

Irrigation optimisation

Soetmelkvei Farm, South Africa

water scarcity impact


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

volumetric impact
627 000 m³/yr

capital cost
\$400 000

estimated unit cost of water
10 ¢/m³

Water Stress
Soetmelkvei Farm, South Africa



Arid & low water use	Low (<10%)
Low to med (10-20%)	Med to high (20-40%)
High (40-80%)	Extremely high (>80%)
No data available	

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

Credits
 We wish to acknowledge the input of Nicky du Plooy of Soetmelkvei farm, Willie du Plooy Trust, in the preparation of this case study.

Project Overview

Soetmelkvei Farm is an owner-managed irrigation operation of 183ha on the Orange-Riet Irrigation Scheme using water from the Vanderkloof Dam on the Orange River. State-of-the-art technology combined with excellent management achieved increased yields and a reduced level of water use per hectare of crop. Precise scheduling is possible because the Orange-Riet Water User Association, which operates the irrigation scheme, manages a distribution system that allows farmers to place water orders daily. While the thinking of many farmers on the scheme is focussed on minimising costs, at Soetmelkvei the philosophy is to maximise yield from their allocation of water and to invest accordingly. Since there are no realistic opportunities for the introduction of lucrative cash crops, efforts have been directed towards getting the best results out of the crops traditionally grown such as maize, wheat, dry bean and lucerne through a combination of approaches. These include both the implementation of the latest equipment and effective irrigation systems and the use of various management and decision support systems. The reduced use of water has allowed the farm to increase the area under productive irrigation with no increase in allocation.

Key Elements

- Irrigation scheduling based on real-time soil moisture measurements and local weather forecasts and reports.
- Support from commercial service providers on both soil moisture and fertiliser application.
- Selection of most efficient but affordable irrigation system.
- Increased profit per unit volume of water used through a combination technology and careful management.
- Member of an excellent water user association providing water on order as required.

Key Outcomes

- Crop yield per unit of water withdrawn has increased; with no increase in withdrawal irrigated areas have expanded from 126ha to 183ha and Biomass production has increased by more than 50%.
- Accurate scheduling of water to optimise soil moisture requirements of crops.
- Very high yields compared to other farms in the country and internationally.
- Reduced fertiliser bill resulting from targeted application of fertiliser to the crops.
- Crop growth has increased the consumptive use on the farm and thus return flows to the basin have been reduced.



Orange River, South Africa

Intervention Features

- ▢ Irrigation metering
- ▢ Irrigation scheduling
- ▢ Remote monitoring and sensing
- ▢ Fixed overhead sprinkler system
- ▢ Fertigation systems

Project Levers

(1) Irrigation scheduling:

A system provides daily data and graphs on the status of soil moisture and irrigation requirements and the farmer is able to order water and irrigate accordingly. Each probe serves an area of 10ha and provides readings at 10cm intervals up to a depth of 120cm. This accurate irrigation scheduling system has allowed the farmer to make major water savings and use this for the expansion of his land under irrigation.

(2) Efficient irrigation systems:

The irrigable land between the centre pivots which irrigated the original area of 126ha are now irrigated using fixed overhead systems which are suitable for filling awkward spaces. While more expensive than centre-pivot systems they are generally more water efficient and allow the farmer to further utilise his saved water. All irrigation water is supplied through a central pumping and fertigation station.

(3) Involvement of commercial suppliers:

Soil moisture probes and the associated real-time communication and scheduling software package are supplied by commercial service providers on a one off payment plus annual maintenance contract basis. Specialist services include installation and calibration of soil moisture probes and associated software, detailed up-to-date weather forecasts and technical support. Commercial fertiliser providers carry out soil tests before making recommendations on fertiliser mixtures and concentrations. Working with commercial suppliers facilitates access to competitive financing options.

(4) Industry-oriented approach:

Management of farm operations acknowledge that farming is now an agribusiness that requires dedicated management, appropriate technology and financing arrangements like any other business. The natural risks associated with farming only add to the need for exceptional management standards for a sustainable operation. Operating like a business has facilitated the farmer's access to finance for capital and operating costs.

Outcomes and Challenges

Since taking over the farm the area under irrigation has been increased from 126 ha to 183 ha without an increase in water allocation. The allocation of 11 000m³/ha/yr for the original area is now used to irrigate the expanded area with an average application rate of around 7 500m³/ha/yr. Average water use at Soetmelkvei has been reduced to 5 000m³/ha compared to the scheme average of 7 700m³/ha for maize and to 11 000m³/ha for lucerne compared to 12 750m³/ha. Crop per drop has been further increased by an increase in crop yields resulting from more accurate water scheduling and fertiliser application. Overall increase in yield per drop of water is approximately 65% when both the increased area and per hectare yields are taken into account. Investment in irrigation infrastructure has been offset by much higher levels of both per hectare and farm-wide productivity as well as through savings in fertiliser and per hectare pumping costs.

The payback period is estimated to be between six and eight years. Efficiency, as measured in dollars earned per cubic metre of water is much higher at Soetmelkvei than the irrigation scheme average. Earnings for maize are approximately \$0.21/m³ compared with the scheme average of \$0.07/m³. For wheat they are approximately \$0.08/m³ compared with \$0.04/m³, and for lucerne they are \$0.09/m³ compared with \$0.06/m³.

The operation at Soetmelkvei demonstrates the effectiveness of state-of-the-art water and fertiliser management systems on increasing production per unit of applied water, with an overall increase in net income.



Above: DACOM soil moisture probe in maize field (© WRP (Pty) Ltd)