

# GEOSPATIAL WORLD FORUM



15-19 January, 2018, Hyderabad, India

ONE GLOBAL PLATFORM – FOUR KEY EVENTS!



15-16 January, 2018



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# Digital Agriculture for Food and Soil Security



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INTERNATIONAL CROPS RESEARCH  
INSTITUTE FOR THE SEMI-ARID TROPICS



# A Global R&D Organization for Semi-Arid Agriculture



## Our locations



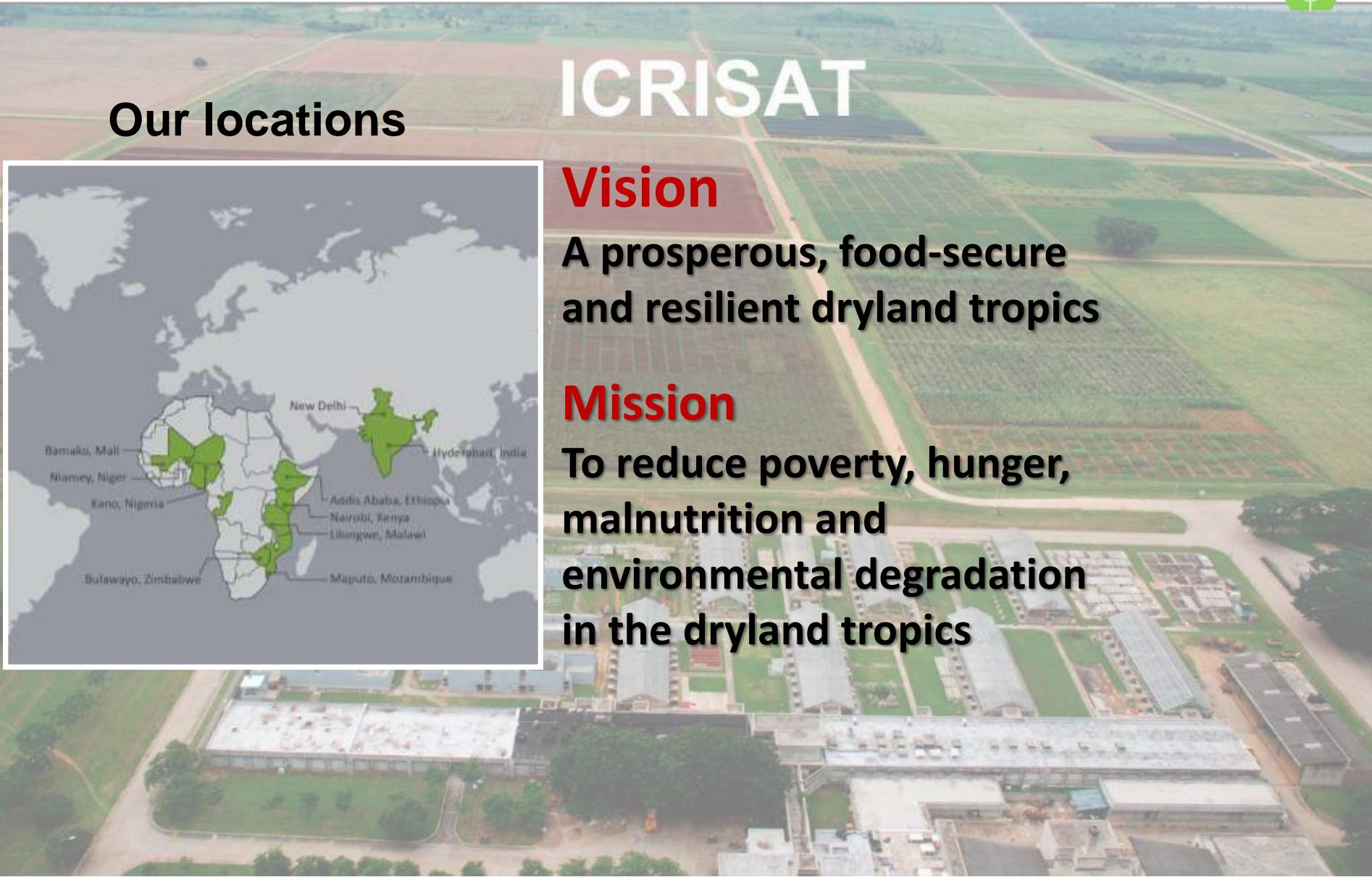
# ICRISAT

## Vision

A prosperous, food-secure  
and resilient dryland tropics

## Mission

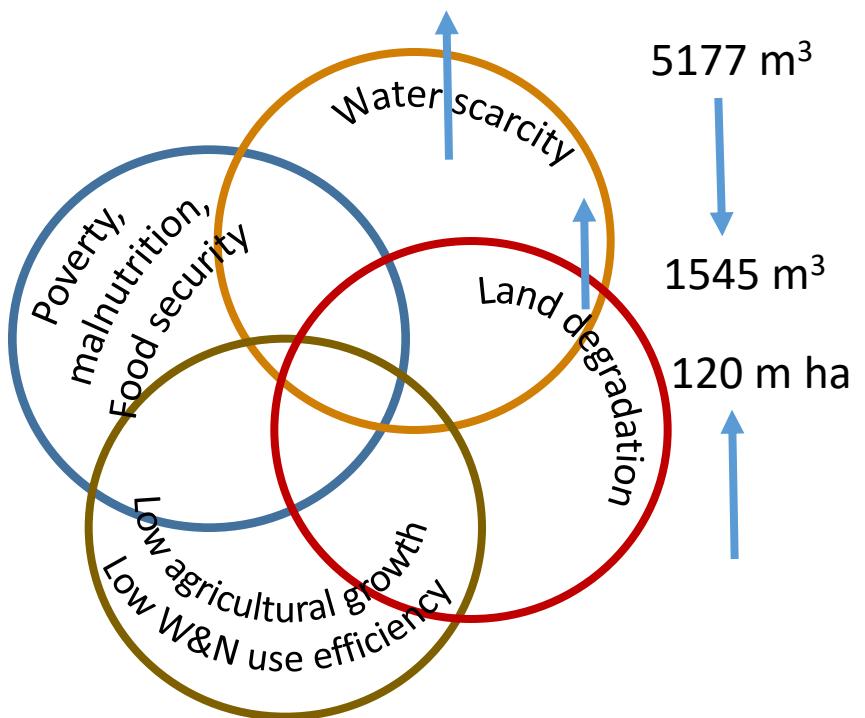
To reduce poverty, hunger,  
malnutrition and  
environmental degradation  
in the dryland tropics





# Challenges of the 21<sup>st</sup> Century

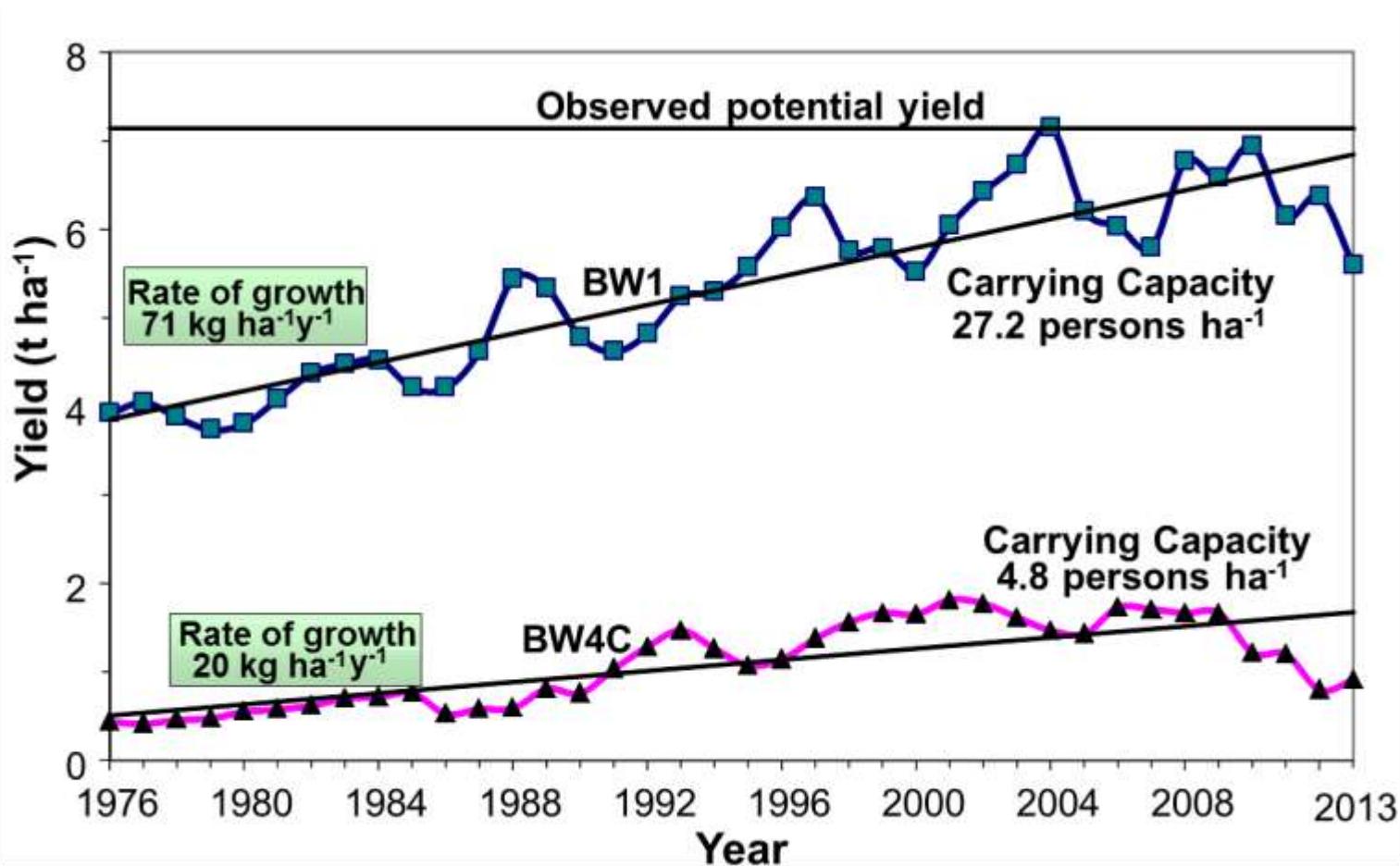
- ❖ Water scarcity
- ❖ Land degradation
- ❖ Low water and nutrient use efficiency
- ❖ Low agricultural productivity
- ❖ Poverty



