

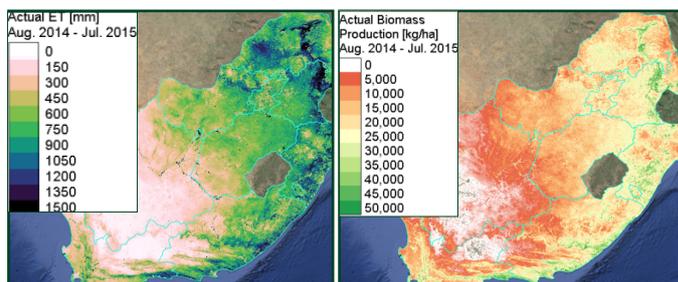
Service summary and potential applications

Organizations concerned with food security require timely information on predicted and actual crop production figures at various scales, for example to assess market situation or act upon food scarcity events. Earth Observation (EO) allows for continuous monitoring of agricultural production and early detection of risks associated with it. EO services provide valuable information on crop biophysical, soil and climate characteristics, but also on the occurrence, duration and intensity of natural disasters such as heat stress, droughts, and floods that strongly influence production figures.

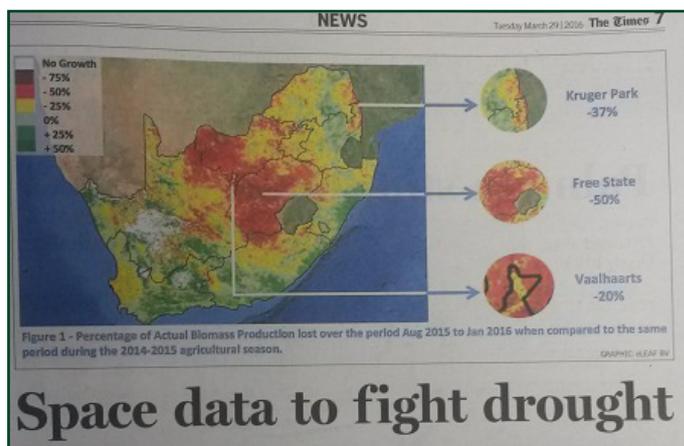
Over the years, EO services have produced several globally available datasets that characterize climate and production of an area. They are used to monitor the meteorological and growth conditions that affect yield to establish a baseline and monitor change. This allows climate risk assessments, rainfall and drought impact assessments, and consequently possible effects of plant water stress and water deficits on crop growth at the regional and local level. This has led to a number of services that monitor food security. They allow define, develop and execute actions that battle food production risks in real-time, based on a combination of historic and near-real-time EO monitoring services.

For example, crop production can be expressed as water productivity ("crop per drop") that not only indicates where production has obtained its full potential and where not, but that also reveals distinct patterns of change as upcoming risks or prosperity. Thus, a farming system monitoring information service provides valuable insight in production status quo, and aids in the optimization of production as well as risk and production loss assessment.

When losses have occurred, EO-based index insurance schemes can provide a cost-effective and unbiased appraisal. In this context, insurance premiums and indemnity payouts are based on an index derived from EO services rather than from actual crop and livestock losses. Given that this eliminates loss verification costs, an index insurance approach has substantial potential for scale-up, even if sales and education of sales agents and insurance takers remain critical for effective insurance take-up.



Actual water consumption (left) and biomass production (right) in South Africa in 2014-15. Copyright: eLEAF.



An example of how production losses can be quantified from EO-derived biomass production data, as featured in the Times newspaper of South Africa.

EO information services

Information service	Content / Products
Mapping of cultivated areas	» Detection of cropping area, crop type, irrigated area and area estimates
Monitoring of farming systems	» Show the spatial distribution of crop production and water productivity also in comparison to other years and regions, determine crop performance and anomalies, advise on irrigation requirements and fertilizer application
Yield assessment and prognosis	» Timely information on cropping area, weather anomalies and crop performance
Risk assessment	» Occurrence, duration and intensity of natural hazards over time (risk analysis) using cultivated area maps and weather data
Early warning & impact of natural hazards	» Impact of natural hazards on crop production using cultivated area, weather and production data
Index insurances	» Long time series of satellite-derived indices that correlate to farmer losses or yield reductions caused by natural hazards and weather

The Sudanese farmer Ahmed Ibrahim Wakea Allah took part in a pilot study that demonstrated the value of EO-based monitoring and advisory services for smallholder farmers. Before he tried the technology himself, Ahmed was sceptical about the value of the information that he would receive from the monitoring service. But in the 2014/15 irrigation season, he harvested 12 sacks of wheat per acre, up from less than 3 sacks per acre in 2013/14. This gave him an income of about 80,000 Sudanese pounds (over US\$13,400) from his 8-acre farm, compared to a loss of 8,000 pounds in the previous season.

