

# Monitoring and Assessment of Floods and Droughts: Improved Solution for Mitigation and Risk Management in South Asia



**Giriraj Amarnath**

Research Group Leader: Water Risks and Disasters  
International Water Management Institute (IWMI),

Sri Lanka

Email: [a.giriraj@cgiar.org](mailto:a.giriraj@cgiar.org)



RESEARCH PROGRAM ON  
Climate Change,  
Agriculture and  
Food Security



RESEARCH  
PROGRAM ON  
Water, Land and  
Ecosystems

This is not an ADB material. The views expressed in this document are the views of the author/s and/or their organizations and do not necessarily reflect the views or policies of the Asian Development Bank, or its Board of Governors, or the governments they represent. ADB does not guarantee the accuracy and/or completeness of the material's contents, and accepts no responsibility for any direct or indirect consequence of their use or reliance, whether wholly or partially. Please feel free to contact the authors directly should you have queries.

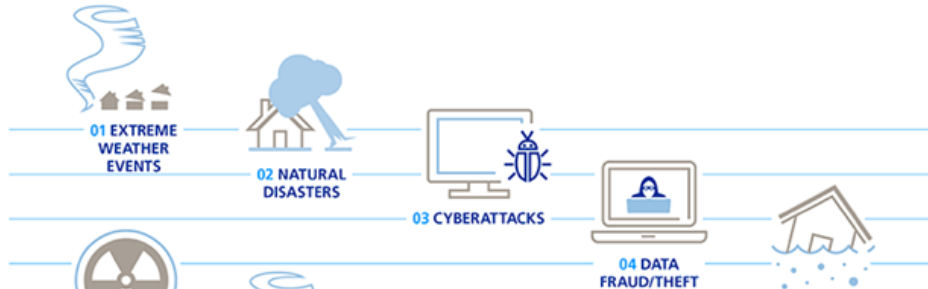


# Starting points

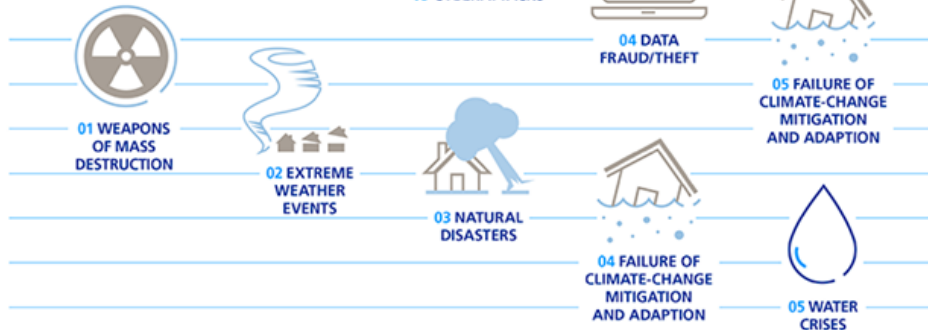
## Global Risks Report

The 5 risks most likely to happen in the next 10 years

### Top 5 risks in terms of *likelihood*



### Top 5 risks in terms of *impact*



- Disaster risk is growing as a result of unplanned urbanization, persistent poverty and ecosystem degradation.
- Last year, the insurance industry suffered insured losses of US\$135 billion, the highest in almost 40 yrs.
- Economic loss US\$330 billion; 97% from extreme weather damage.

# Climate change and the Asian food-agriculture system: the challenges

Climate change will:

- Negatively affect agriculture, water, coastal livelihoods, health and biodiversity
- Undermine water security of over 1 billion people globally by 2050s. The poorest are most at risk
- Put the stability of food systems at risk, especially in parts of Asia that are vulnerable to hunger and malnutrition