# Rainfed Agriculture: A Large Untapped Potential



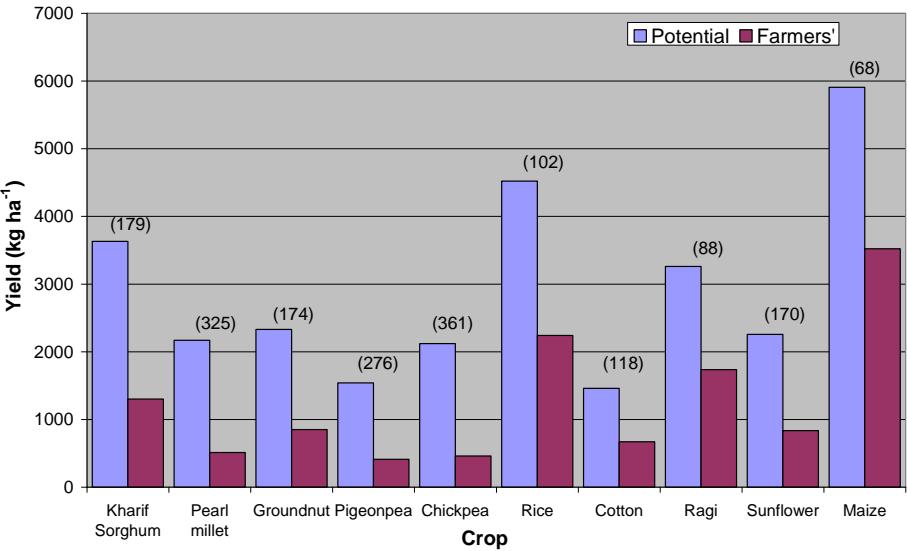
- Current farmers' yields are lower by 2 to 5 folds than the achievable yields
- Vast potential of rainfed agriculture needs to be harnessed



# Large yield gap- Opportunity to harvest Huge untapped potential

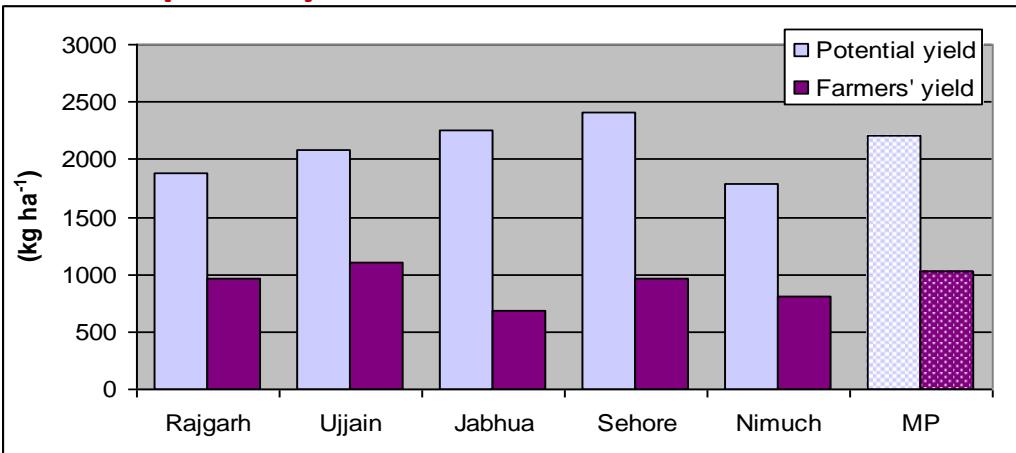


## Yield Gaps in Karnataka

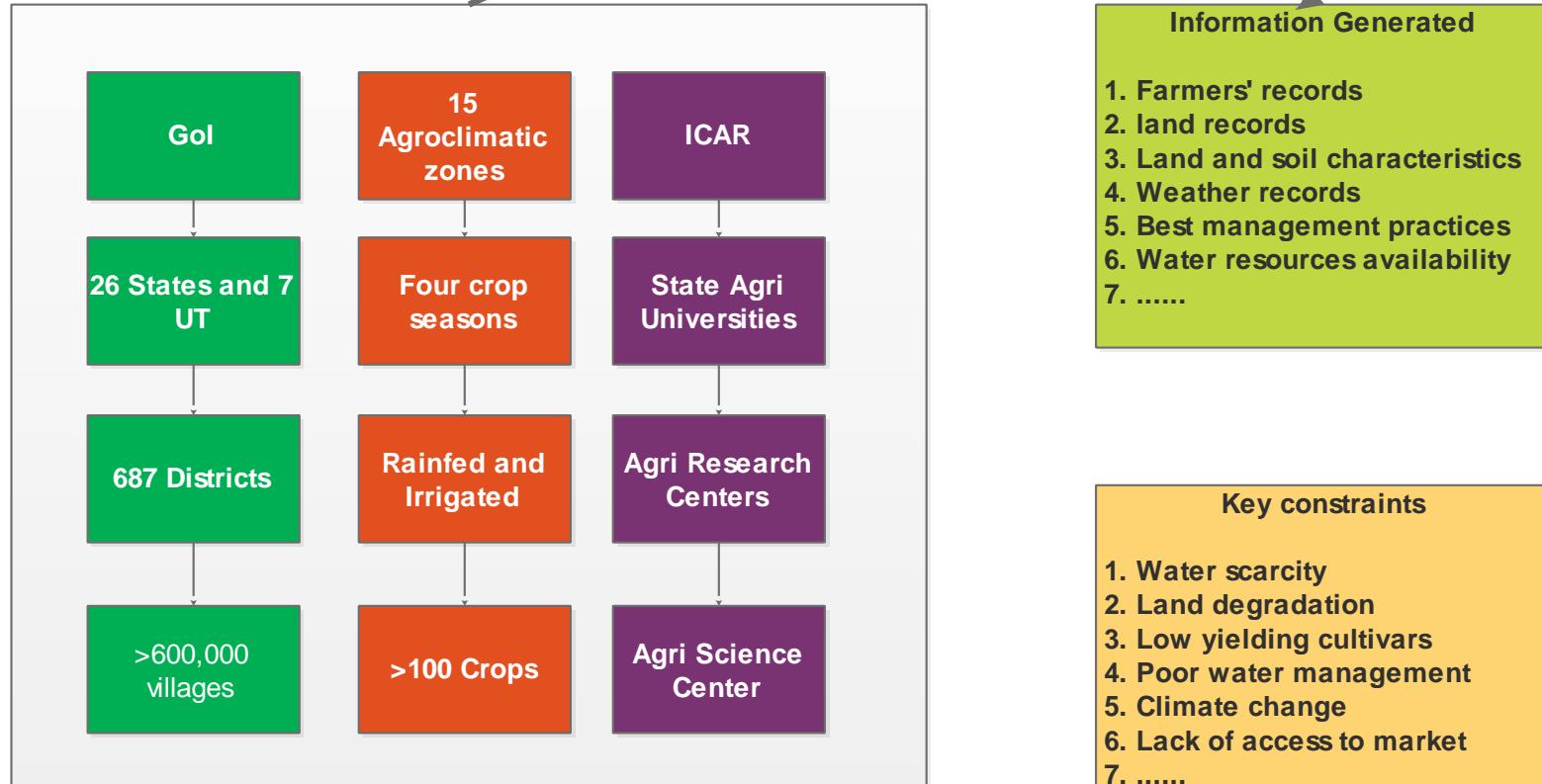


**Yield potential of elite germplasm is not realized because of soil degradation**

## Yield Gap of Soybean in MP



# Why Digital Agriculture



## Information Generated

1. Farmers' records
2. land records
3. Land and soil characteristics
4. Weather records
5. Best management practices
6. Water resources availability
7. .....

Bridging gap between solutions and farmer?

