ST 4 AR

e-Governance vis-à-vis e-Agriculture

Global Focus on Agriculture

2014 International Year of Family Farming

2015 International Year of Soils

2014 Year of Farmer Producer Organizations

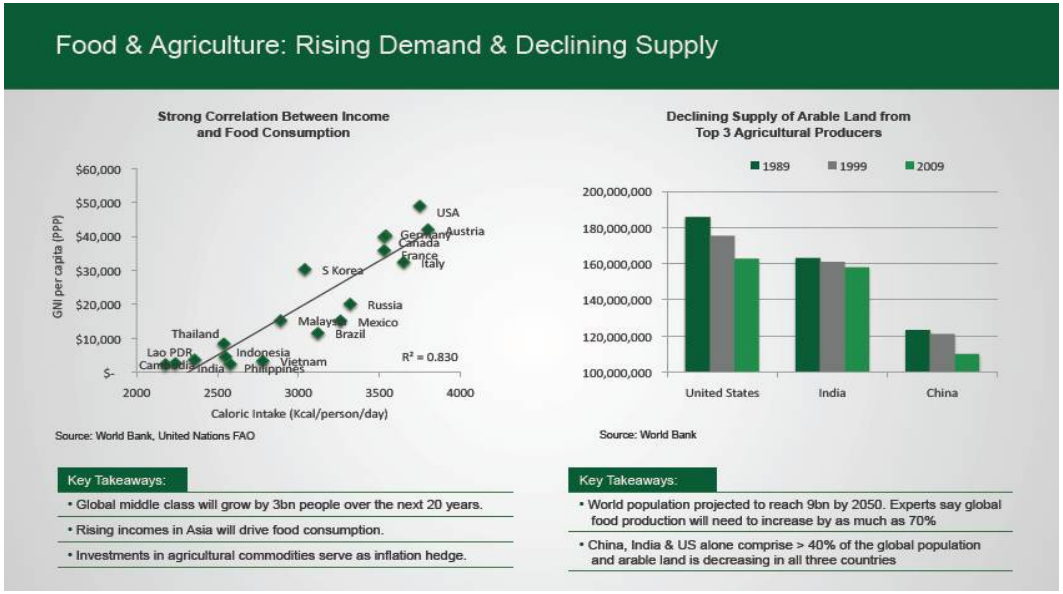
Soils are the Foundations for Family Farming

2016 – International Year of Pulses

Dr. Borlaug's last words: "Take it to the Farmer"

