TOWARDS A GLOBAL FOOD SECURITY-SUPPORT DATA PRODUCT AT 30 m RESOLUTION (GFSAD30)

Prasad S. Thenkabail[1], Cristina Milesi[2], Mutlu Ozdogan[3], Russell G. Congalton[4], Chandra Giri[5], James Tilton[6], Temuulen Tsagaan Sankey[7], Pardhasaradhi Teluguntla[1,8], Jun Xiong[1,7], Murali Krishna Gumma[9], Richard Massey[1,7], Aparna Phalke[3], and Kamini Yadav[4]

1 = U. S. Geological Survey (USGS), 2255, N. Gemini Drive, Flagstaff, AZ 86001, USA
2 = NASA Ames Research Center, MS 242-4, Moffett Field, CA 94035, USA
3 = University Of Wisconsin, 1710 University Avenue, Madison, WI 53726, USA
4 = University of New Hampshire, 215 James Hall, 56 College Road, Durham, NH 03824, USA
5 = U. S. Geological Survey (USGS), (EROS) Center, Sioux Falls, SD, USA
6 = NASA Goddard Space Flight Center (GSFC), Greenbelt, MD 20771, USA
7 = School of Earth Sciences and Environmental Sustainability (SESES), Northern Arizona University, Flagstaff, AZ 86011, USA
8 = Bay Area Environmental Research Institute (BAERI), 596 1st St West Sonoma, CA 95476, USA
9 = International Crops Research Institute for the Semi Arid Tropics (ICRISAT), Patancheru, Hyderabad, India
pthenkabail@usgs.gov

Commission VI, WG VI/4

KEY WORDS: global croplands, agriculture, remote sensing, global food security, algorithms

ABSTRACT:

Monitoring of global croplands (GCs) is imperative for ensuring sustainable water and food security for the people of the world in the Twenty-first Century. However, the currently available cropland products suffer from major limitations such as: (1) Absence of precise spatial location of the cropped areas; (b) Coarse resolution nature of the map products and their significant uncertainties in areas, locations, and detail; (b) Uncertainties in differentiating irrigated areas from rainfed areas; (c) Absence of crop types and cropping intensities; and (e) Absence of a dedicated web-baseddata portal for dissemination of the cropland map products.

This research aims overcome these limitations through development of a set of Global Food Security-support digital map products at 30 m resolution (GFSAD30)consisting of four distinct map types:

1. Cropland extent/area,
2. Crop types with focus on the 8 types that occupy 70% of the global cropland areas,
3. Irrigated *versus* rainfed croplands, and
4. Cropping intensities: single, double, triple, and continuous cropping.

The above 4 products will be generated for global food security-support analysis data at 30 m (GFSAD30) for nominal year 2010 (GFSAD2010) based on the Landsat 30m Global Land Survey data product for year 2010 (GLS2010) in fusion with monthly maximum-value NDVI composite (MVC) data at 250 m resolution for years 2009-2011 from the Moderate Resolution Imaging Spectroradiometer (MODIS),, and a suite of ancillary data (e.g., long-term precipitation, temperature, global digital elevation model data). GFSAD30 will be produced using three mature cropland mapping algorithms (CMAs):

1. Synergistic cropland classification and class identification (SCCI) that includes unsupervised classification, bi-spectral plots, spectral matching techniques, and various class identification steps;
2. Functional analysis approach, and cluster algorithm written in C computer language;
3. Automated cropland classification algorithm (ACCA) involving rule based decision tree approach;
4. Data fusion and object oriented classification approaches;
5. Hierarchical segmentation (HSeg) algorithm; and
6. MAGIC (Making Accurate Global Information of Croplands (MAGIC) Algorithm that captures agricultural knowledge using remotely sensed data and has the ability to replicate the information year after year automatically and rapidly.

Funded by NASA MEaSUREs, GFSAD30 will make significant contributions to Earth System Data Records (ESDRs), Group on Earth Observations (GEO) Agriculture and Water Societal Beneficial Areas (GEO Ag. SBAs), GEO Global Agricultural Monitoring Initiative (GEO GLAM), and the recent “Big Data” initiative by the White House. The project has the support of USGS Working Group on Global Croplands (https://powellcenter.usgs.gov/globalcroplandwater/).