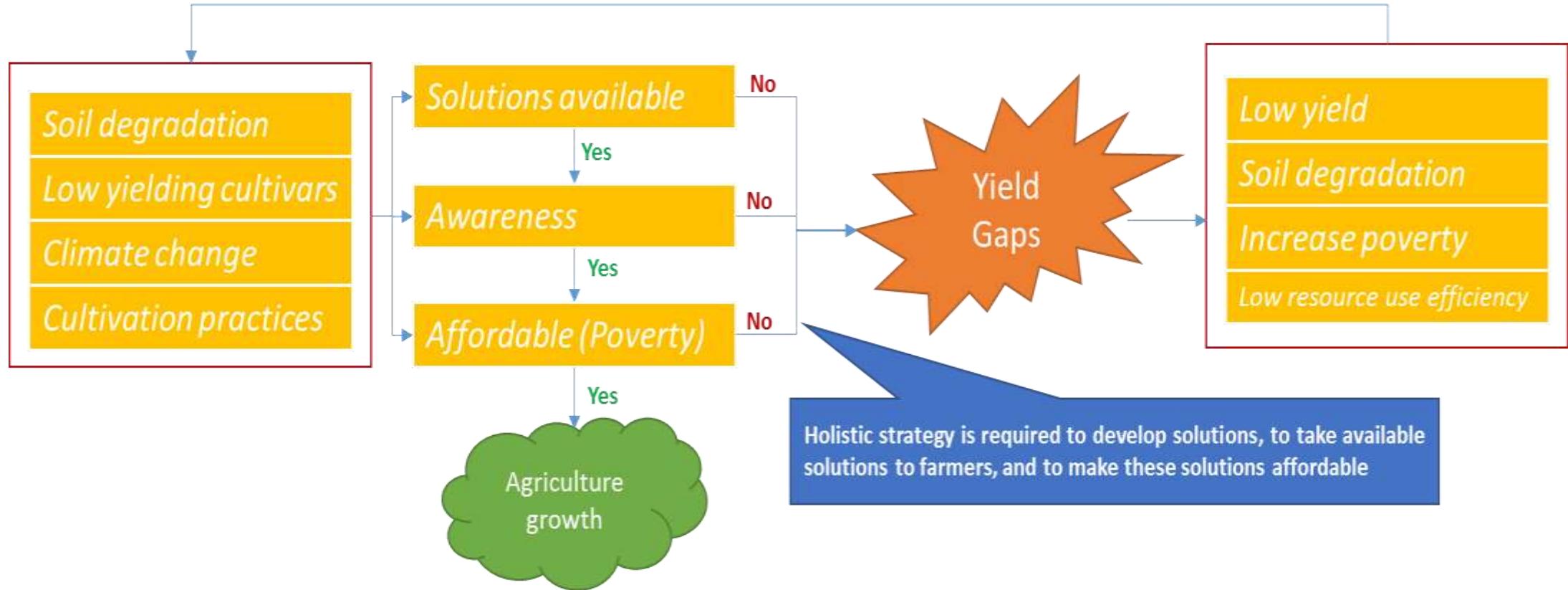


138 million

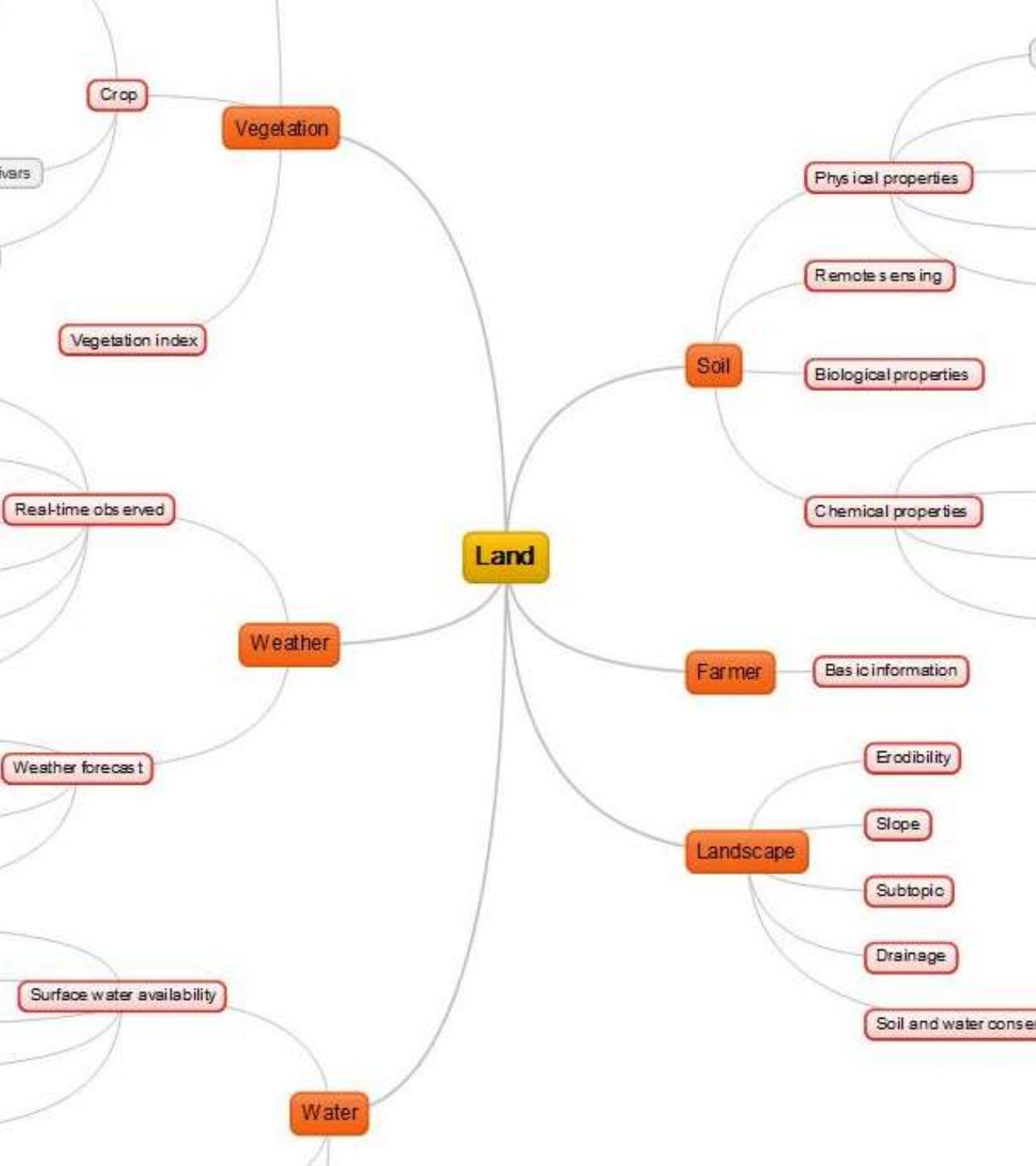
## Key constraints

1. Water scarcity
2. Land degradation
3. Low yielding cultivars
4. Poor water management
5. Climate change
6. Lack of access to market
7. .....

# Why Digital Agriculture



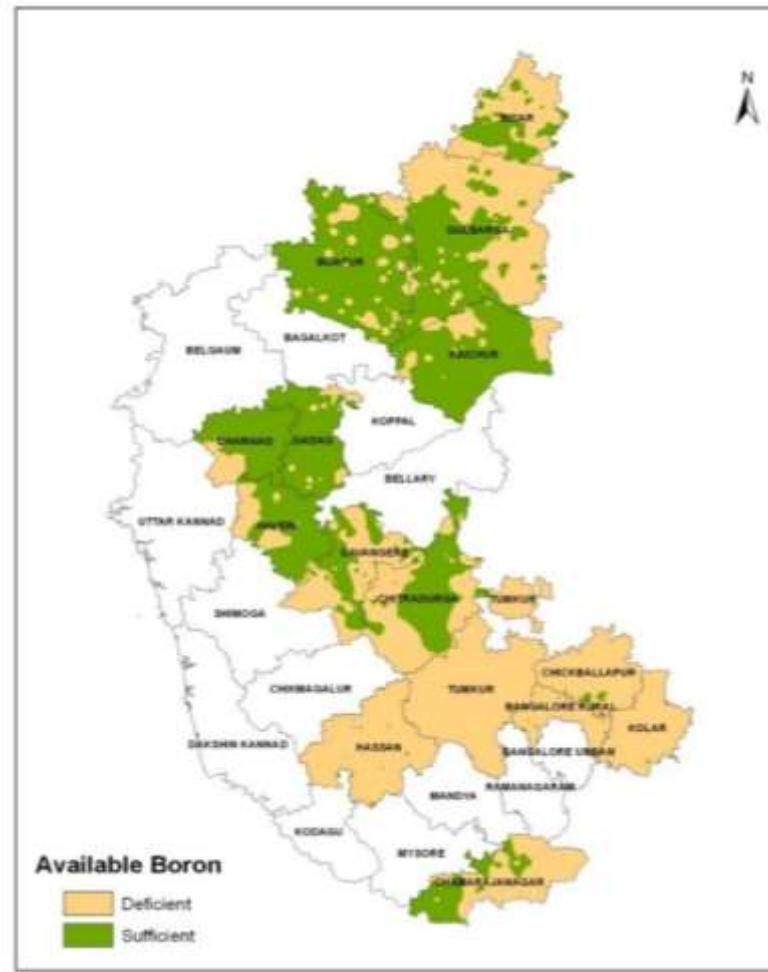
# Spatial Data Infrastructure in Agriculture



- Land is base for all farm based activities
- All entities need to be mapped to land parcels
- A platform for developing decision support systems
- A tool for preparing knowledge based development plans and adopting agriculture management practices

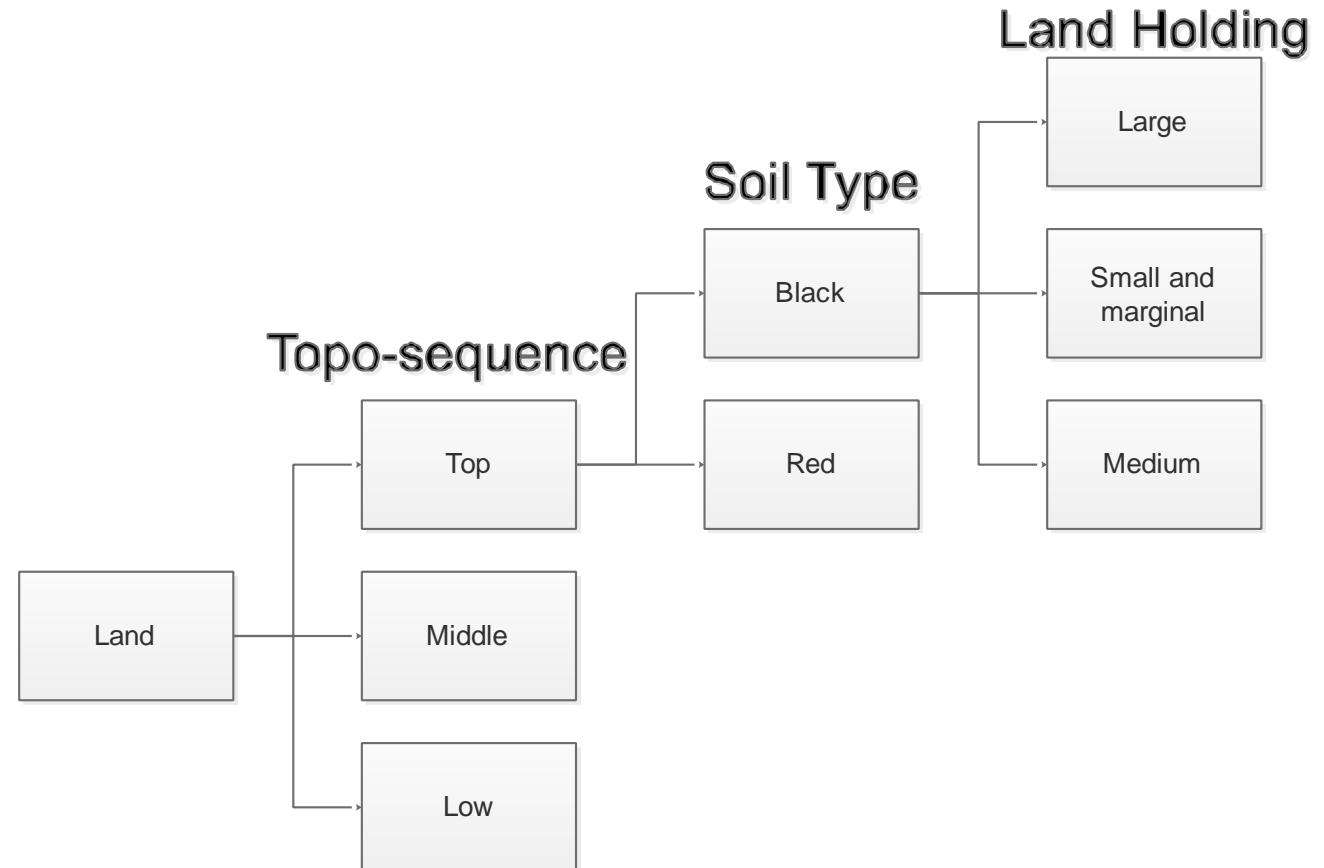
# Bhoochetana (Soil Rejuvenation): Soil mapping as entry point

