




Irrigation scheduling in grape farming


Shelanu Farm, South Africa


water scarcity impact

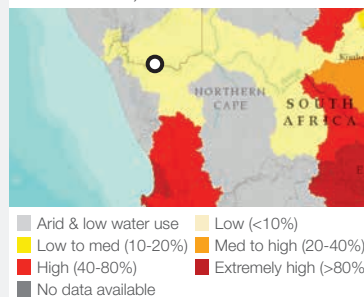
Reduced withdrawal	
Reduced consumption	
Improved water quality	
Increased productivity	
Net basin benefit	

volumetric impact
86 000 m³/yr

capital cost
\$215 000 



estimated unit cost of water
50 ¢/m³ 

Water Stress
Shelanu Farm, 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

Shelanu farm is situated on the southern bank of the Orange River from which it abstracts its water supply. The rainfall precipitation in the area is 125mm per year. All of the 28.7ha are used for the growing of table grapes that can be exported mainly to the United Kingdom in November, earlier than other producers, enabling them to command a good selling price. It is a small but highly intensive farm focussing on the production of a high yielding high quality crop using modern technology. In addition, the UK supermarkets require an audited water footprint for each kg of grapes exported, so there is real pressure to minimise the volume of water abstracted per kg of grapes. This is achieved largely through optimised scheduling of irrigation water based on data automatically received from soil moisture (capacitance) probes and analysed using a sophisticated computerised monitoring and management system. Soils around the farm vary considerably and the automated system allows variable irrigation cycle time depending on soil type and soil moisture status. A combination of scheduling and other measures has permitted a reduction in irrigation water per hectare of 20%.

Key Elements

- Irrigation scheduling based on real-time soil moisture measurements and local weather forecasts and reports.
- Reduced evaporative losses through mulching and half-shade netting.
- Increased profit per unit volume of water used through a combination of technology and careful management.
- Agreement that water savings would not be used to expand irrigated areas.
- Reduced consumptive use as a result of reduced evaporative losses.

Key Outcomes

- A 20% reduction in annual water application rate from an average of 15 000m³/ha to 12 000m³/ha, a saving of 20%.
- A 20% increase in crop yields and a 21% reduction in pumping costs.
- Reduced costs resulting from minimal wastage of fertiliser into the groundwater and/or return flows.
- The net return per m³ of water has increased from an estimated \$0.82/m³ to \$1.31/m³.
- A 35% reduction in the water footprint of a kilogram of grape.



Orange River, South Africa

Intervention Features

- ▢ Irrigation metering
- ▢ Irrigation scheduling
- ▢ Remote monitoring and sensing
- ▢ Fertigation systems
- ▢ Micro jet irrigation
- ▢ Mulching
- ▢ Shade netting

Project Levers

(1) Irrigation scheduling:

Central to the success of operations is the irrigation scheduling designed to get appropriately fertilised water to the roots of the crops and no further, ensuring that neither water nor fertiliser is wasted. Irrigation scheduling is based on a computerised monitoring network of soil moisture (capacitance) probes and associated management system. The fully automated telemetry logging system provides continuous data and graphs on the status of soil moisture, climatic conditions and irrigation requirements. Each probe serves an area of 2.5ha and provides readings at 10cm intervals down to a 120cm depth.

(2) Reduced evaporative losses:

The efficiency of the system is enhanced by inter-row mulching with wheat, reducing direct evaporation from the inter-row and soil temperature. The erection of a shade-cloth canopy modifies the micro-environment around the crop by reducing ambient temperature, increasing humidity and reducing air movement. These micro-environment modifications result in improved growing conditions for the crop as well as protection from bird damage.

(3) Micro-jet irrigation:

An automated micro-jet irrigation system has been installed and arguably provides the most efficient system for grape vines especially since temperatures are high. The efficiency of the system is illustrated by irrigation application rates as low as 35mm/week compared with 50-55mm at other similar schemes. All irrigation water is supplied through a central pumping and fertigation station.

(4) Accurate measurement:

Accurate measurement of irrigation water, including fertiliser application concentrations is facilitated by the use of a central pumping and fertigation station. Measurement and monitoring and evaluation of water use and associated yields are characteristics of the high level of management at the farm.

Outcomes and Challenges

Upgrading operations at the farm have resulted in both a significant reduction in the water used and a significant increase in productivity. Prior to upgrading, the full licensed quota of 430 500m³/yr was abstracted, corresponding to an application rate of 15 000m³/ha. Now only 12 000m³/ha is used, or 344 400m³/yr, a saving of 20%. The end result is that the water footprint for each unit of grapes produced has been reduced by 35%. The net return per unit of water used has been increased by nearly 38%. Irrigated areas have not been extended.

The use of agronomic practices of a high standard, such as the “fertigation” system using soluble fertilisers applied through the carefully scheduled irrigation system and mulching, have all contributed to a high level of overall efficiency. The precise irrigation requirement applied together with a precise nutrient requirement has minimised losses through leaching of both irrigation water and expensive fertilisers which otherwise would contribute to nitrification and salinisation of ground water and downstream surface water.

Shelanu Farm is a small and compact operation that makes use of the latest technology, the expert support of the commercial sector and a high level of management to achieve major savings and high productivity.



Above: Panoramic view of Shelanu Farm
(© Steve Crerar)