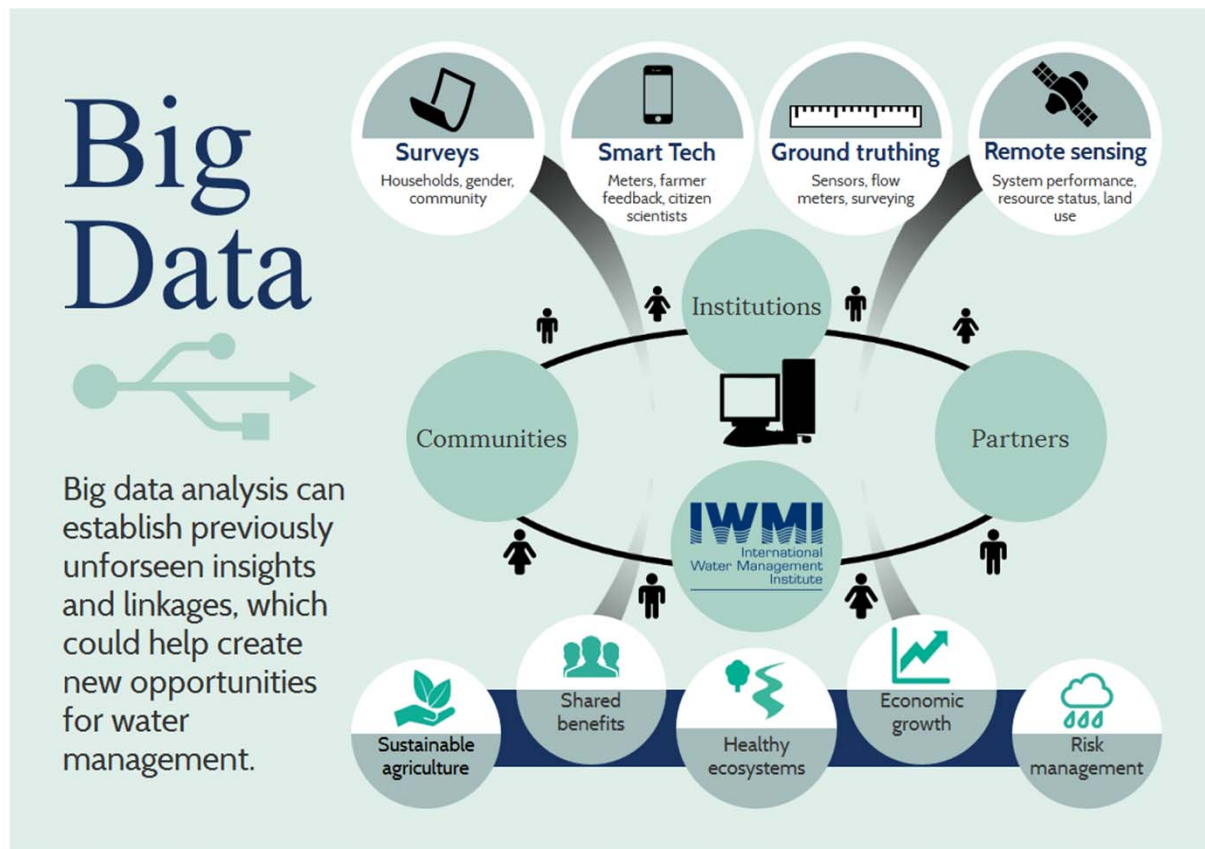




# Some solutions for climate resilience



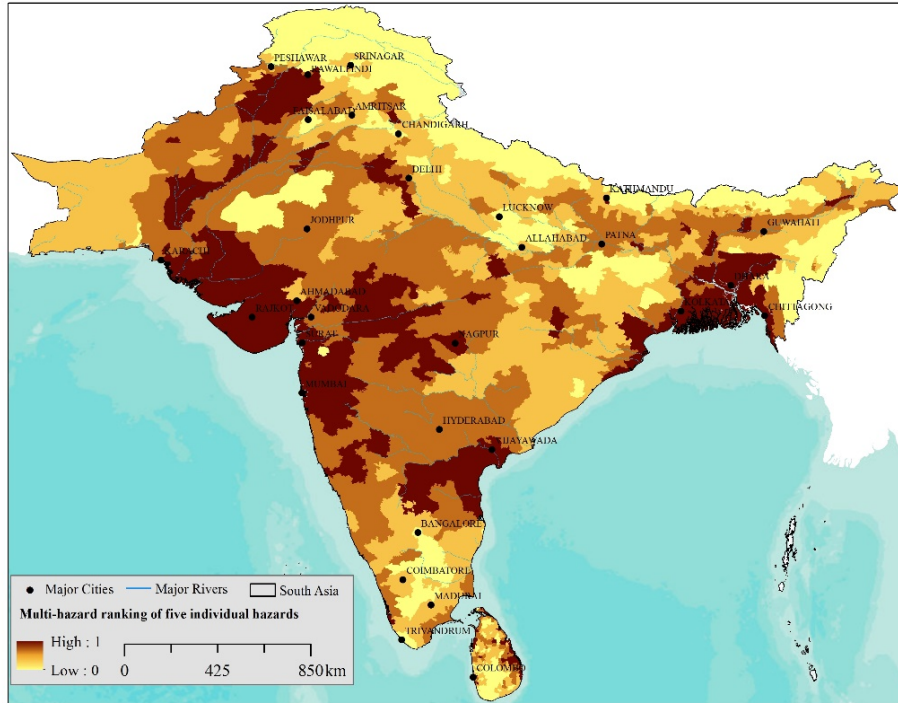
# Big Data approaches



- Hazard and Risk assessment
- Managing floods and drought
- Risk transfer through Insurance
- Digital agriculture risk management
- Post-flood recovery to agriculture

