Project Description

Food production in South Asia has increased four-fold since the early 1950s, enabling food production to keep pace with population growth. These increases are largely the result of Green Revolution technologies, multiple cropping, irrigation, fertilizers, and other inputs. Yet most of the world's malnourished live in South Asia, most agriculture in the region is rain-fed, and yields lag behind other parts of the world.

Future climate change is expected to bring higher temperatures and higher overall precipitation to the region. Significant drops in yields for rice and wheat, the most important cereal crops, are projected for the future. The combination of stagnating yields and negative impacts of future climate change on yields raises the urgent need for improved understanding of the factors associated with climate sensitivity of Indian agriculture.

This project focuses on using multitemporal remote sensing to assess cropping patterns throughout India in relation to climate variability. This project will detect the spatial patterns and temporal variability of cropping patterns throughout India from 2000 to the present at 250m spatial resolution. We are using data from MODIS, Landsat, Tropical Rainfall Mapping Mission (TRMM), and other sensors to establish annual estimates of cropping patterns. Time series of MODIS Enhanced Vegetation Index (EVI) data will be used to identify number of crops and agricultural productivity based on phenological profiles.

The ultimate goal of this research is to enable risk mapping and inform effective approaches for adaptation to climate variability in the region. Data sets on cropping patterns at 250m resolution and aggregated to district level for each year from 2000 to present will be made available to the community of researchers investigating climate impacts on agriculture.

Photo: P. Mondal

Photo: M. Jain

Participants (in alphabetical order)

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Publications

1. Jain, M., Mondal, P., DeFries, R., Small, C., Galford, G. 2013. Mapping cropping intensity of smallholder farms: a comparison of methods using multiple sensors. *Remote Sensing of Environment* 134, 210-223.

2. Mondal, P., Jain, M., DeFries, R., Galford, G., Small, C. 2014. Sensitivity of crop cover to climate variability: Insights from two Indian agro-ecoregions. *Journal of Environmental Management.* In Press.

3. Small, C., Jain, M., Mondal, P., Galford, G., DeFries, R. **Periodicities, Trends and Abrupt Changes in the Vegetation   Phenology of South Asia**. *Remote Sensing of Environment.* In revision.

4. Mondal, P., Jain, M., Robertson, A., Galford, G., Small, C., DeFries, R. **Winter crop sensitivity to inter-annual climate variability in central India.** *Climatic Change.* Submitted.