Environmental Change Analysis for Crop Monitoring

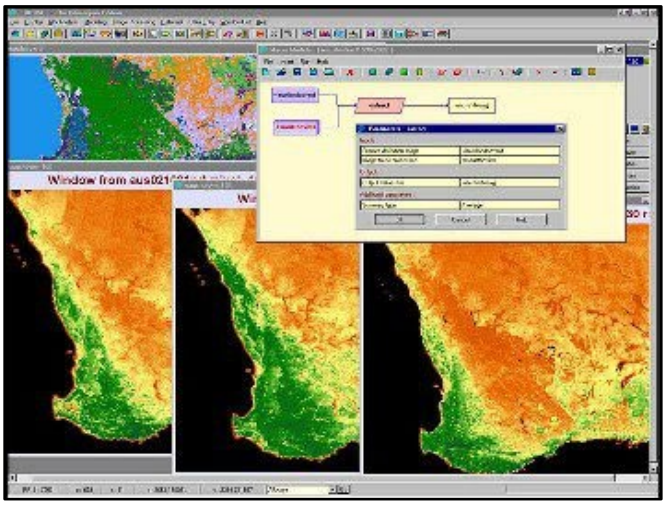
Canadian Wheat Board Monitors Crops with IDRISI

By Clark Labs

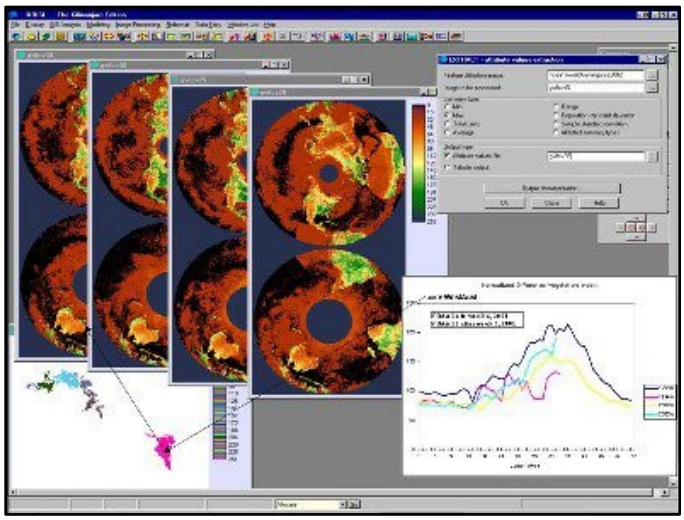
The Canadian Wheat Board (CWB), the largest single seller of wheat and barley in the world, uses IDRISI Kilimanjaro to both assess and forecast crop yields internationally. Crop surveillance is a critical activity within the CWB, enabling them to make better estimates about global production on cereals, guide their marketing efforts, and determine sales strategies based on import and export forecasts. Crop surveillance and forecasting rely on several types of data, primarily satellite imagery and weather-based models. IDRISI Kilimanjaro is used as the primary image processing and analytical tool in the satellite surveillance component.

A general assessment of vegetation conditions using NOAA's GVI vegetation data series is conducted for training areas in the most important wheat, durum and barley growing countries of the world. Although the imagery is of coarse resolution, not allowing the analyst to separate out the particular crops, it still provides a picture of general vegetation health at an affordable cost. As the data has been available since the late 1980's, it is quite useful for time series analysis, the examination of change over a sequence of images.

The CWB produces a vegetation growing curve for each training area (area where wheat, durum and barley is grown). The curve for the current season is then analyzed in relation to the previous year, the record peak year, and the lowest curve on record. Viewing the data within this context allows the analyst to assess the shape of the curve, i.e., the height of the curve for yield potential, the shape of the curve for development issues, and whether it will be an early or late crop in terms of harvest. This sets the stage for harvest quality concerns in some countries.

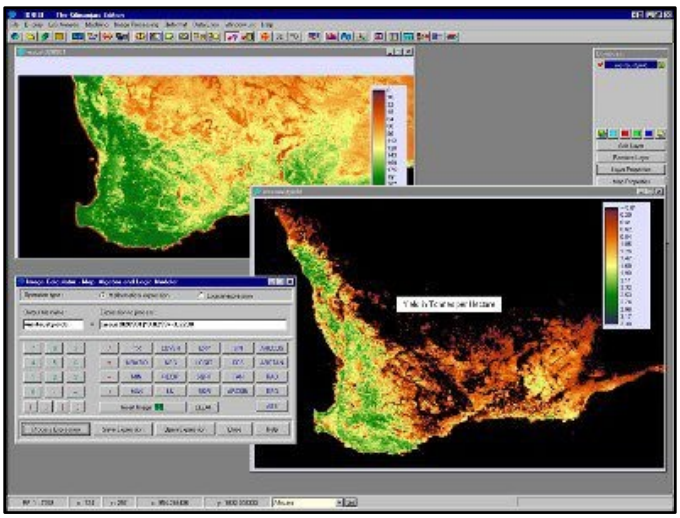


NDVI values for each time period are extracted for each landuse type using the IDRISI Kilimanjaro Macro Modeler.



Normalized Difference Vegetation Index (NDVI) values for each time period are extracted and plotted over time.

In order to better predict yields, the Canadian Wheat Board has begun using finer resolution data, such as SPOT 1 km imagery, for country-specific analyses. The effect of drought on yield potential in Australia is one example. A time series of Normalized Difference Vegetation Index (NDVI) satellite data (10-day time step) is created for a minimum period of 6 years. The time series data is coupled with the land use/cover information for each cropping region. The IDRISI Kilimanjaro EXTRACT module is then used to extract the necessary information such as average, minimum value and maximum NDVI values for the cereal growing area (wheat, durum, barley) within each country. These values are then used in IDRISI Kilimanjaro's REGRESSION module in conjunction with local yield data to produce a predictive equation for yield in wheat, for example. In the future, weather variables, such as temperature and precipitation, will be incorporated into the regression equation to improve the responsiveness of the model. The predictive equation is then used in IDRISI's IMAGE CALCULATOR module to produce a current yield map for each wheat-growing region in a country.



IDRISI Kilimanjaro's Image Calculator is used for deriving yield estimates based on NDVI values.

The Canadian Wheat Board, a farmer-controlled organization, is one of Canada's largest exporters, with annual sales revenue of between $4 billion and $6 billion (Cdn) on more than 20 million tons of grain sold to over 70 countries worldwide.