# Some areas will be more affected than others:

Identifying vulnerability hot spots for climate change to design locally relevant adaptation measures



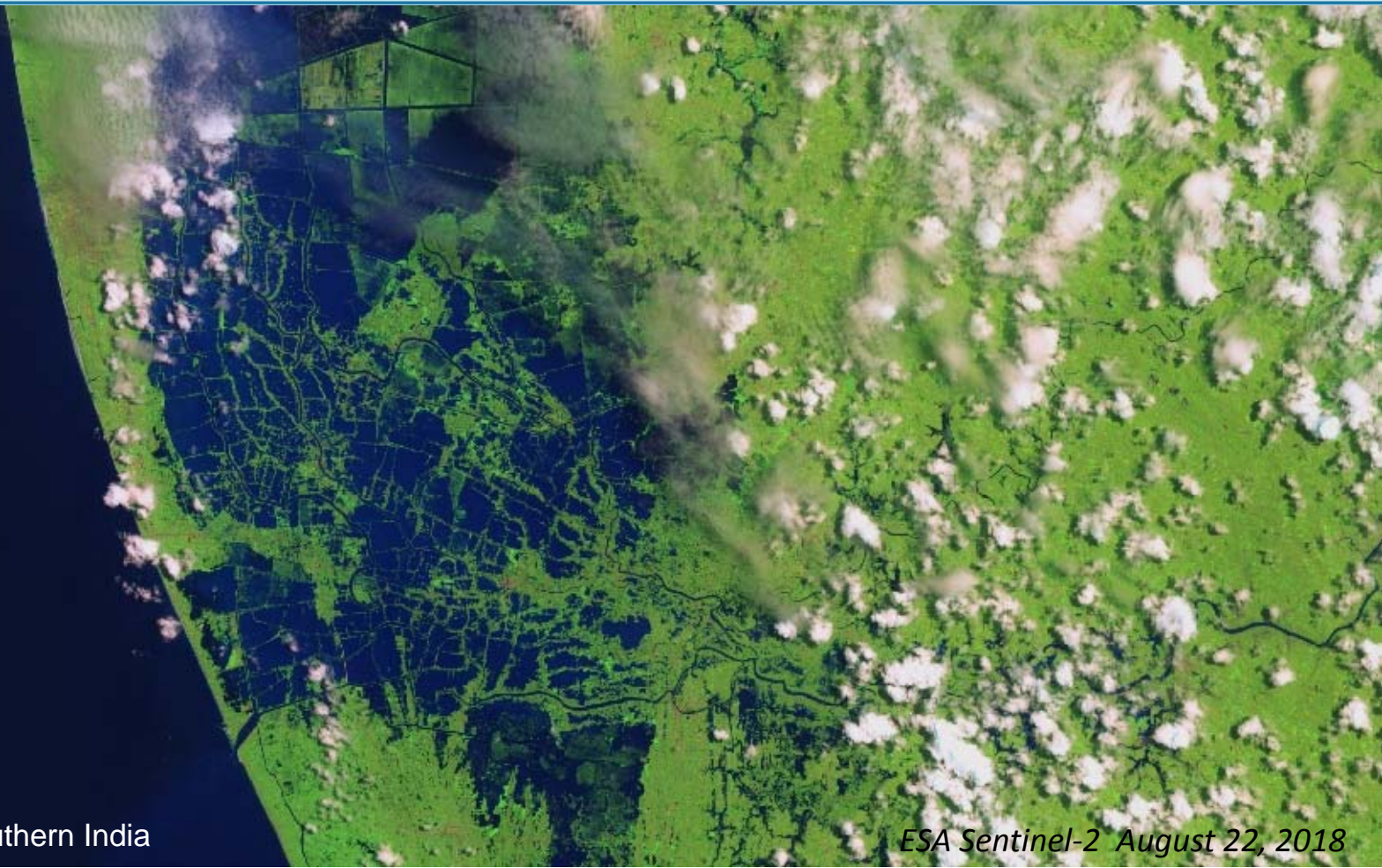
- Drought: 70% land
- Floods: 12% land
- Cyclones: 8% land
- Heat: Frequent at many areas
- Coastal salinity ingress
- One of the most vulnerable regions to CC
- Food security and poverty are the key issues