Widespread deficiencies of micronutrients (> 60-100%) are recorded in farmers fields

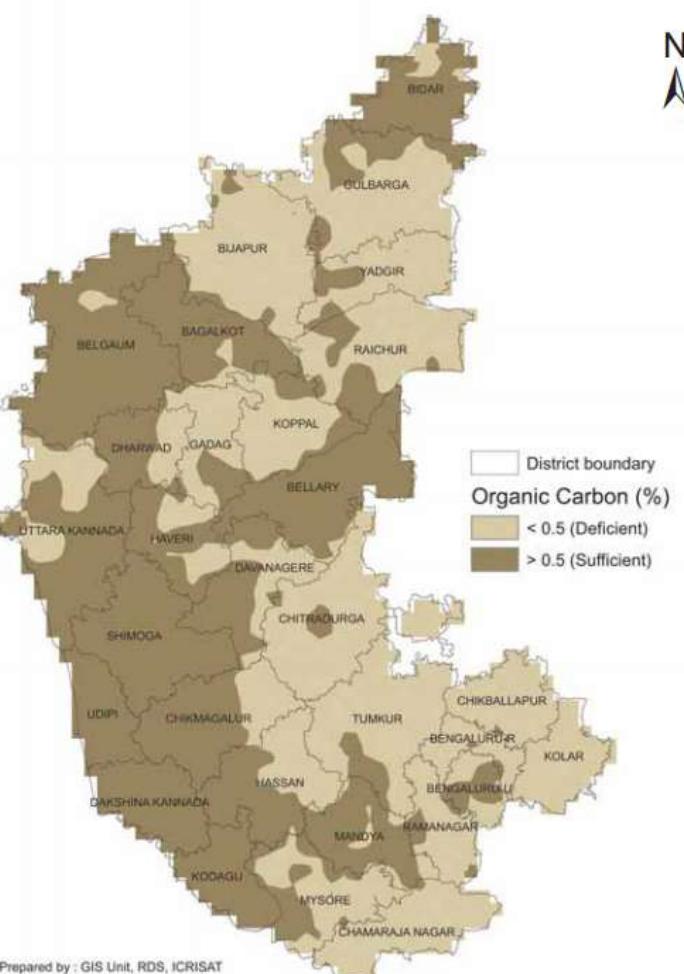
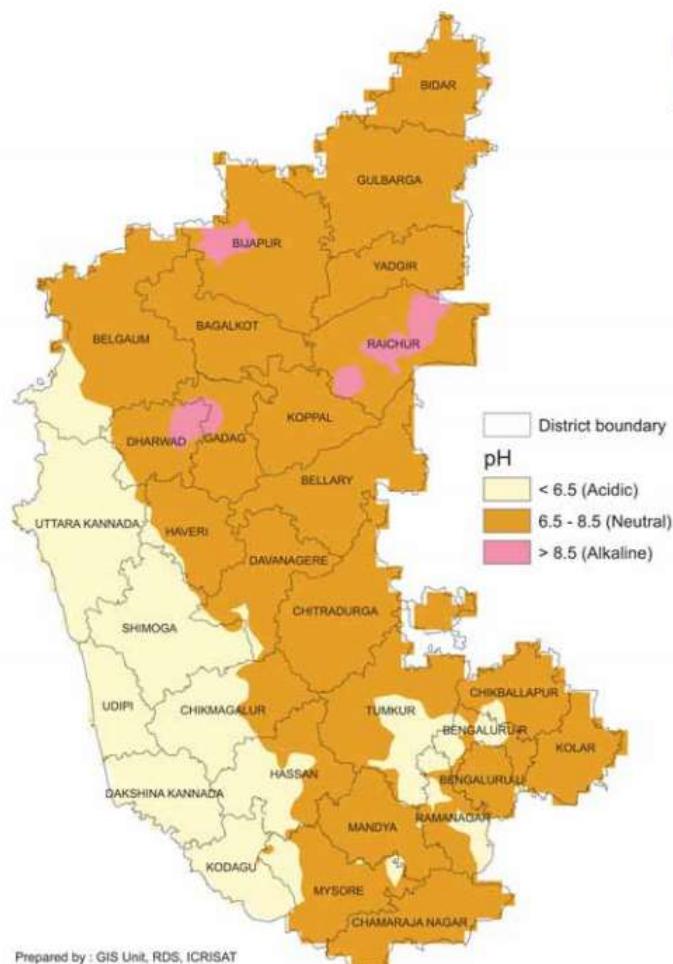
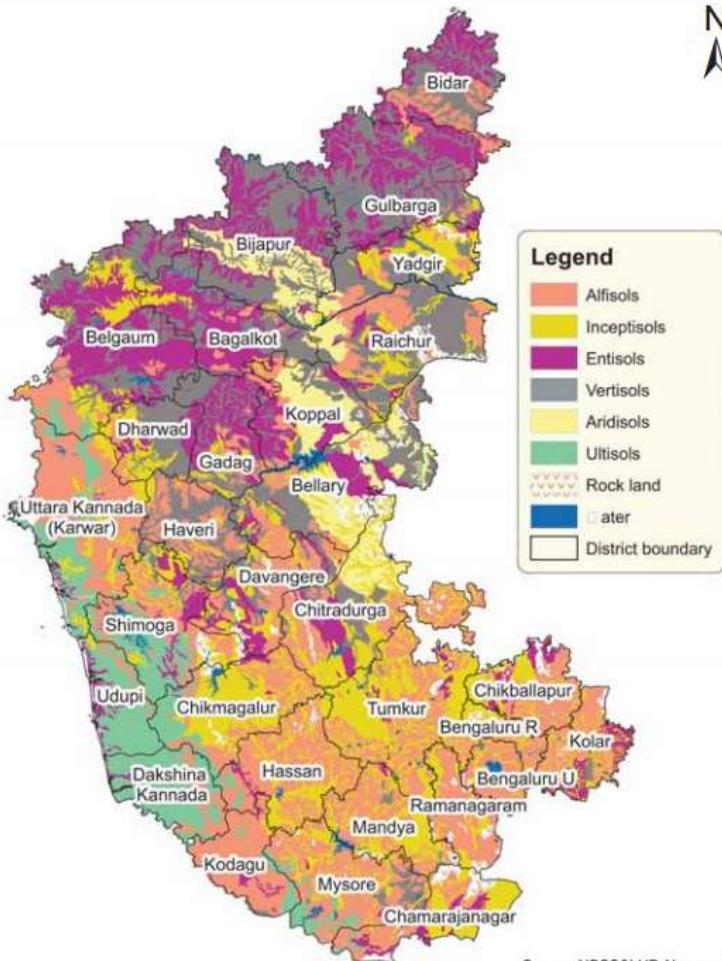


# Soil Fertility Atlas: Stratified soil sampling

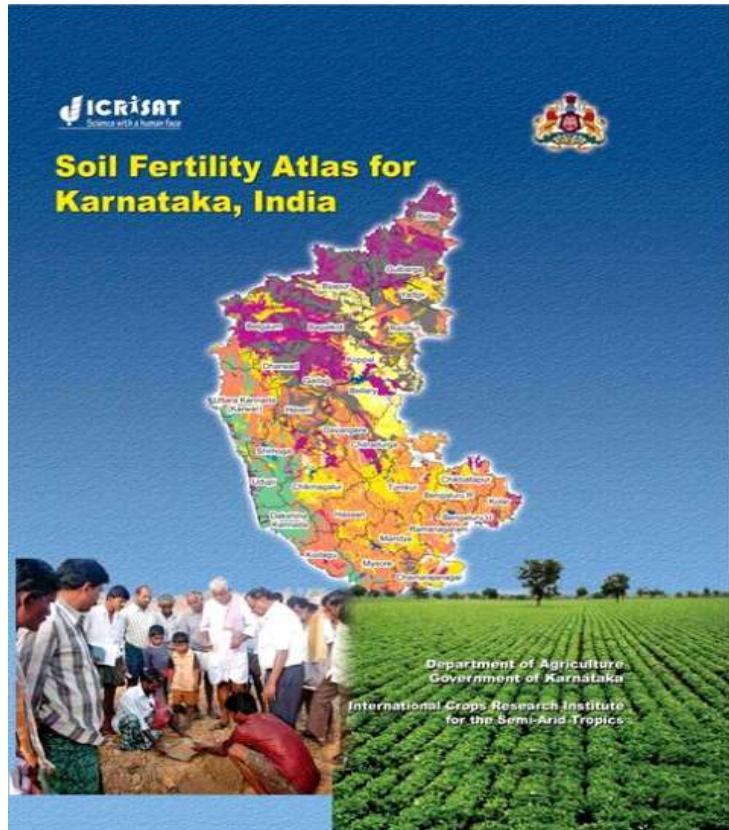
- Stratification of land
- Participatory approach for soil sampling
- Total 92000 geo-referenced samples were collected
- Parameter analyzed: pH, EC, organic carbon, phosphorous, potassium, sulfur, boron, zinc