The Greatest Challenge in Human History

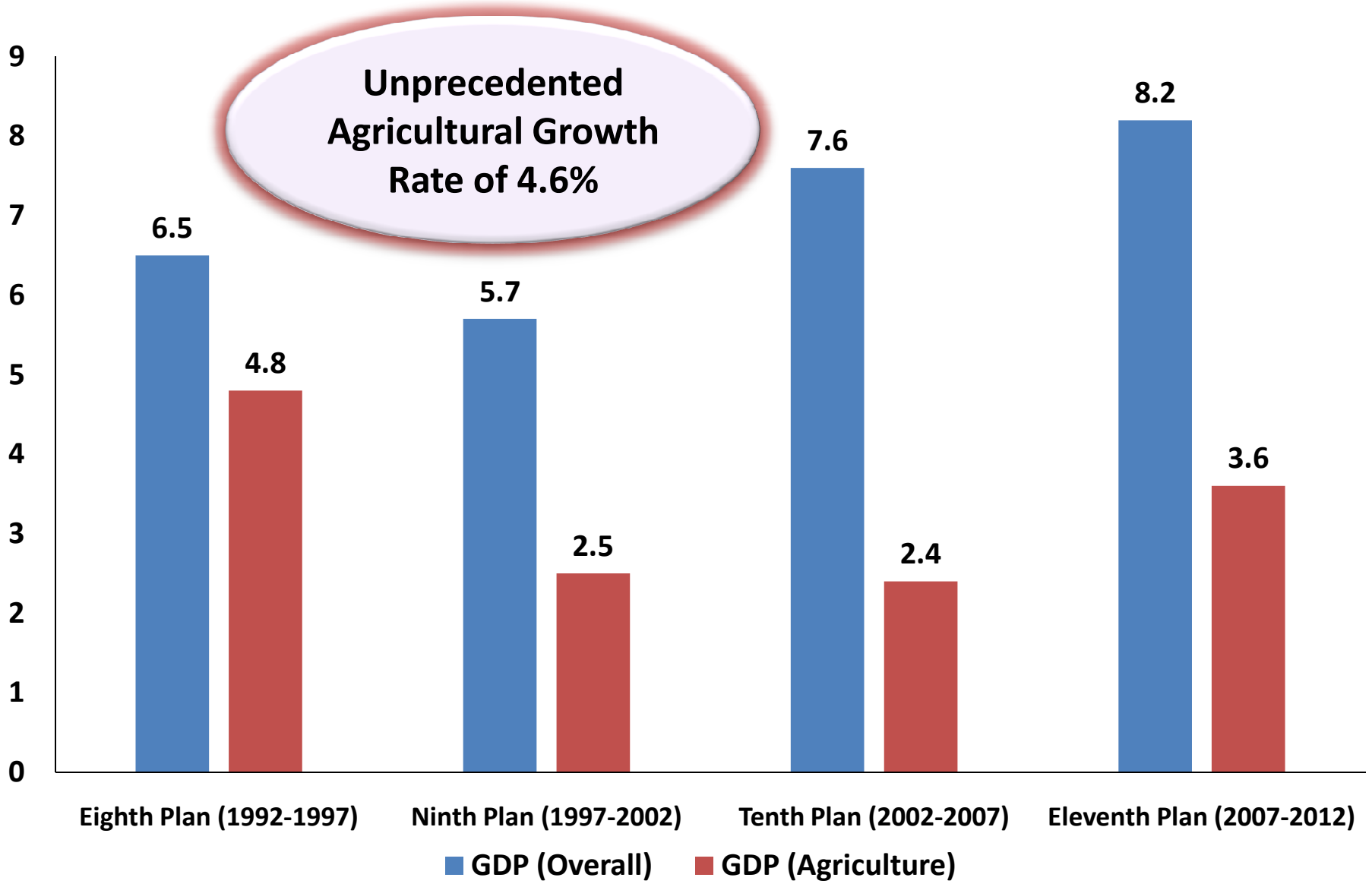
Sustainably Feeding 9 Billion People by 2050



World Food Supply:
We will have to double it by 2050

- 80% of future growth must come from lands already in use
- Most of the production growth must occur in countries where it is consumed
- Limited potential for land expansions, except in the Americas and Sub-Saharan Africa
- Irrigation expansion crucial to meeting food demand

National Agricultural GDP



Technology-led Indian Agriculture

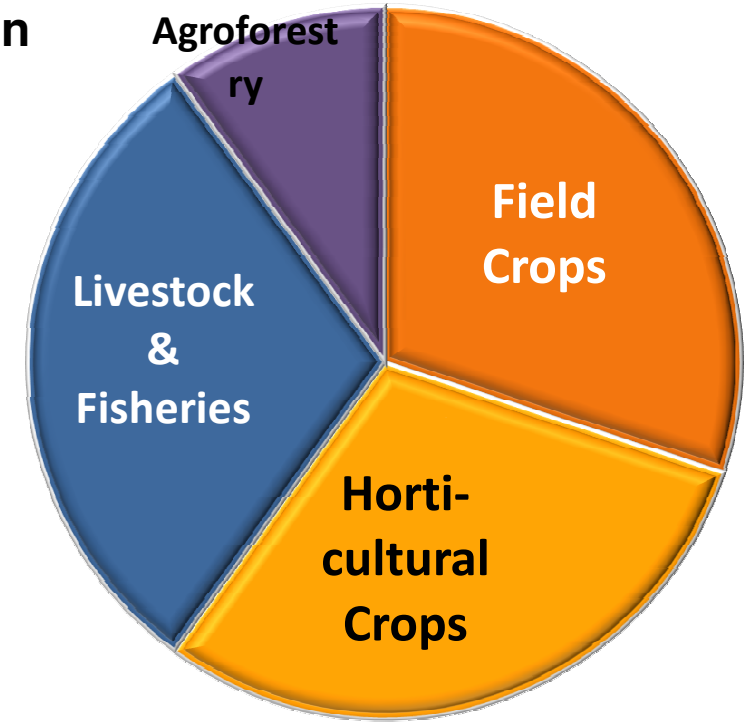
Traditional Farming (Early 1900s)

