

# Water Use Efficiency Initiatives

## in the Onderberg

*SASRI is collaborating with the University of Kwa-Zulu Natal (UKZN) and WaterWatch BV in a Water Research Commission funded project to promote the efficient use of water for irrigated sugarcane production in Mpumalanga. Three types of technologies are implemented in this project to develop tools and information that could support irrigation management, namely remote sensing, in-field soil water and crop monitoring and crop simulation modelling.*

**T**HE SURFACE ENERGY BALANCE ALGORITHM FOR LAND (SEBAL) MODEL DETERMINES THE ENERGY BALANCE OF A SURFACE FROM SATELLITE INFORMATION CAPTURED WITHIN DIFFERENT SPECTRAL BANDS AND SPATIALLY EXTRAPOLATED WEATHER DATA. THE END RESULT IS HIGH RESOLUTION (20 M X 20 M) DATA MAPS ON LAND SURFACE CHARACTERISTICS RELATED TO GROWTH (BIOMASS PRODUCTION) AND WATER (EVAPOTRANSPIRATION). THE PROJECT AIMS TO DETERMINE THE ACCURACY OF SEBAL TO ESTIMATE SUGARCANE EVAPOTRANSPIRATION, BIOMASS AND CANE YIELD AND BIOMASS WATER USE EFFICIENCY (DEFINED

AS THE BIOMASS PRODUCED PER UNIT OF WATER USED) AT WEEKLY INTERVALS. IT FURTHER AIMS TO INVESTIGATE HOW REMOTE SENSING DATA CAN BE INTEGRATED WITH OTHER FIELD-BASED DATA SOURCES FOR IMPROVED WATER MANAGEMENT. THE SEBAL ESTIMATES WILL BE COMPARED WITH FIELD MEASUREMENTS AND *MyCanesim* ESTIMATES OF SOIL WATER STATUS AND YIELD AT 13 SITES IN THE ONDERBERG. WEEKLY SEBAL ESTIMATES ARE AVAILABLE ON THE WEB ([WWW.SUGARCANELOOK.COM](http://WWW.SUGARCANELOOK.COM)) AND CAN BE USED BY FARMERS TO MONITOR CROP WATER USE AND GROWTH AT A FIELD LEVEL AND IDENTIFY IN-FIELD VARIATIONS.

One of the field-based methods used in this project is the *MyCanesim* system which was developed by SASRI to support irrigation management at field level. *MyCanesim* is an on-line weather based modelling system that estimates crop water use and growth and provides real time scheduling advice to subscribers via sms, fax or e-mail. It also provides a production efficiency report that includes crop stress indicators, actual irrigation, rainfall and evapotranspiration totals and the associated cane yield and cane quality potential.

Daily estimates of crop water use and growth by the *MyCanesim* system for the 13 sites have been made available to participating growers via a website and can be used to gain insight into the crop water relations and its impact on crop productivity.

Data from these technologies (SEBAL and *MyCanesim*) will be compared to field data of soil water and crop growth. Hourly soil water status, rainfall and irrigation are recorded electronically and the data made available through the web to participating growers. The data will also be used to complement *MyCanesim* simulations.

Other field measurements like stalk height and population, canopy cover and biomass and cane yields are measured at frequent intervals through the season

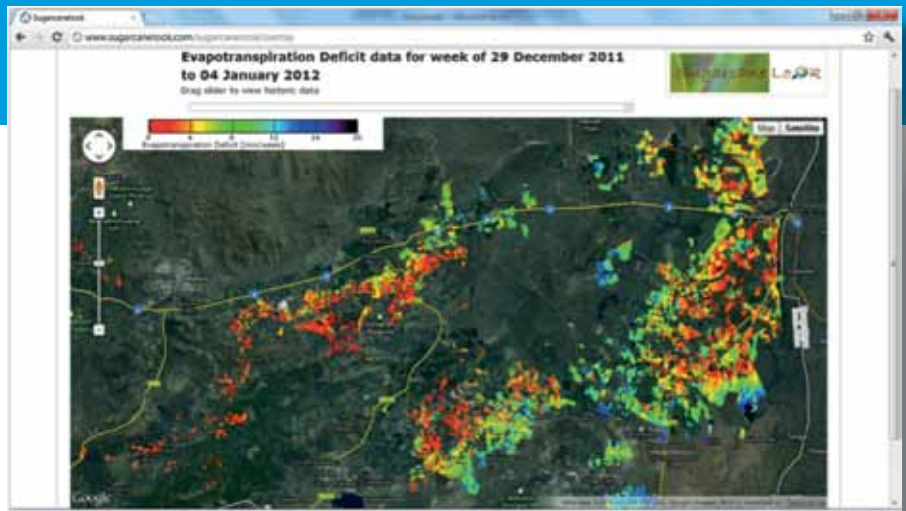


Figure 1: A map of evapotranspiration-deficit (potential evapotranspiration minus actual evapotranspiration indicating possible under irrigation) of the week from 29 December to 4 January 2012 for the Onderberg area.

and will be compared against the SEBAL and *MyCanesim* estimates.

The information and integrated systems generated in this project could assist the industry in improving the management of irrigation water. For example, periods when crops are under or over-irrigated could be identified, to which growers can respond by making adjustments that would lead to improved water use efficiency. If the industry finds these tools and information useful they could be more widely implemented. ☺

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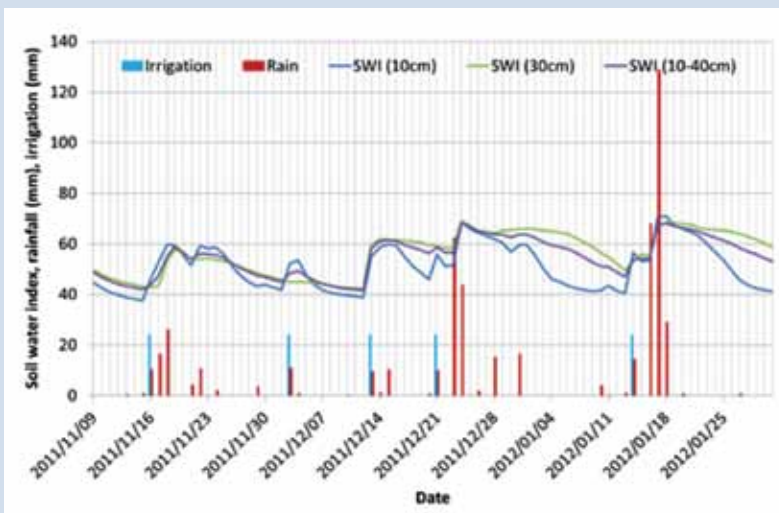


Figure 2: The water balance as recorded by soil water and rainfall sensors in one of the fields that are monitored in the project. The soil water index (SWI) recorded at depths of 10 and 30 cm, the average SWI recorded for the top 40 cm of the soil profile, the recorded daily rainfall and irrigation amounts are shown.