# Soil Maps



# Soil Health Knowledge Dissemination



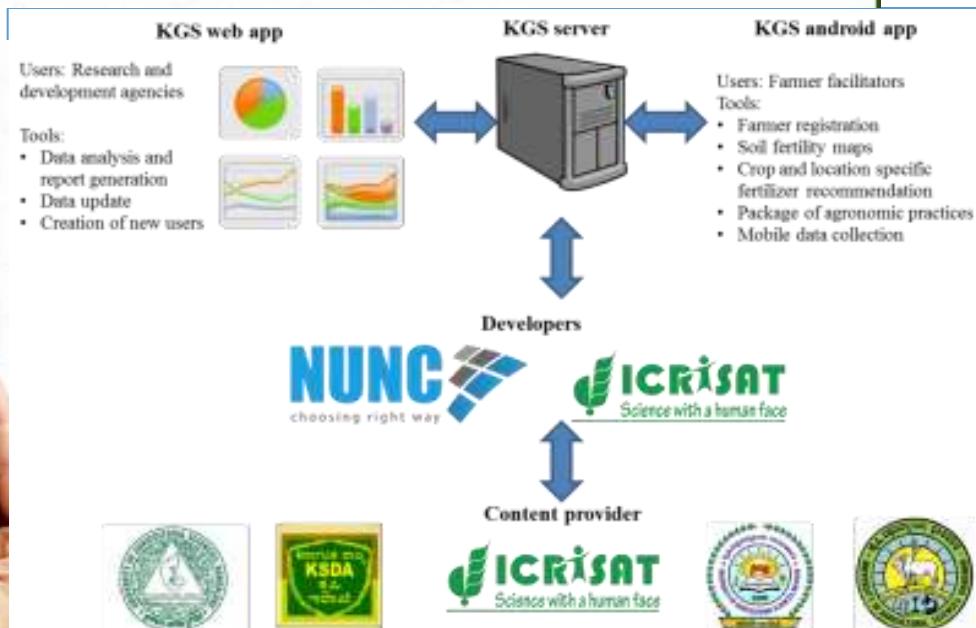
<b>ಖೂಬಿಕೆರ್ವನ್</b>			
ಕರ್ನಾಟಕದಲ್ಲಿನ ಸಾಮಾನ್ಯಾಧಿಕಾರ ಮೇಲೆ ನ್ಯಾಯ ಅನುಷ್ಠಾನ ವಿಭಾಗದ ವಿಭಾಗದ ಮುನ್ಸಿಪಲ್ ಅರ್ಮೆನ್ಸ್ ಪತ್ರ			
ಡಿಫೆಕ್ಷನ್ ನಂ.: K 21945	ಅಧಿಕ. ನಂ.: BB45		
<b>ಅಧಿಕಾರಿ, ಕ್ರಾಂತಿ</b>			
1. ಹೆಚ್ಚಿನ ವರ್ಣನೆ	1. ಮೊದಲಿನ್‌ನ್ಯಾಯ/ಕ್ರಾಂತಿ		
2. ಗ್ರಾಮ	2. ಮರಣ		
3. ಜಾವಾತ್	3. ದೀಪಾಲಿ		
4. ಮೆಂತ್ರ	4. ಮಾರ್ತಿ		
5. ರಾತ್ರಿ	5. ಶಾರ್ಕಾರ್		
6. ಮಾನ್ಯ ವರ್ಷ	6. 0.15 ಮ್ಯಾ.		
7. ಅಧಿಕಾರಿ ವರ್ಷ/ದಿನ	7. ಏಪ್ರಿಲ್ 2009		
<b>ಉತ್ತರ ಮಾನ್ಯಮಾನಿಕ ಅಧಿಕಾರಿ ಪತ್ರ</b>			
ಅಧಿಕಾರಿ ವರ್ಣನೆ ವಿಳಾಂಕು	ಅಧಿಕಾರಿ	ಹಿಂದಿನವರ್ಷ	ದಿನಾಂಕ
1. ಕ್ಲೋ. 2.000 (1.2 H.O)	7.1	2009-04-01	
2. ಕ್ಲೋ. 2.000 ಮತ್ತು ಕ್ಲೋ. (1.0 m <sup>2</sup> )	< 0.8	0.21	2009-04-01
<b>ಅಧಿಕಾರಿ ವರ್ಣನೆ ವಿಳಾಂಕು</b>			
3. ಅಧಿಕಾರಿ ವರ್ಣನೆ (%)	0.5	0.53	2009-04-01
4. ಅಧಿಕಾರಿ ವರ್ಣನೆ (mg kg <sup>-1</sup> )	5	5.7	2009-04-01
5. ಅಧಿಕಾರಿ ವರ್ಣನೆ (mg kg <sup>-1</sup> )	50	148	2009-04-01
<b>ಅಧಿಕಾರಿ ವರ್ಣನೆ ವಿಳಾಂಕು</b>			
6. ಅಧಿಕಾರಿ ವರ್ಣನೆ (mg kg <sup>-1</sup> )	10	5.8	2009-04-01
<b>ಅಧಿಕಾರಿ ವರ್ಣನೆ ವಿಳಾಂಕು</b>			
7. ಅಧಿಕಾರಿ ವರ್ಣನೆ (mg kg <sup>-1</sup> )	0.75	0.56	2009-04-01
8. ಅಧಿಕಾರಿ ವರ್ಣನೆ (mg kg <sup>-1</sup> )	0.58	0.32	2009-04-01
ಅಧಿಕಾರಿ :	ಅಧಿಕಾರಿ	ಹಿಂದಿನವರ್ಷ	ದಿನಾಂಕ
ಈ ಪತ್ರವು ಕರ್ನಾಟಕದಲ್ಲಿನ ಸಾಮಾನ್ಯಾಧಿಕಾರ ಮೇಲೆ ನ್ಯಾಯ ಅನುಷ್ಠಾನ ವಿಭಾಗದ ವಿಭಾಗದ ಮುನ್ಸಿಪಲ್ ಅರ್ಮೆನ್ಸ್ ಪತ್ರ ಎಂಬ ಅರ್ಥದಿಂದ ಮಾಡಿದೆ.			



## Krishi Gyan Sagar: An Innovative Tablet Mediated Extension System

### Goal

**Establish linkages between research-extension-markets through innovative ICT mediated Extension Systems and Public-Private Partnerships for improving productivity and profitability of smallholder agriculture**





## A Green SIM enabled mobile innovations for disseminating right information at the right time through public-private partnerships



"Earlier we used to take advice from the shop dealer on mixing of pesticides, but now with Krishi Vani's information advisory service we are able to figure out the accurate dosage. It saves money"



- Experimentation is in progress in three experimental hubs located in Mahabubnagar & Ananthapur districts in Andhra Pradesh and Bhoochethana districts in Karnataka
- Each experimental hub is unique and experiments are carried out with different set of partners to test the hypothesis
- Pilot covers 15000 farmers in 171 villages; 35 free voice messages per week per farmer in 16 categories in multiple languages

Info-entrepreneurs/farm facilitators generated Rs. 31,000 Indian Rupees in 15 working days



International Crops Research Institute  
for the Semi-Arid Tropics



CGIAR  
A member of the CGIAR Consortium

This work has  
been undertaken  
as part of the



Government  
of Andhra  
Pradesh

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been undertaken  
as part of the



Government  
of Andhra  
Pradesh



RDT

Adarsha Mahila Samakya



IFFCO

airtel

Farmer facilitator is screening the video for group of women using battery operated portable projector

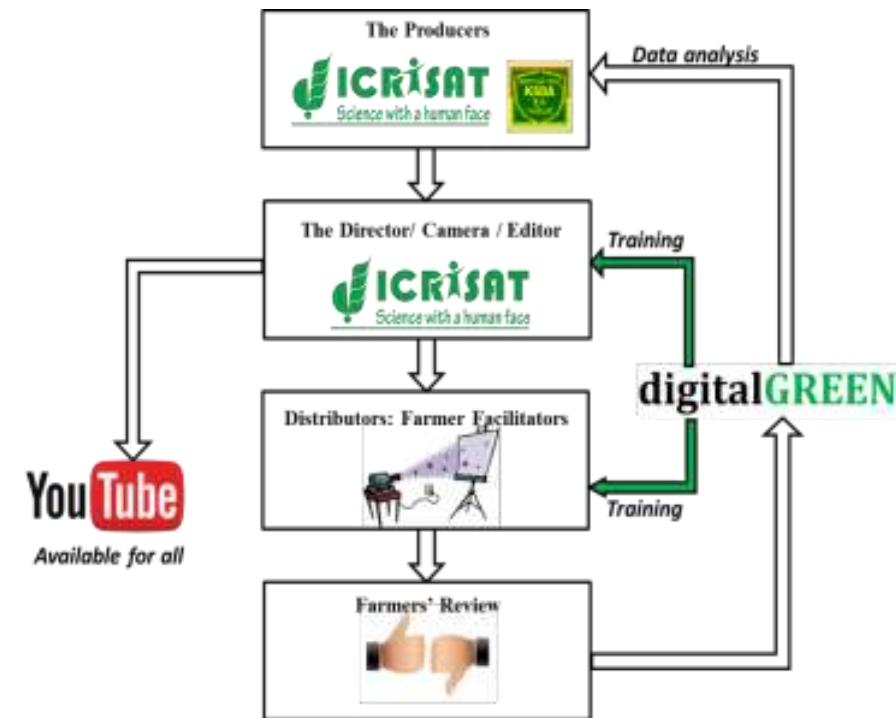
# Farmer to Farmer Video



**Hadycam being used for recording the videos in field.**



**Farmer facilitator is screening the video for group of women using battery operated portable projector**



# Applications based on soil fertility data



The image displays two screenshots of mobile applications for soil fertility management:

