water Head Water Control Officer Kobus Harbron, water management was mainly a manual business prior to the installation of WAS. "All water orders, balances etc. were captured and calculated manually. This was a laborious, time-consuming process, leaving much room for human error."

The WAS program is now used extensively for water distribution management and reporting purposes. Eight computers have been installed at the Vaalharts Water office to assist in the capturing of water orders and all water control officers are now computer literate. Every water control officer comes into the water office once a week to capture their own water orders, which are used for the release calculation.



Michael Mathathau and Abel Sehako are part of the water control management team at Vaalharts Water.

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Paper work has been minimised and all reports are now generated electronically. This has greatly reduced water shortages on the canals as a result of human error. Not only has WAS enabled the water user association to keep all their water usage information up to date and accurate, it has also freed up personnel. Rather than capturing data their time is now spent out in the field inspecting and maintaining canal infrastructure and liaising with clients.

For effective water monitoring a number of OTT-type chart recorders are in use at Vaalharts Water. Eleven canal tail ends are monitored with chart recorders and almost all of the feeder canals have chart recorders installed at the inflow.

Digitising capabilities were specifically integrated into the WAS program for Vaalharts Water allowing charts from the OTT recorders to be digitised into the WAS database in a fraction of the time it used to take. This also reduces the chances of mistakes. "We have also installed an electronic measuring station at the start of the main canal to import water release data into the WAS database," reports Harbron.

All of these efforts have reduced water losses from 32% to 26,7%. "Vaalharts is a prime example of what can be achieved with dedication and a system such as WAS," notes Dr Benadé. This was one of the contributing factors for Vaalharts Water receiving the First Runner-up Water Conservation and Water Demand Management Sector Award in Agriculture from the Department of Water Affairs (DWA) in 2008.

Harbron praises his team for their dedication and hard work in reducing water loss and improving water management at Vaalharts. "Having an excellent system such as WAS is one thing, but without disciplined and passionate people

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Vaalharts Water Head Water Control Officer Kobus Harbron.

nothing can be achieved. We have been receiving many compliments from farmers in the area for the manner in which we are managing our water. This makes us even more determined to bring about further water loss reductions."

Now that management aspects have improved Harbron hopes to achieve further water savings by improvements to operational aspects. Infrastructure maintenance especially is a huge challenge. With most of the infrastructure older than 60 years, leaking and crumbling canals is a huge issue. The water user association spends millions of Rand every year in an effort to keep its infrastructure from falling apart. A massive capital injection is required to rehabilitate the irrigation scheme and calls have gone out to government in this regard.

SAVINGS ACROSS THE SECTOR

There is now a drive to extend WAS to all of South Africa's irrigation schemes. "We believe that with the application of WAS on all irrigation schemes, the water savings for commercial farming can over time increase significantly," says Dr Benadé. "This saving can be achieved with training to improve water management and investment in water measuring installations over a relatively short period, compared to the lead time for investment in additional storage to increase supply."

Dr Gerhard Backeberg, Director: Water Utilisation in Agriculture at the WRC comments: Over the last 15 years implementation of WAS on irrigation schemes has practically proven that real water savings through water loss control are achievable. The higher these losses, the bigger the opportunities are for savings. These savings ensure that existing water use entitlements can be complied with and additional allocations can be made to provide for ecological balances (as part of the Reserve) and alternative uses within or outside of agriculture."

In the case of the Vaalharts irrigation scheme, for example, 11 580,4 m^3 per hectare instead of 12 064,8 m^3 per hectare now has to be released at the weir, to deliver the allocation of 9 140 m^3 per hectare at the farm edge. This is a saving of 14,135 million m^3 a year for the whole irrigation scheme.

"This water remains in the Vaal River for the ecology or alternative downstream uses," notes Dr Backeberg. "Similar or higher savings are achievable if implementation of WAS is expanded from the current 143 000 ha to the estimated 500 000 ha of irrigation schemes in South Africa. This can be done with support of water managers in water user associations and public servants in the regional and head offices of the DWA."

VAALHARTS WATER USER ASSOCIATION MANAGES FOUR SECTIONS:

Vaalharts
Scheduled area: 29 181 ha
Allocation: 9 140 m^3/ha/year
Main canal length: 100 km
Feeder canal length: 180 km
Community canals: 540 km
Drainage canals: 300 km
Max flow capacity: 38,3 m^3/s

Klipdam/Barkley West Canals
Scheduled area: 2 396,7 ha
Allocation: 11 855 m^3/ha/a (mainly for grazing)
Canal length: 320 km

Hartrivier/Spitskop Dam
Scheduled area: 1 663 ha
Allocation: 7 700 m^3/ha/year
River length under dam: 55 km
Max flow capacity: 5 m^3/s

Taung scheme
Scheduled area: 6 424 ha (only 3 759 ha currently irrigated)
Allocation: 8 470 m^3/ha/year
Max flow capacity: 18 000 m^3/hour

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More than 300 km of drainage canals transports water from agricultural fields back to the Harts River.