The Group on Earth Observations’ Global Agriculture Monitoring (GEOGLAM) initiative is one of several emerging initiatives of the Group on Earth Observations (GEO) where policy and science meet. In 2011, as part of its Action Plan on Food Price Volatility and Agriculture, the G20 committed to “improve market information and transparency in order to make international markets for agricultural commodities more effective”. In its Final Declaration from Cannes (November 2011), the G20 invited GEO to “lead the development of an initiative to coordinate satellite monitoring observation systems in different regions of the world in order to enhance crop production projections and weather forecasting data”.

One example of the effects that significant weather events in producer/exporter countries have on crop prices is shown below in data from the World Bank. The graph illustrates wheat prices (in $/metric ton) for the period from 1960-2011. The first decade (1960-72) shows a relatively stable situation with price volatility increasing thereafter, and particularly so since 2007. Droughts in Australia, Russia and the Ukraine and the effect that they have had on wheat prices are shown on the graph.

Also shown on the graph is the launch in 1972 of the first in a series of Landsat satellites designed to observe the Earth’s landscape. Landsat-8 was successfully launched earlier this year (February 2013), resulting in a 40+ year record of how the Earth’s landscape is changing, including croplands, forests and urban areas.

The observations of these croplands from space are a key element in the policy/science spectrum, where both opportunities and challenges associated with their use emerge. Satellites from space agencies around the world afford us the opportunity to collect consistent, sustained global observations of cropland areas. Clearly, agricultural measurements from the ground are essential, and will remain so. Supplementing traditional ground-based observations with space-based observations, however, provide and/or strengthen global transparency.

The map above shows the percentage of cropland at a 1km resolution, and was created using satellite and ground-based data at the global, regional and national level. Cropland statistics from the Food and Agriculture Organization (FAO) and International Food Policy Research Institute (IFPRI) were used to calibrate the product to ensure compliance with those data sources. The 25 countries producing 80% of the world’s food supply are visible. This map, available for viewing and downloading at http://beta-hybrid.geo-wiki.org, is now being used to develop crop-type distribution maps, and, combined with crop calendars, to optimize the future collection of satellite data for GEOGLAM. The map was prepared by the International Institute for Applied Systems Analysis (IIASA) as a contribution to GEOGLAM.

The map on the opposite page indicates how satellite imagery can provide the global community with timely information on crop conditions and prospects prior to crop harvest. It shows a snapshot of daily maps that are available in real time of a satellite-derived index, called Normalized Difference Vegetation Index (NDVI). This vegetation index provides information on crop growth and condition. The anomaly image shows the
cropland NDVI departure from Average (2000-11) on 30 July 2012, highlighting hotspots of crops under stress during the 2012 droughts that affected the United States and the Black Sea region. The time series curves below the map compare the daily development of croplands in 2012 (red) to average (blue) in three important crop-growing regions: Illinois, USA; Orenburg Oblast, Russia; and Kostanay Oblast, Kazakhstan. The crop development through the season depicted by NDVI shows consistent negative anomalies with regard to a 10-year average during critical development stages, with the highest discrepancies during the peak crop-development period. In 2012, crops in the US, southern Europe and the Black Sea region suffered from prolonged high temperatures and low soil moisture, which resulted in significantly reduced production. The negative impact on crops was seen in the satellite imagery well ahead of harvest. And while speculation often starts between seasons, any improvement in production forecasts during the season should have a positive impact on price stability. Increased global transparency brought by Earth observations, harmonized methodologies and international coordination and cooperation will have a positive impact on both production forecasts and price volatility, making international markets for agricultural commodities more effective – the stated intention of the G20. The map was produced by the University of Maryland (UMD) in collaboration with the National Aeronautics and Space Administration (NASA) and the United States Department of Agriculture (USDA).

Currently, Argentina, Australia, Brazil, Canada, China, the European Commission, France, Germany, India, Japan, Kazakhstan, Mexico, Russia, South Africa, Thailand, Ukraine, USA, the Asian Development Bank (ADB), the Committee on Earth Observation Satellites (CEOS), FAO, IFPRI, IASA and WMO are actively participating in GEOGLAM. The early efforts are focusing on the four main commodities – corn, rice, soybeans and wheat. Activities are designed for the major producing countries (development of a global agricultural monitoring system), countries that may be both producing and at risk (development of national capabilities) and for countries at risk (development of regional capabilities).

Like any other GEO initiative, participation is voluntary and open to all GEO Member countries (90 to date) and any of the nearly 70 Participating Organizations (including international organizations with an interest in Earth observations, UN agencies, and scientific associations). In November 2012, GEO Members approved broadening stakeholder engagement in GEO to include foundations, development banks, other non-governmental organizations and commercial entities. GEO would welcome additional participation and contributions to this important initiative. There are few greater needs than creating and ensuring a food-secure world.