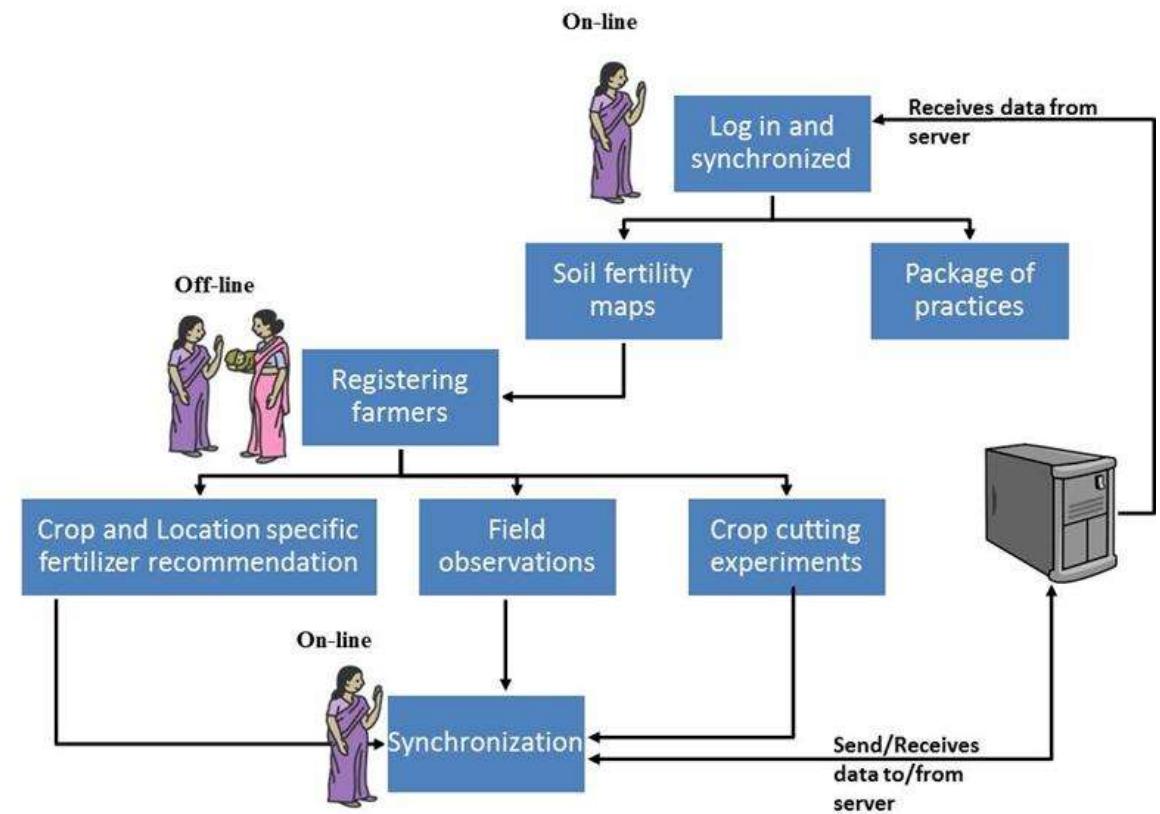
**Top Screenshot: Soil Fertility Maps**

- Header: Soil Fertility Maps
- Left sidebar: Fertiliser, Exit, ICRISAT logo.
- Map: Shows districts of Karnataka with soil fertility levels indicated by color. Labels include Jamkhandi, Mudhol, Bilgi, Bagalkot, Badami, and Hungund. A legend indicates Taluks boundary and Organic Carbon (%): 0.3 - 0.5 (Deficient) and 0.6 - 0.8 (Normal).
- Bottom: Home, Back, Forward, Stop buttons.

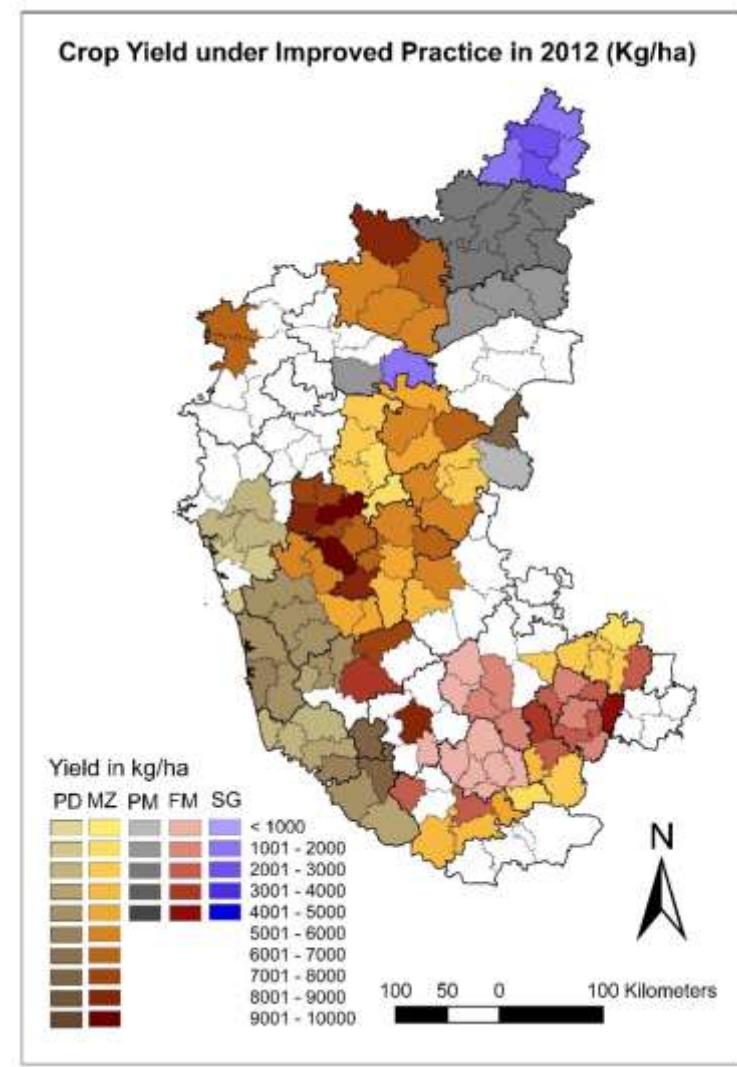
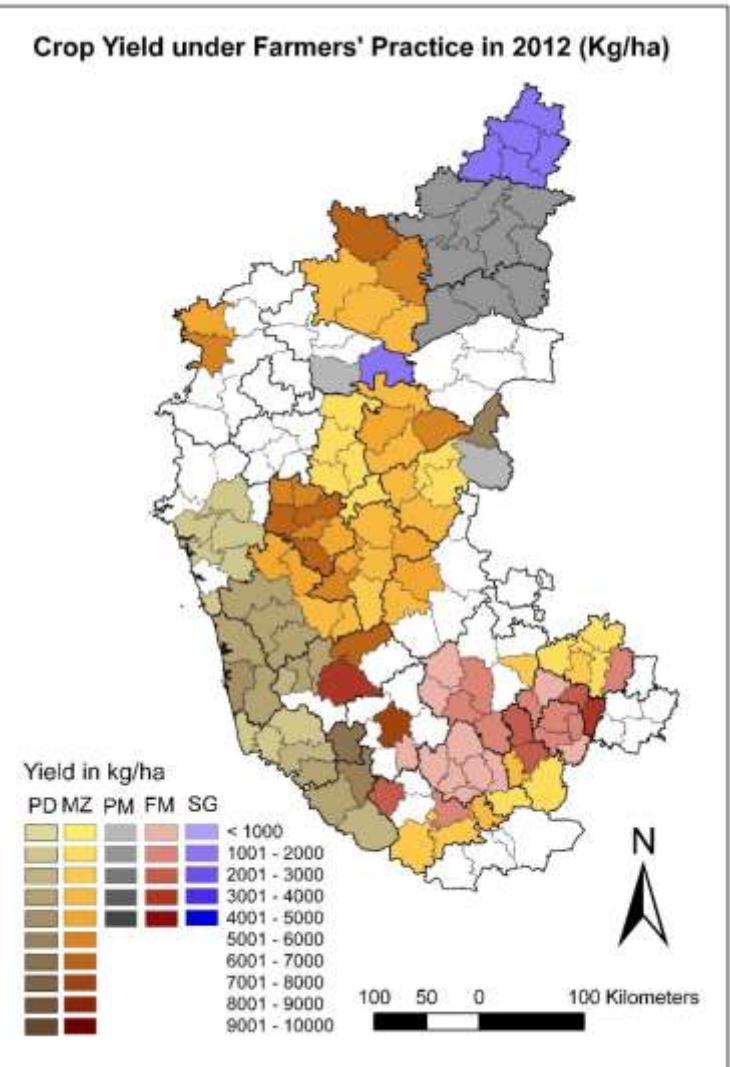
**Bottom Screenshot: Agricultural Information System**

- Header: Agricultural Information System
- Left sidebar: Cropinfo, Fertiliser, Exit, ICRISAT logo.
- Title: Soil Test Based Fertilizer Recommendations
- Text: Select Crop and Touch Button
- Table:

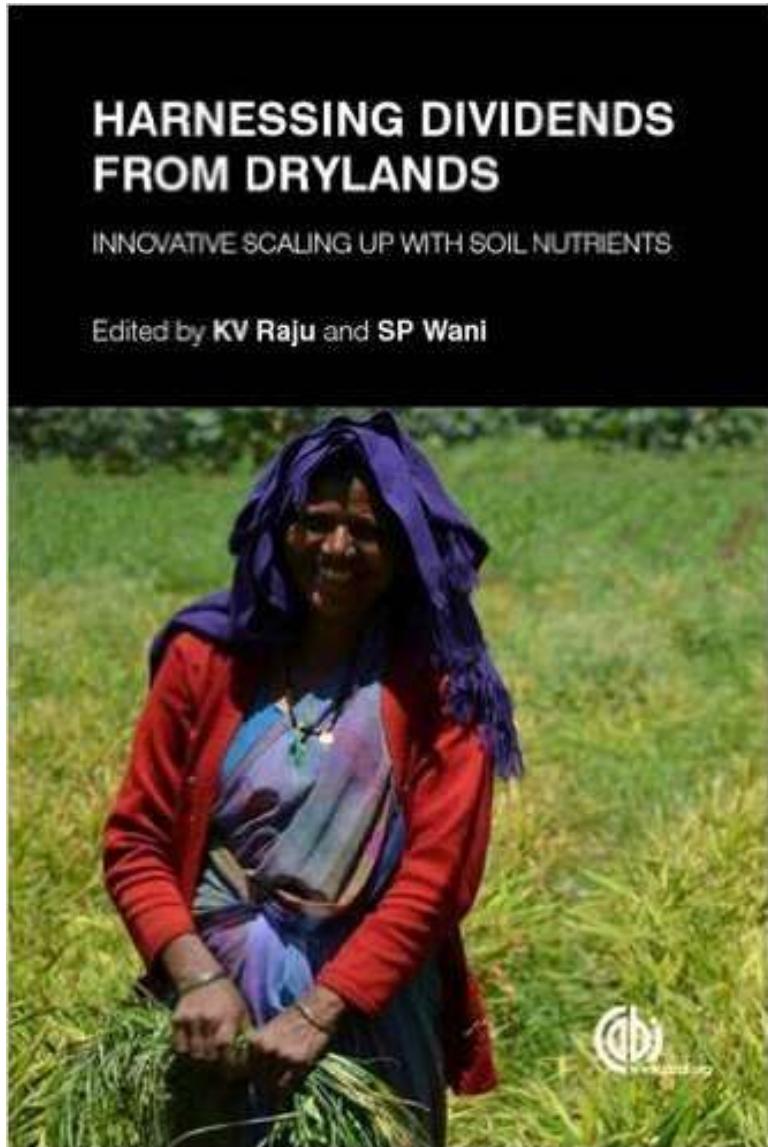
Crop Category	Crop Name	Action
Cereals	Baby corn	Select
Pulses	Blackgram	Select
Oil seeds	Castor (Irrigated)	Select
Cash crops	Beedi Tobacco	Select
Vegetables	Lemon	Select
- Bottom: Home, Back, Forward, Stop buttons.