Mechanization (1960s)

Green Revolution (1970s)

Biotech and Nanotechnology Era (2000s)

Knowledge-based Agriculture

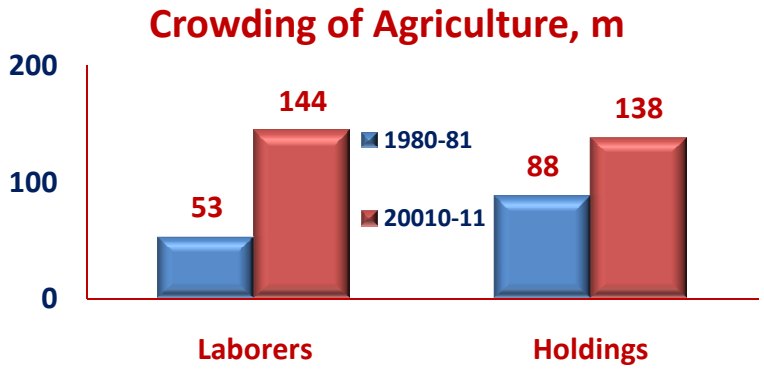


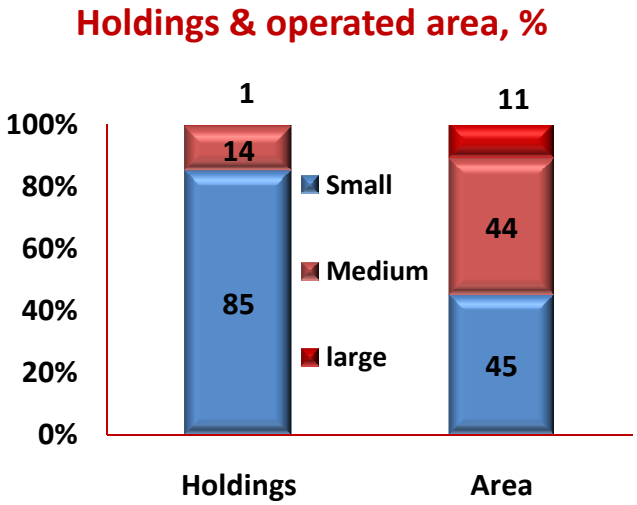
Efforts in Agricultural R&D

Farmers' Challenges

Small Farmers: The Core of Indian Agriculture

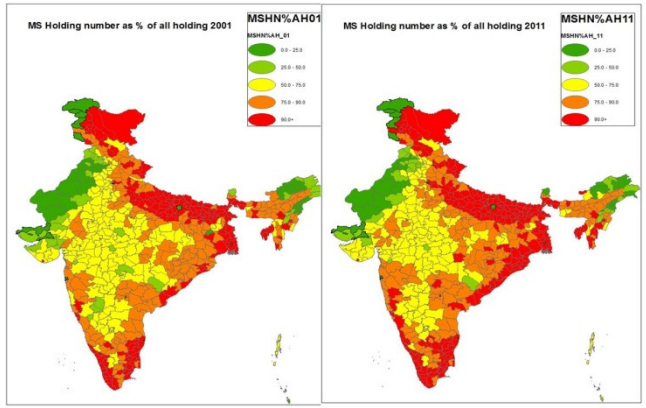
- 17.6% of the world's human & 15% livestock population and counting
- 4.2% of the world's water
- 2.4% of the world's area
- 142 m ha cultivated & 63.6 m ha net irrigated
- 140% cropping intensity
- 52% of population earns livelihood in agriculture
- 13.8% contribution in GDP;
  14.1% earning of total exports





