Combining Remote Sensing and Economic Analysis to Assess Water Productivity

Location	Inkomati Basin, South Africa
Contractor	Partners for Water II
Partners	LEI (Agricultural Economics Institute)
Period	2006

Scope of the project

The project was to demonstrate that remote sensing analysis in combination with a surface energy balance model (SEBAL) can be used to calculate actual water consumption and can be combined with a set of social and economic indicators.

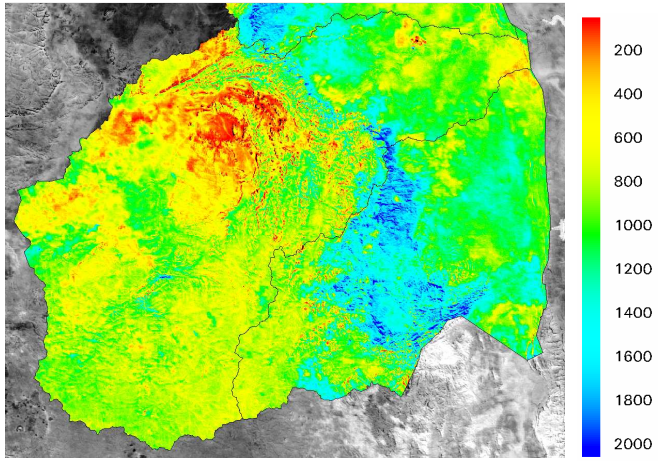
Study approach

This study is divided into two parts: (1) a technical analysis of remote sensing images, including the actual evapotranspiration for a one year period, and the resulting hydrological implications of these measurements; and (2) a secondary analysis and interpretation of the technical data, including social and economic indicators. The objective is to illuminate the implications of water reallocation between sectors (for example between agriculture and environment) as well as intra-sectoral indicators of water use and productivity (e.g. between commercial and emerging farmers). The analysis focused on the Inkomati basin, using both MODIS (large resolution images for large areas) and Landsat images (high resolution images for detailed small area analysis).

Results

The analysis of rainfall and actual evapotranspiration showed a large change in water storage between the beginning and end of the season. The whole catchment consumed ~20 km^3 water during the (relatively dry) study year, from which ~5 km^3 is consumed by agriculture and forestry. These estimates agreed very well with the rough estimates of the DWAF (6 km^3 for an average year).

The SEBAL analysis also looked to agriculture at field scale. Surprisingly biophysical crop water productivity varied less for emerging farmers than for commercial farmers. Discussions during the workshop showed that during the drought, commercial farmers were restricted in their water use, while emerging farmers were not, which may explain the differences in the spread of crop water productivity. Also productivity of emerging farmers was higher than of commercial farmers, which may be related to strong support form existing commercial farmers and TSB Sugar.



Actual ET_a July 2004 – June 2005 (mm)

The social and economic indicators developed provide valuable analytical tools and concepts for understanding the nature of water and how its use can be controlled and influenced.

Conclusions

This project demonstrated that our methodology provides an objective consistent overview of the major water consumers in a river basin as well as an estimate of the benefits produced by the major water consumers. This kind of insights can support policy makers with respect to their decisions regarding water reallocation as it can show the socio-economic and environmental implications for those directly concerned, as well as society more generally.

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