# Spatial Variability (Improved vs Farmers Practice)



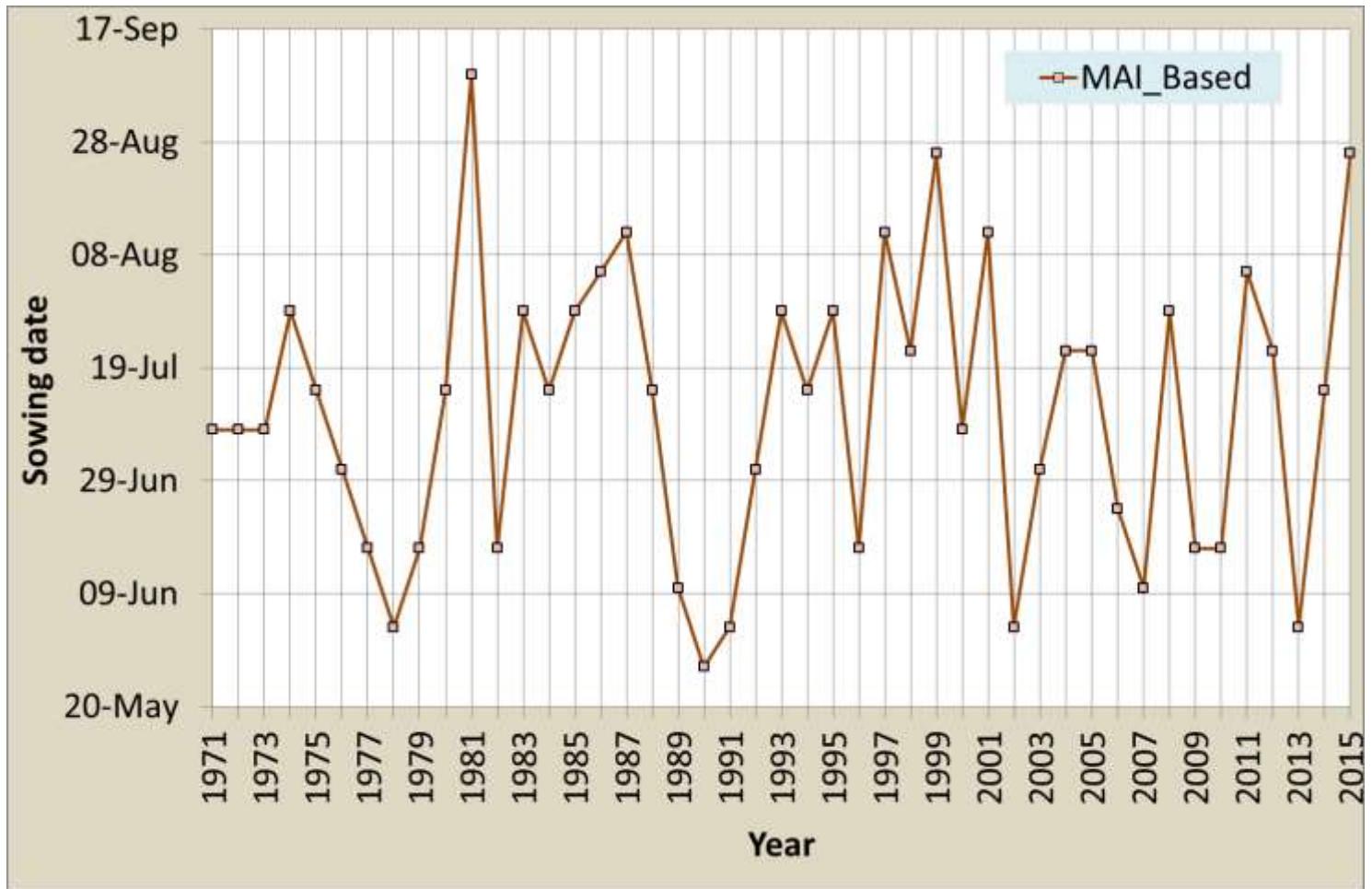
# Impact



- Increased crop yield by **20 – 66%**
- Rise in agriculture growth annually above **5%** since 2009
- Benefit cost ratio for the farmers **3-14:1** resulting in average gain of US\$500 per ha per season
- Net benefits accrued in 5 years **US\$ 353 million**



## Great Variability in rainfall and Monsoon Setting Time



Great year-to-year variability exists, making rainfed cultivation a challenge

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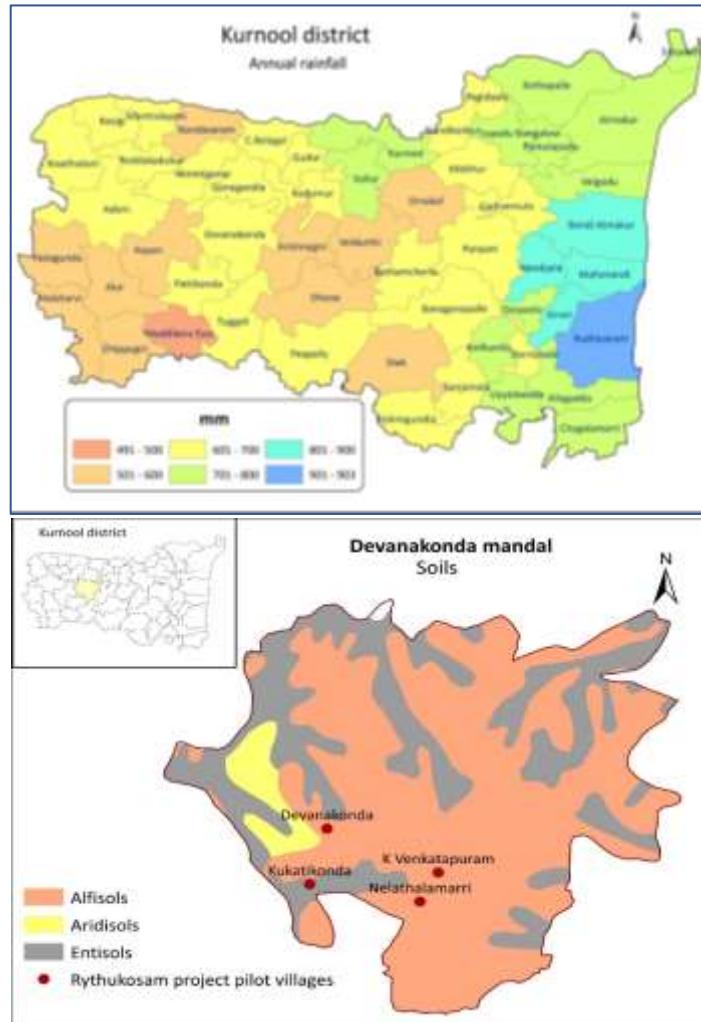
## ICRISAT, Microsoft and aWhere Developed Sowing Date App under AP Rythu Kosam Project



- Developed sowing date application
- Piloted in 2 districts based on water balance calculations taking into consideration rainfall forecast from aWhere using Moisture Adequacy Index (MAI)
- Current observed rainfall and predicted rainfall for the next five days
- Advisory is communicated thru voice mail and SMS based on the Predicted Sowing Date