Total Land	328.7 mha
Forest Area	70 mha
Misc. Tree Crops	3.4 mha
Agricultural Land	182.5 mha
Degraded land	59.3 mha

Food Grains	265 mt
Horticulture	269 mt
Pulses	19 mt
Milk	132 mt
Fish	9.5 mt
Eggs	70 b
Meat	5.9 mt



1 in 3

PEOPLE WORK IN AGRICULTURE WORLDWIDE

SMALLHOLDERS PRODUCE

80%

OF FOOD CONSUMED IN DEVELOPING COUNTRIES

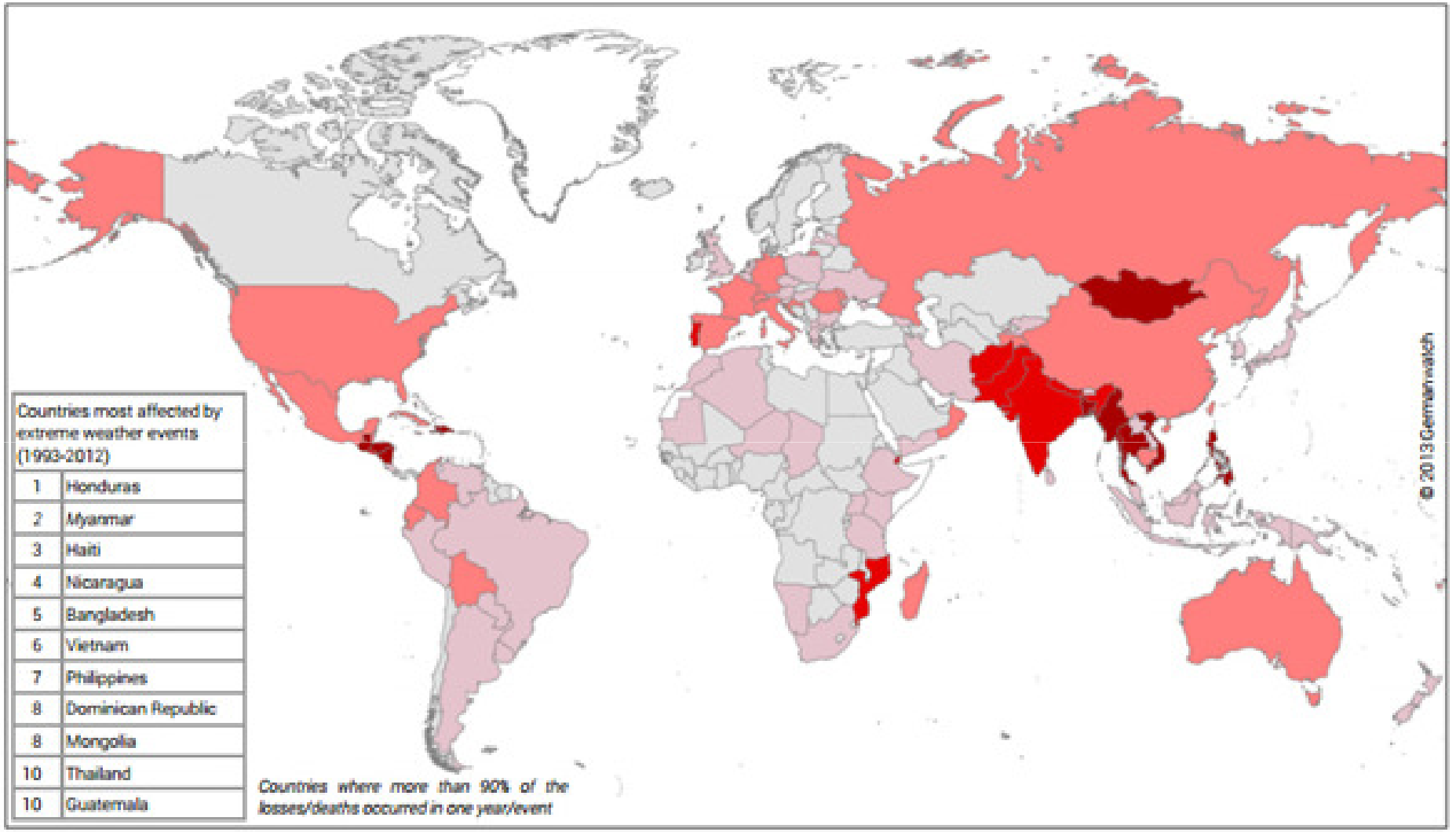
60%

OF CHILD LABOURERS WORK IN AGRICULTURE

49.5%