Amarnath, G.; Alahacoon, N.; Smakhtin, V.; Aggarwal, P. 2017. Mapping multiple climate-related hazards in South Asia. IWMI Research Report 170, 41p. doi: 10.5337/2017.207



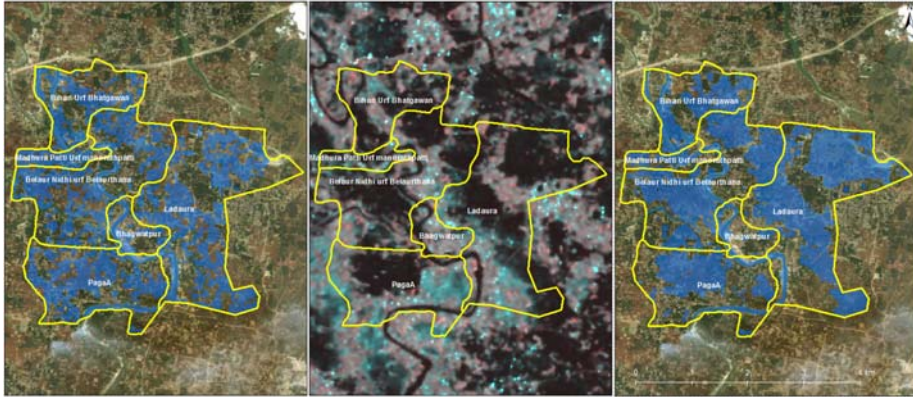
# Emergency crisis management and Disaster loss assessment

- Over 445 people died
- 1 Million population affected
- Hundreds of villages partially submerged
- Destroyed ~10,000 km of roads and thousands of homes
- Estimated \$5.6 billion economic losses

