Satellite-based spatial data to aid in irrigation

Western Cape, South Africa

water scarcity impact

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

volumetric impact
10 150 000 m^3/yr

capital cost
$300 000

estimated unit cost of water
<5 ¢/m^3

Water Stress
Western Cape, 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:
F. Gassert, P. Reig, T. Shiao, M. Luck and M. Landis, 2015. "Aqueduct Global Maps 2.1."

Confidence level
Low Medium High

Water Scarcity Impact Key
Main Minor

Credits
We would like to acknowledge Ruben Goudriaan and Steven Wonink of eLEAF for their input in the preparation of this case study.

Project Overview

Agriculture is the biggest consumer of fresh water in South Africa with irrigation accounting for approximately 43% of the available water resources in the Western Cape Province. Within this region, on average citrus fruits and grapes can demand as much as 7 000-11 000 $m^3/ha/yr$ of water for irrigation.

FruitLook (www.fruitlook.co.za) is an open web portal that runs during the grape and deciduous fruit season of October to April in the Western Cape Province of South Africa. The service is governmentally funded by the Western Cape Department of Agriculture to encourage efficient water use in agriculture and minimise losses due to surplus use. Via the website farmers have access to spatial data based on satellite information to analyse crop growth and water status over time and space. These data components result from a set of algorithms that transform meteorological and remote sensing based data into quantitive crop, water and climate paremeters per pixel. Information on nine growth parameters, such as actual evapotranspiration, biomass production and leaf nitrogen content is provided.

Farmers have found that in understanding and using these parameters it has led to conscious use of fresh water supplies and a decrease in irrigation water application.

Key Elements

- Provision of weekly updated, web based, semi-real time information on parameters such as crop growth, crop water use, actual evapotranspiration and evapotranspiration deficits.
- Spatial data based on satellite information to enable farmers to evaluate and compare blocks of land and optimise water application.

Key Outcomes

- Reduced water withdrawals of 10 150 000 m^3 during the 2014-15 season.
- Over 160 000 hectares, 9% of the total crop fields in the Western Cape, of fruit monitored every week during the fruit growing season, running from October to April. 10% of which is actively used by 800 subscribers and divided over 4 800 individual irrigation blocks.
- Helps improve irrigation system design, probe placement and detection of over and under irrigation.

Western Cape, South Africa

Intervention Features

- Irrigation scheduling
- Soil moisture content monitoring
- Remote monitoring and sensing
- Management of evaporation losses
- Stakeholder engagement
- Education, technical training and capacity building

Project Levers

(1) Remote Monitoring and Sensing

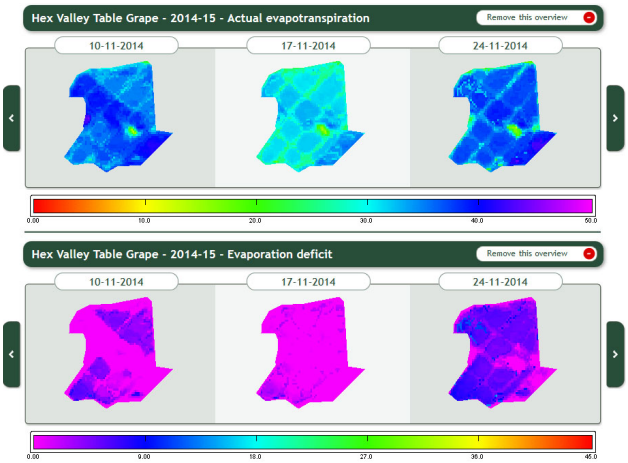
Information such as multispectral and thermal data from satellites along with meteorological data from ground stations and static input from digital elevation models are brought together to form the basis of the website. This allows for weekly updated, semi-real time information on crop growth, crop water use, actual evapotranspiration, evapotranspiration deficits and crop nitrogen status. This allows for a more targeted approach with farmers able to more accurately allocate their water use.

(2) Irrigation Scheduling and Management

From feedback received from users it has been possible to analyse the effect the website has had on irrigation scheduling and management. The majority of users have indicated that the system was very useful in the detection of over or under irrigation with over half of all users highlighting it could be used to detect irrigation problems (e.g. pipe breaks). Similar benefits noted include aiding in the design/improvement of irrigation systems, the determination of irrigation scheduling and post-seasonal evaluation of irrigation.

(3) Stakeholder Engagement, Education and Support

The creators, eLEAF, hold workshops for farmers and liaise with local consultancies to continue the support. Regular surveys are undertaken to ascertain the levels of water saving farmers are experiencing and to gain feedback in order to better manage the service.

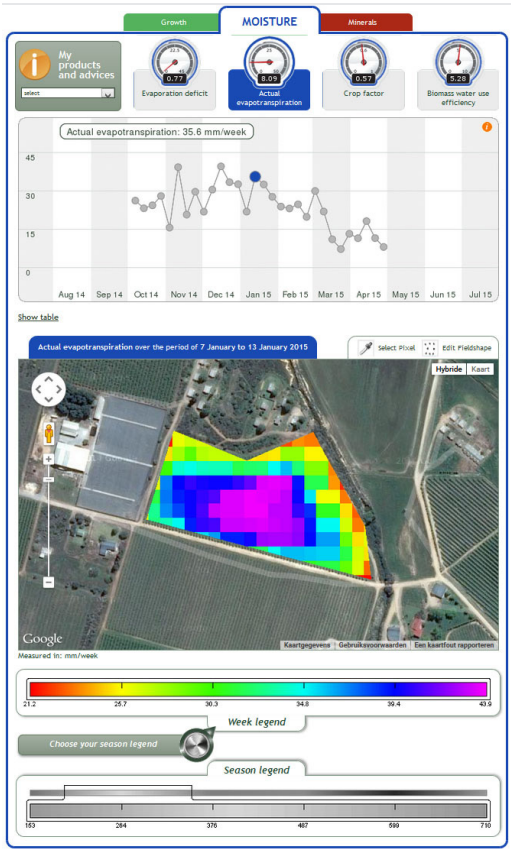


Above: Parameters Available on Fruitlook Website (©Fruitlook)

Outcomes and Challenges

The biggest challenge to the service is to accurately portray the data shown on the website. Data sets are externally evaluated qualitatively through trends analysis of the spatial data and quantitatively with actual values comparison. Stakeholder engagement also identified the need for more training and education in using the service leading to the developers providing extensive examples within the website, manual and newsletters.

Other potential areas of improvement such as a multi-block view for comparison, an extension of the monitoring period, extending the scope to include vegetables and the development of a mobile app version of the website are dependent on available funds. To this end, a future switch from a governmental funded venture to industry funded is envisaged. This would require the introduction of a subscription fee for users.



Above: Fruitlook Website Dashboard (©Fruitlook)