OF THE WORLD LIVE IN RURAL AREAS

World Map of the Global Climate Risk Index, 1993-2012



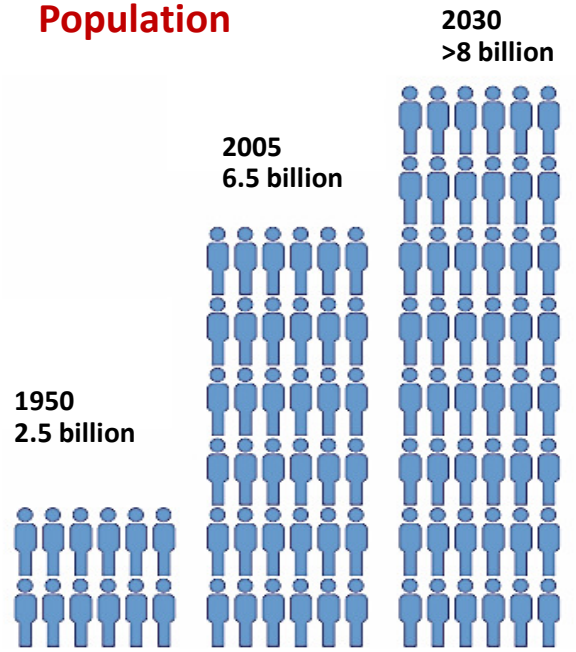
Climate Risk Index: Ranking 1993 – 2012

1 - 10 | 11 - 20 | 21 - 50 | 51 - 100 | > 100 | No data

Pressures on Natural Resource Base

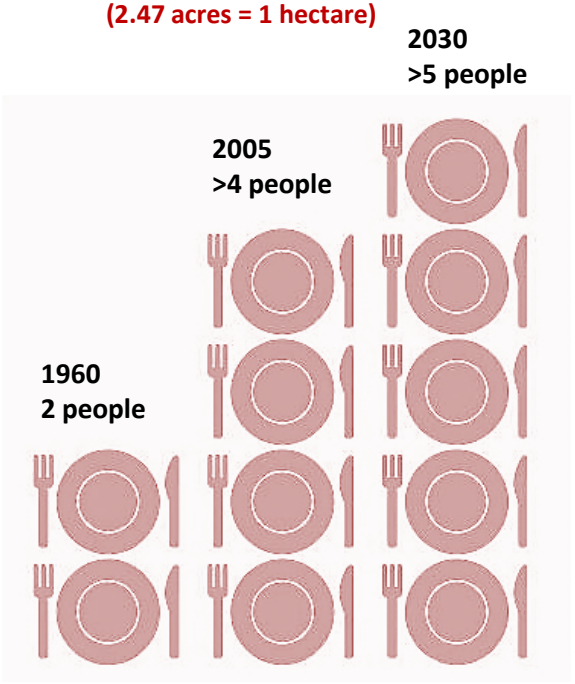
	(million ha)
Land degradation	107.43
Water erosion	57.15
Degraded forests	24.90
Wind erosion	10.46
Salt-affected	6.32
Acid-affected	12.00
Others	8.60