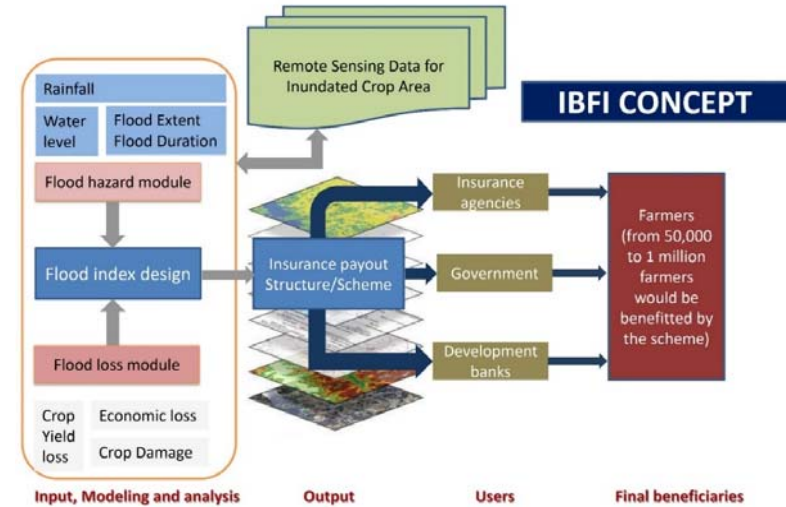


# Index-based Flood Insurance (IBFI)

*IBFI is an innovative approach to developing effective payout schemes for low-income, flood-prone communities. It enables speedy compensation payouts to farmers, based on flood modeling and satellite image analysis techniques.*



*Comparison of flood model and remote sensing data*

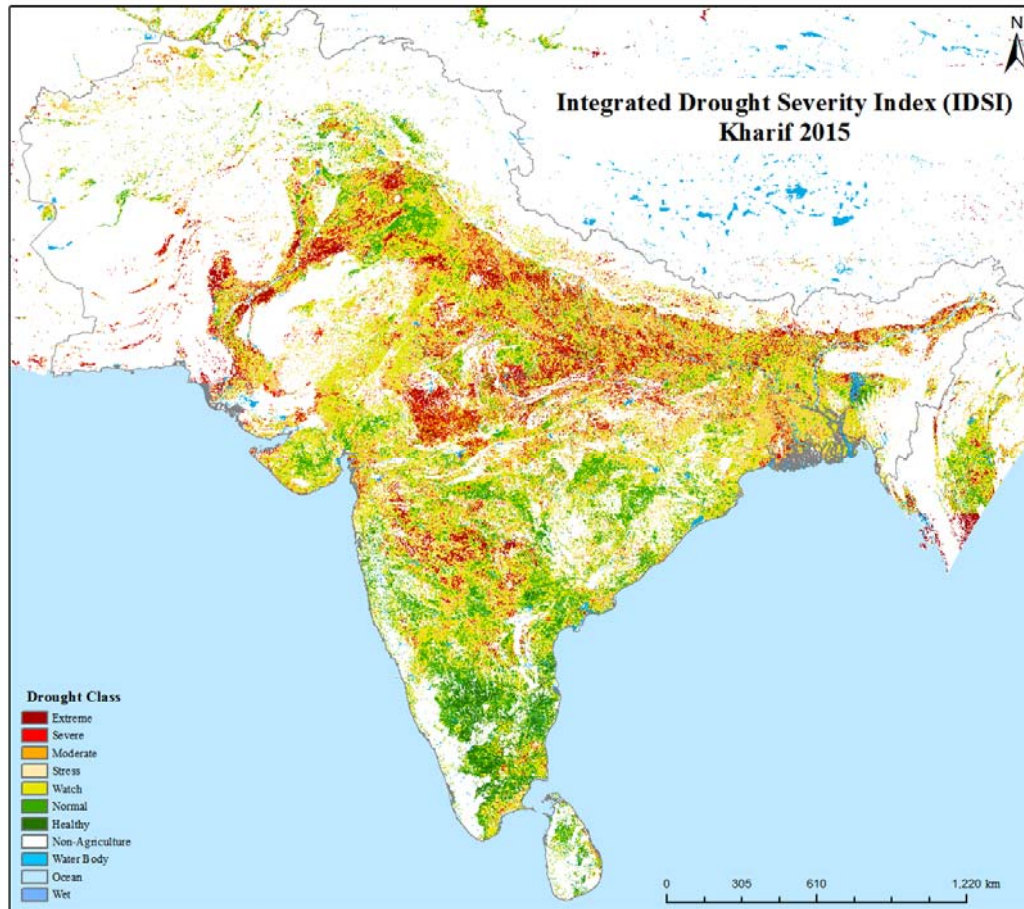


*Shri Radha Mohan Singh, Union Minister for Agriculture & Farmers Welfare, India distributing dummy check on 22 Feb 2018 to eligible farmers*

