CASA 2100
How Will Global Warming Affect Your Cropland Production?

"The average temperature of the earth's surface has risen by 0.74° C since the late 1800s. It is expected to increase by another 1.8° C to 4° C by the year 2100. Agricultural yields are expected to drop in most regions. Drying of continental interiors, such as the Great Plains of the United States, is forecast. These changes could cause, at a minimum, disruptions in land use and food supply."

-- United Nations Framework Convention on Climate Change

Corn Crop Production Predicted from Satellite Sensor Data

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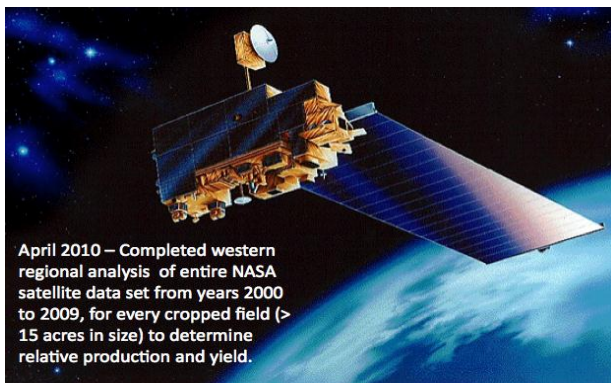**Email: christopher@casa2100.com   Telephone: 408-838-4513   Website: www.casa2100.com**

Background
Mid-Western growers face many challenges to the success of their field operations. Uncertainties in weather conditions and outbreaks of pathogens and pests are constant threats to production. The ability to accurately predict and prepare for changes in crop yields from one year to the next is a pressing need.
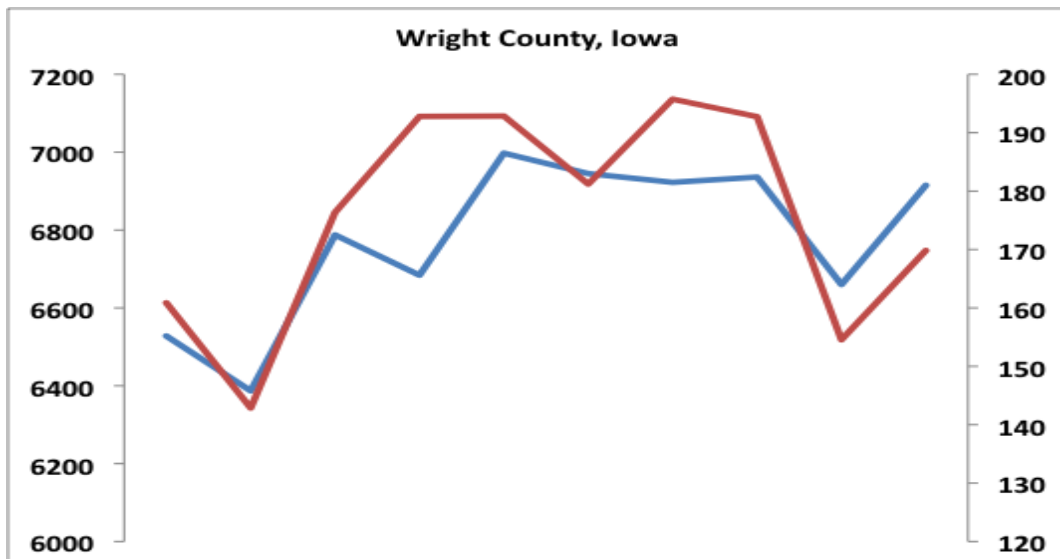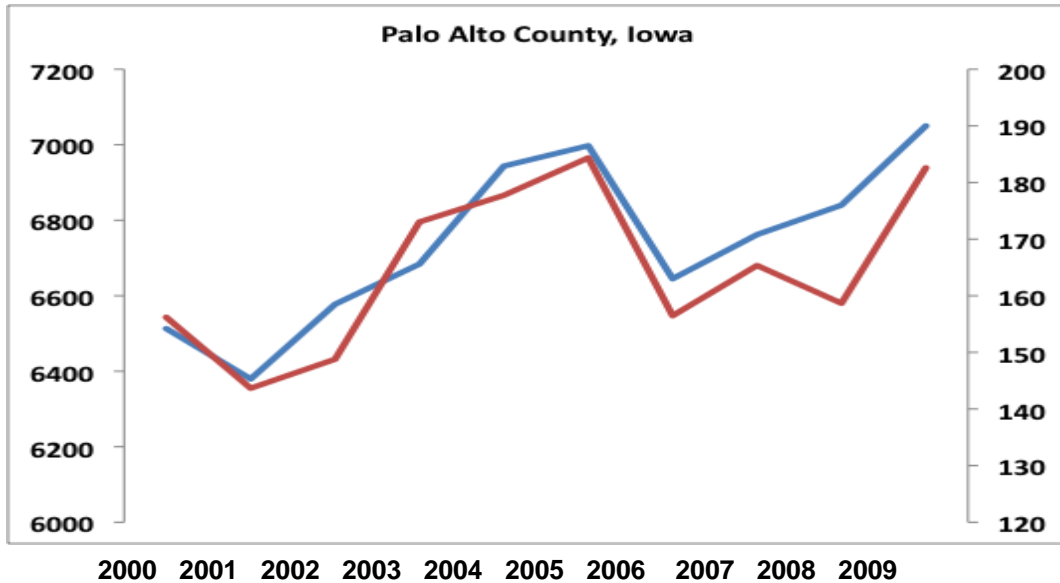
CASA2100 and the Satellite Yield Index (SYI)
CASA2100 is an operational system that begins from historical satellite remote sensing data collected at the level of individual agricultural fields. Crop yields are predicted from a combination of weather station records, soil properties, grower management data, and observed crop growth stage from satellite imagery. To support planning for sustainability, the linkages of crop yields from CASA2100 to field-level management practices can be ordered for *soil greenhouse gases, carbon offsets, nutrient uptake, and chemical leaching rates.*

April 2010 – Completed western regional analysis of entire NASA satellite data set from years 2000 to 2009, for every cropped field (> 15 acres in size) to determine relative production and yield.