World Population

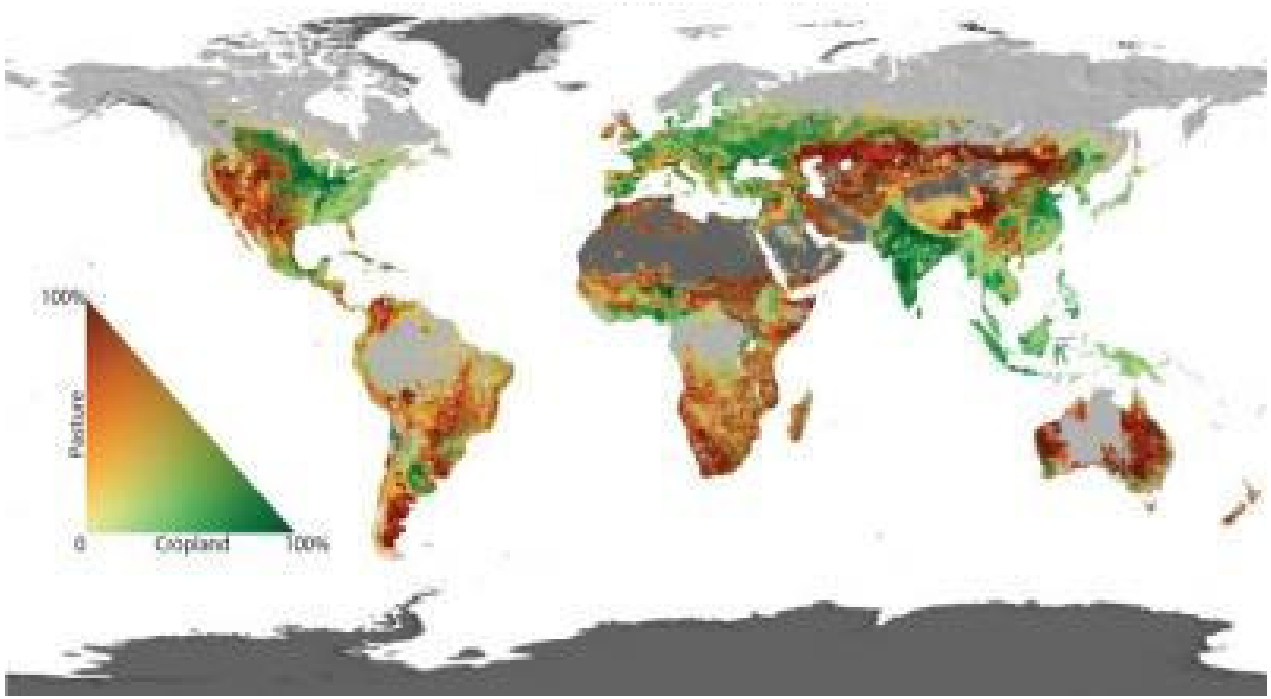


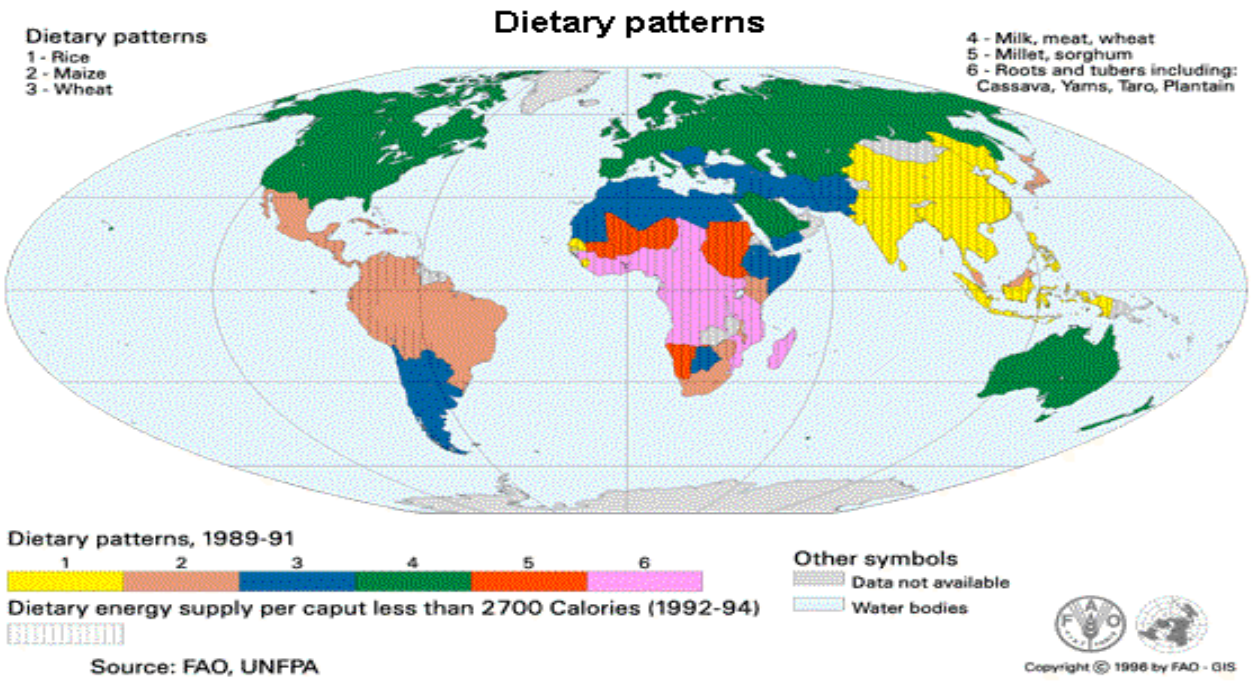
People fed per hectare