# Components of Sowing app



**Rainfall data:**  
• Actual  
• Forecast

**Soil properties**

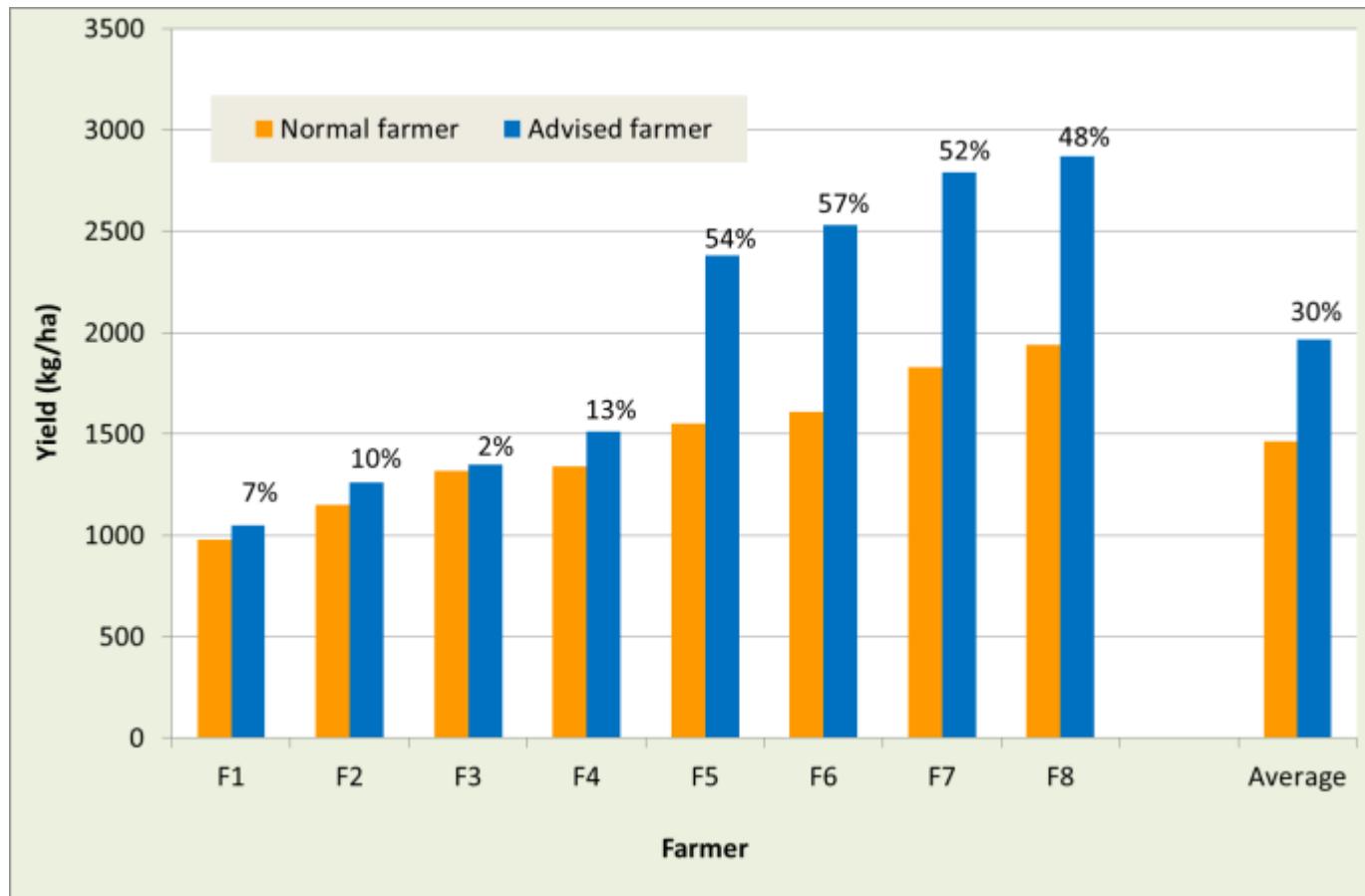
Soil water  
balance  
simulation

Sowing period



# Devanakonda, Kurnool district

Groundnut yields in Kharif 2016



Figures above blue bars indicate percentage increase in yield



## Media Coverage

# THE WALL STREET JOURNAL.

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### New App Promises to Tell Indian Farmers When to Sow Crops

Farmers in Andhra Pradesh can sign up for an app that shows them the weather and prime planting days



By Vibhuti Agarwal

Jun 17, 2016 5:00 pm IST

Monsoon season in India has just begun, but farmers in Andhra Pradesh, a southeastern coastal state of India, won't need to look to the skies to know when to sow their crops. A new mobile application launch earlier this month and developed by a local agricultural research institute, Microsoft India and the state government

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## Advisories based on sowing date application



Date	Topics
15 Jun 2016 20 Jun 2016	Keeping required fertilizers ready as per soil-test based recommendation, land preparation, farm yard manure application
24 Jun 2016 27 Jun 2016 28 Jun 2016	Sowing recommendation, seed treatment, optimum sowing depth, preventive weed management
04 Jul 2016 08 Jul 2016	Weed management, maintaining proper plant density
17 Aug 2016	Observing Boron and Zinc deficiency in field and applying nutrients if needed
12 Oct 2016 14 Oct 2016	Recommendation on harvesting, shade drying of harvested pods and storage

# Need for Water Saving Technologies/ Knowledge: Water Impact Calculator



- Farmers have little access to new knowledge/technologies in developing countries
- Complex and data intensive water balance models and other technologies are used by researchers
- Farmer-friendly knowledge-based decision support system is urgently needed
- Not only water could be saved but also nutrient use efficiency productivity could be enhanced with minimal degradation of natural resources

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## **Sujala III: Digital Library (DL), Decision Support System (DSS), and Land Resource Inventory (LRI) Portal**

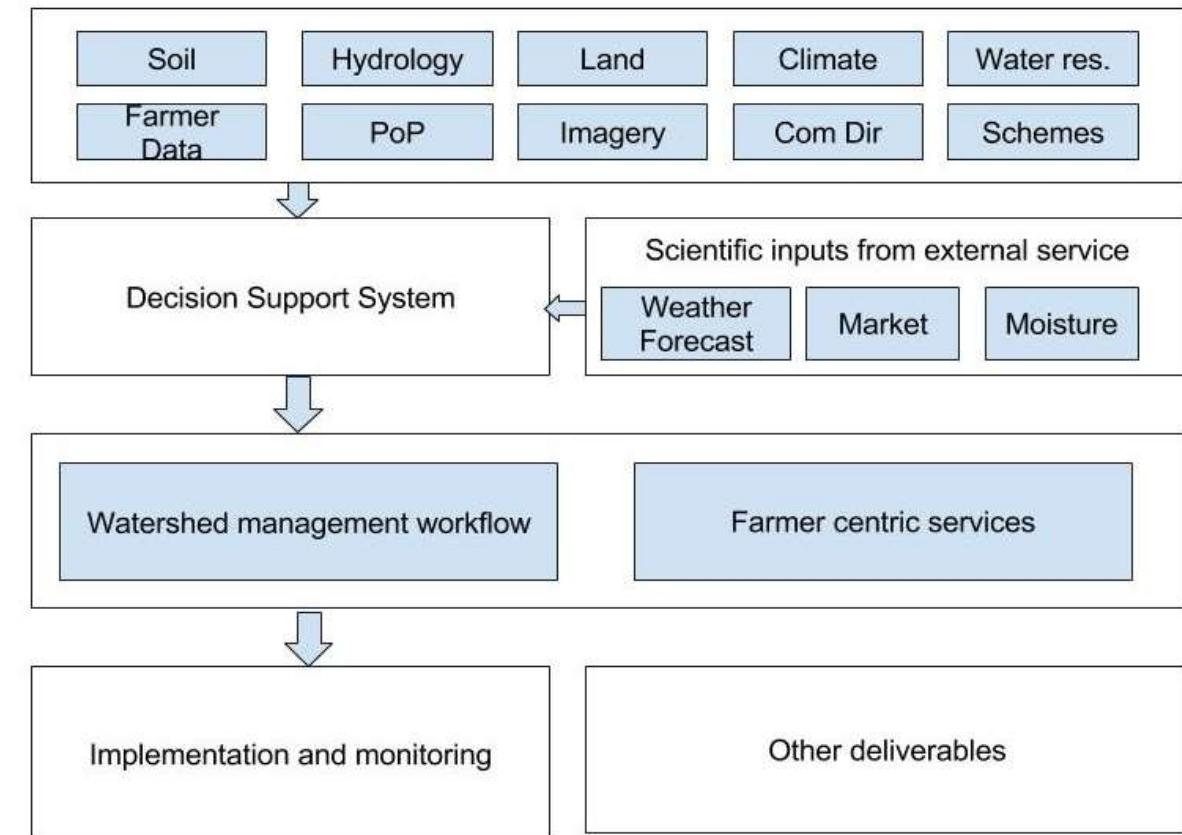
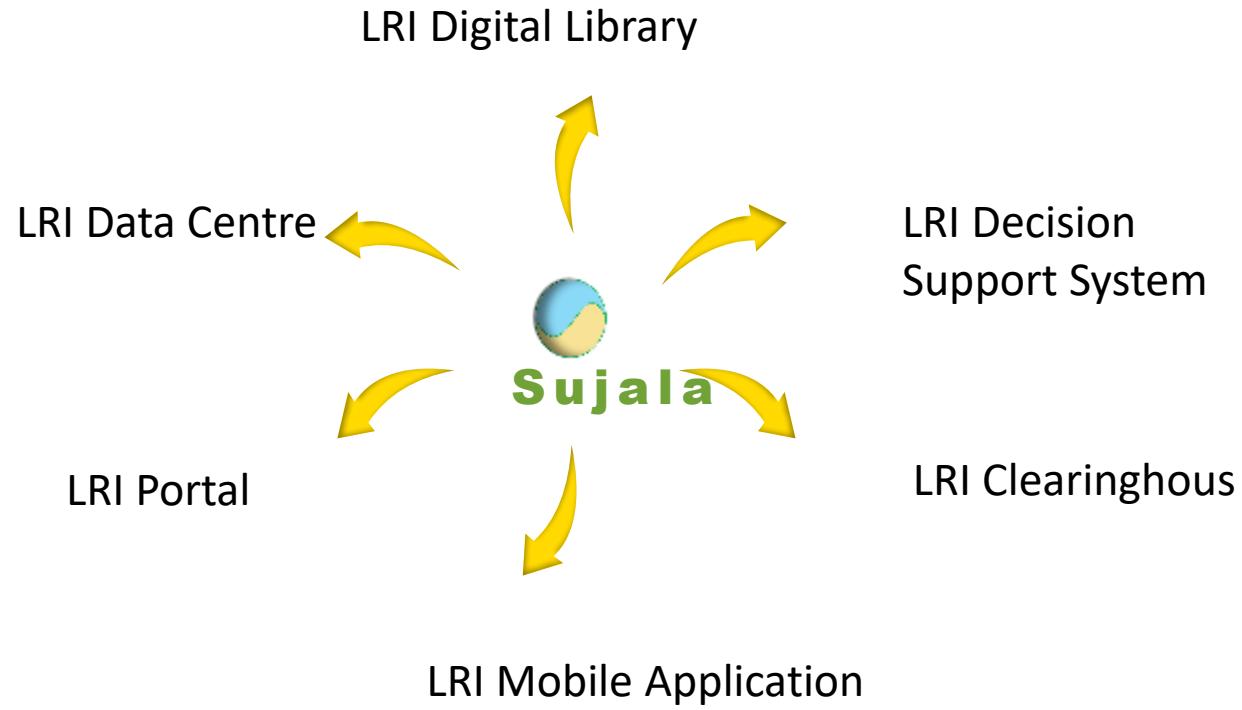
<http://watershed.kar.nic.in/SujalalIII.htm>



**Objective:** To facilitate WDD for establishing Digital Library (DL), Decision Support System (DSS), and Land Resource Inventory (LRI) portal for effective planning, implementation and monitoring of watersheds and other developmental activities



# Components of LRI in Sujala III





## Digital Agriculture: Upgrade Delivery Systems

- For effective delivery, monitoring and information dissemination for achieving the impact
  - ❖ ICT for innovative extension systems
  - ❖ Green SIM card distribution to farmers
  - ❖ ICRISAT in collaboration with Microsoft piloted Climate/Weather information services & advisories in Kurnool and Kadappa (~500 farmers)
  - ❖ Use of Satellite imageries for mapping crop area under irrigation (Nellore)
  - ❖ Water impact calculator is developed and pilot tested.





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# Thank You



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ICRISAT is a member of the  
CGIAR System Organization