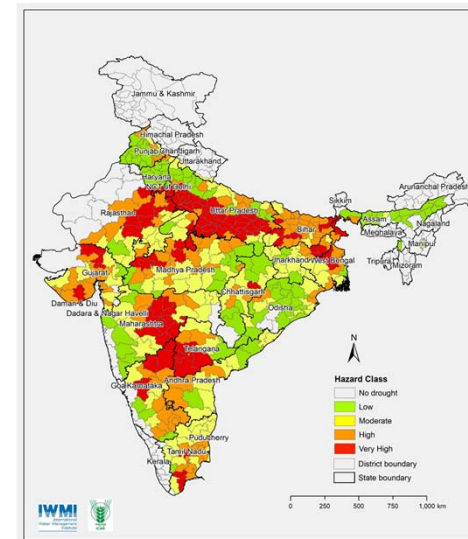




# South Asia Drought Monitoring Systems (SADMS)



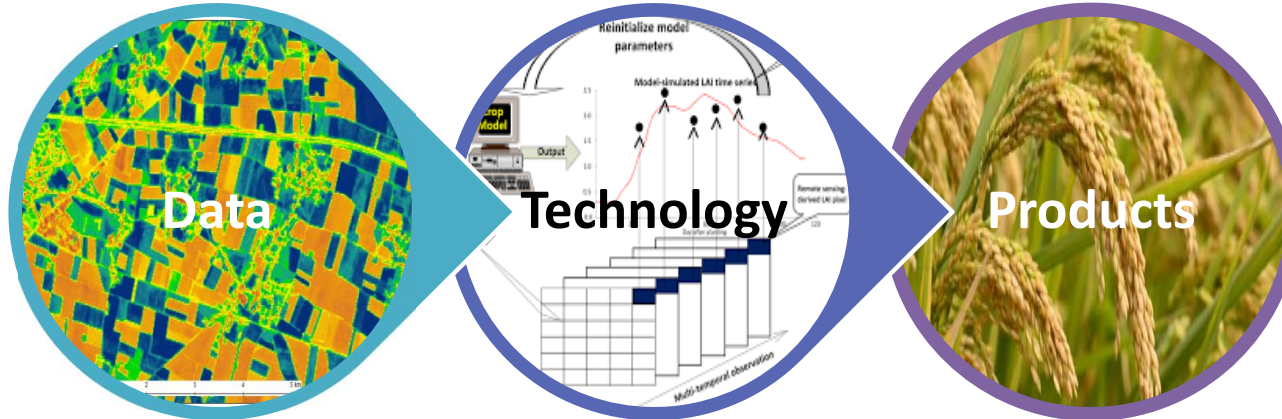
- Near real-time drought forecast and monitoring information to advise agriculture, irrigation, meteorology and disaster agencies;
- Publishes weekly drought bulletin



*Agricultural drought hotspots using IDSI product over India*

# Crop insurance advisory services

*Satellite based technology using SAR Images for rice crop monitoring, yield forecasting and crop damage assessment*



- Remote Sensing (SAR + Optical)
- Weather and Soil
- Field Measurements (Crop specific GPS, Growth condition etc.)