(2.47 acres = 1 hectare)



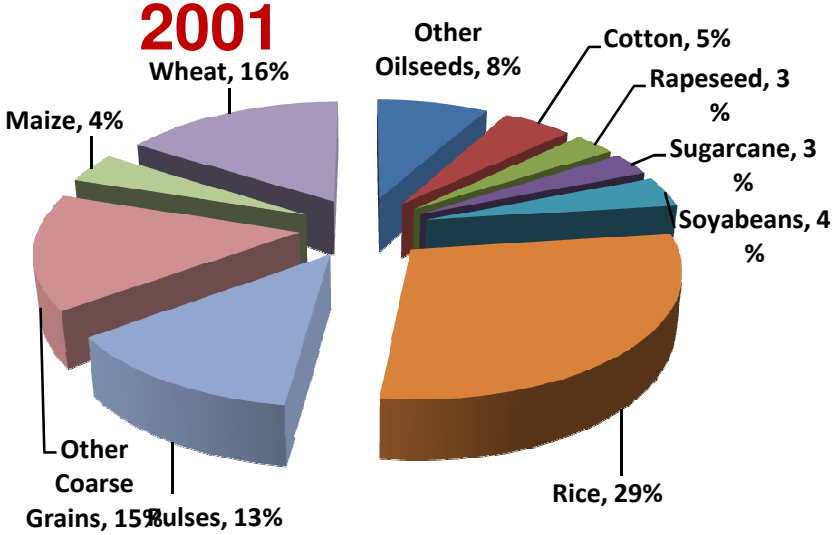
Agricultural Lands & Dietary Patterns of the World