Satellite observations uniquely capture the daily and seasonal dynamics of crop plants across a vast growing region. An optimized satellite yield index (SYI) has been developed for corn, soybeans, and other field crops, whereby the vegetation reflectance properties in multiple spectral bands can be combined to *track crop green cover and plant production throughout the year. S*atellite data covering the growing seasons of 2010 and 2011 has been extracted from the operational CASA2100 system to predict corn yield in Iowa at the county level (in Figures below).
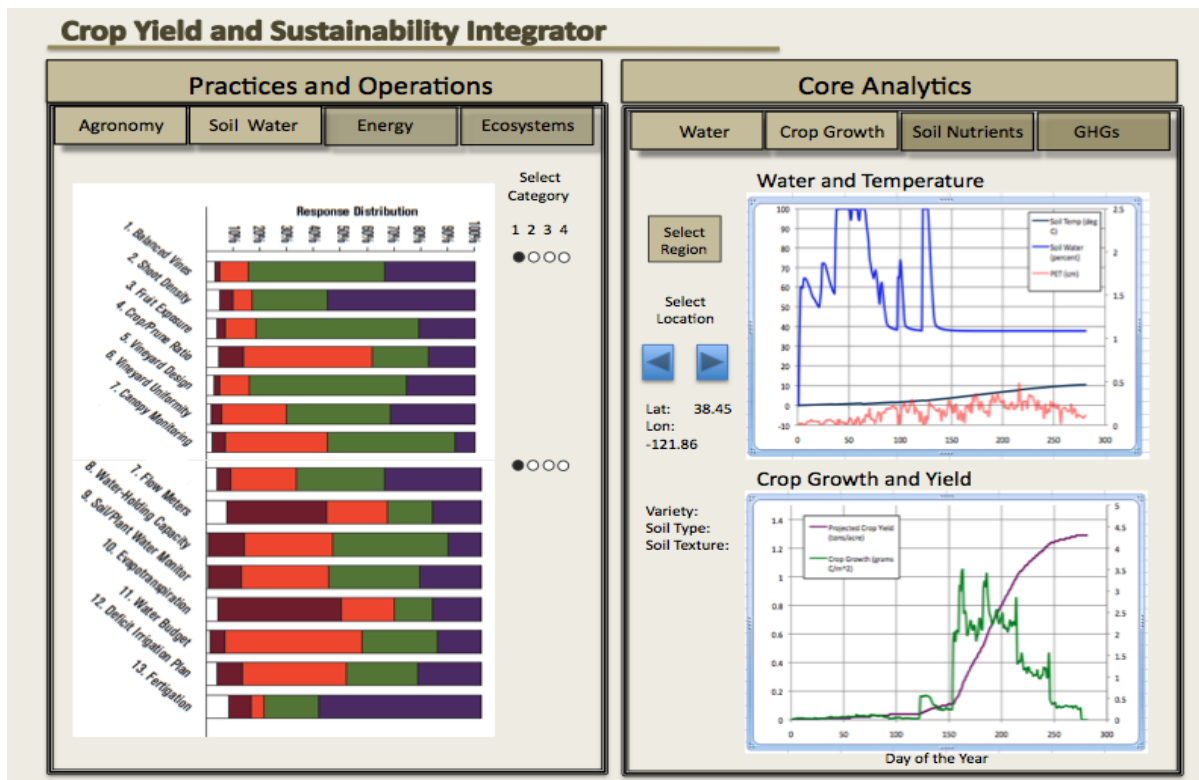
Satellite Yield Index (in blue) computed for Palo Alto County and Wright County in Iowa over the years 2000-2009, and compared to county-average corn yield in bushels (BU; in red) per acre from the U. S. Department of Agriculture.

Palo Alto County, Iowa

Wright County, Iowa

Operational Services Now Available from CASA2100

Services now available from the CASA2100 system include analysis of past and present satellite remote sensing data sets for estimation of crop yields at the individual field level, plus modeling* analysis of crop water use and soil greenhouse gas emissions (Example in Figure 2 below). Such data provision services include the delivery of digital daily summaries, namely estimates of ***crop production, annual crop yield, soil water and nutrient use, greenhouse gas (soil carbon dioxide and nitrous oxide) emission fluxes, for selected field locations or scaled-out for entire growing regions of the country***.

Figure 2. Prototype of CASA2100 display window for review and analysis of crop growth and yield predictions, according to reported management practices provided by growers. Multiple fields may be displayed for comparison of the outcomes of different grower management decisions.

* Based on CASA model as previously developed in 2007 and described in the peer-reviewed journal publication: Potter, C., S. Klooster, A. Huete, and V. Genovese, 2007, Terrestrial carbon sinks for the United States predicted from MODIS satellite data and ecosystem modeling, *Earth Interactions*, 11: 1-21.