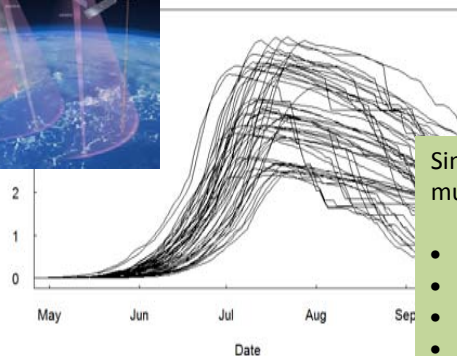
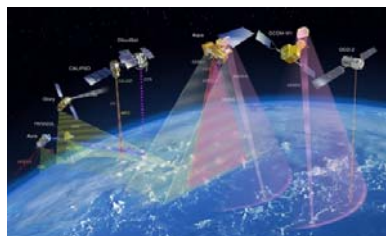
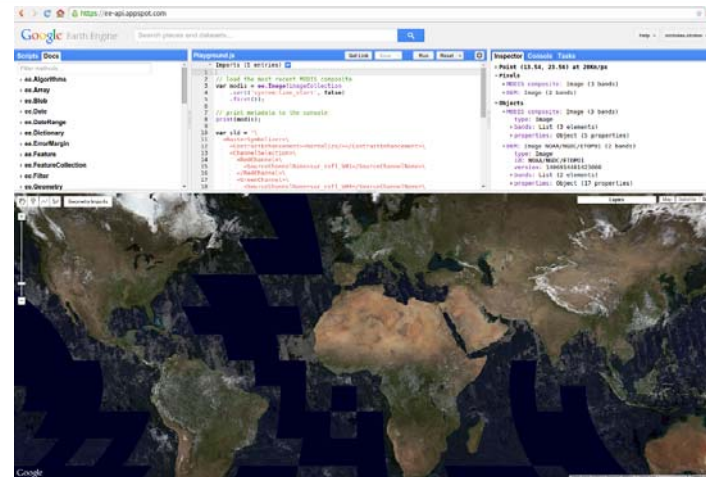
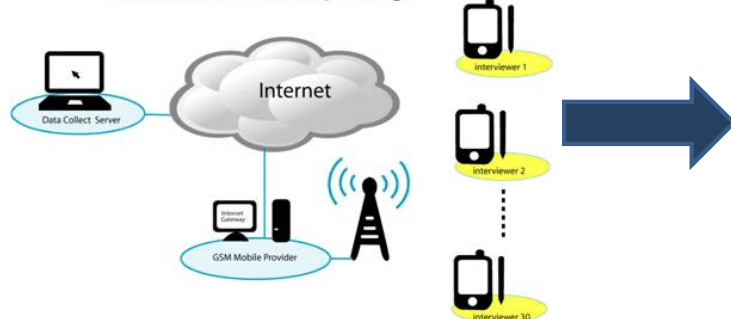
- Remote Sensing
- Crop Modeling
- ODK Smart Phone
- Cloud System

- Crop – ACF
- Planting dates
- PMFBY parameters
- Yield & Production
- Yield forecast
- Damages from floods and drought



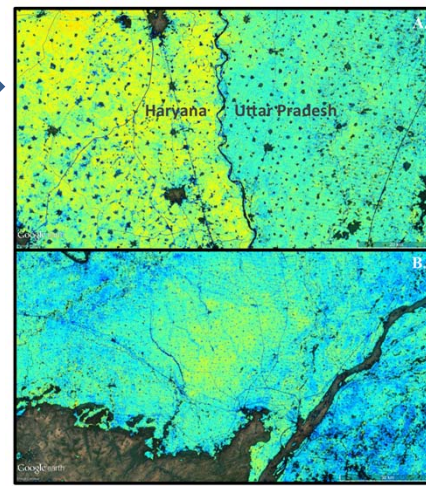
# Digital agriculture data collection using ODK for crop monitoring and impact evaluation

## ODK Mobile Data Capturing



Simulations span multiple:

- Sites
- Years
- Sow dates
- Sow densities
- Soil moisture
- Cultivar choice
- N rate



Crop yield map







[www.iwmi.org](http://www.iwmi.org)

[wle.cgiar.org](http://wle.cgiar.org)

[ccaafs.cgiar.org](http://ccaafs.cgiar.org)