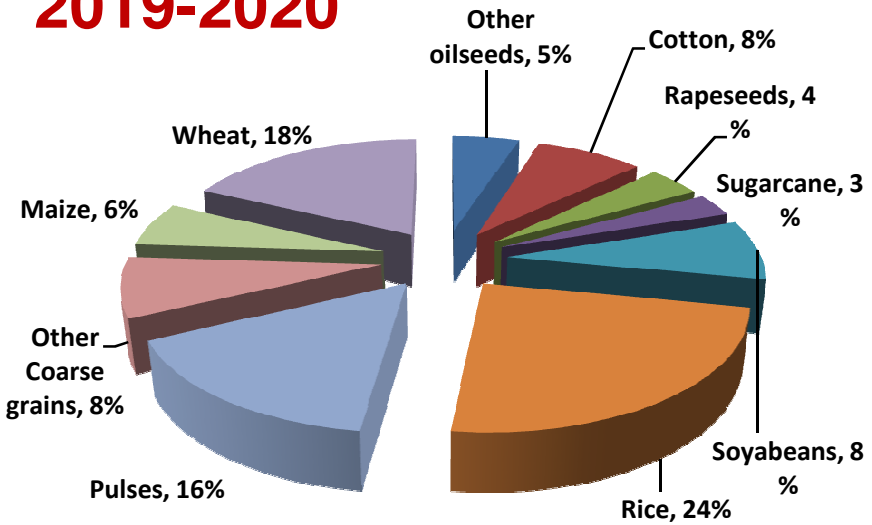


Cropping Pattern – Past, Present & Future

2000-2001

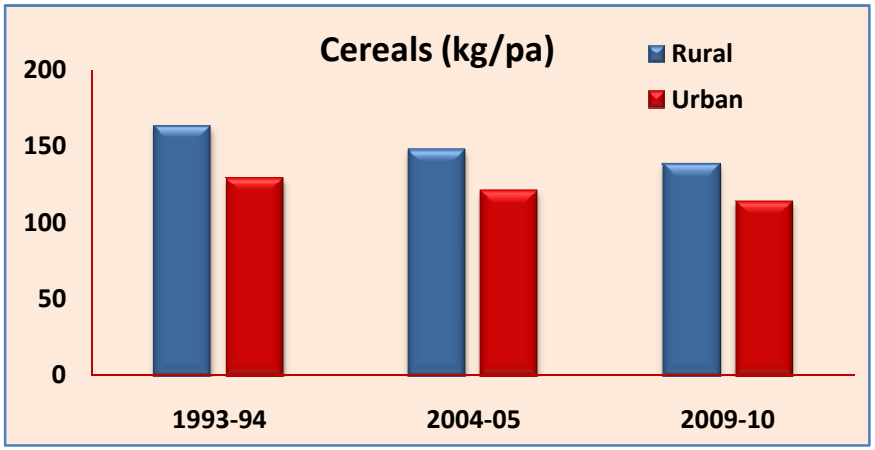


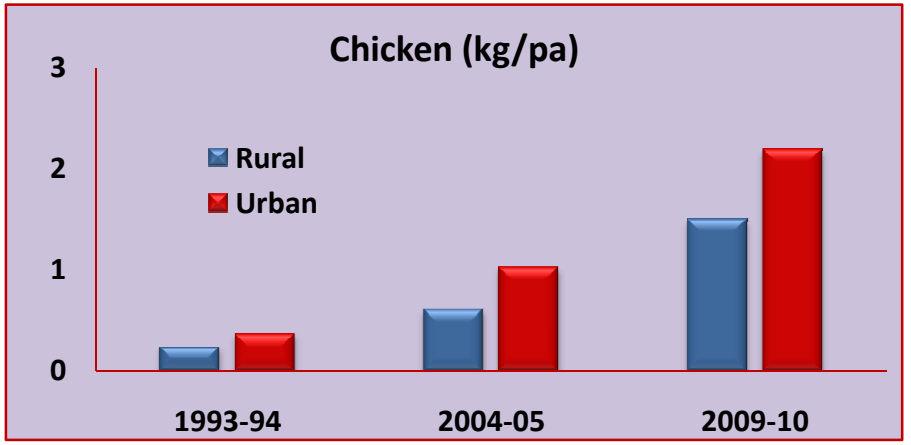
2019-2020



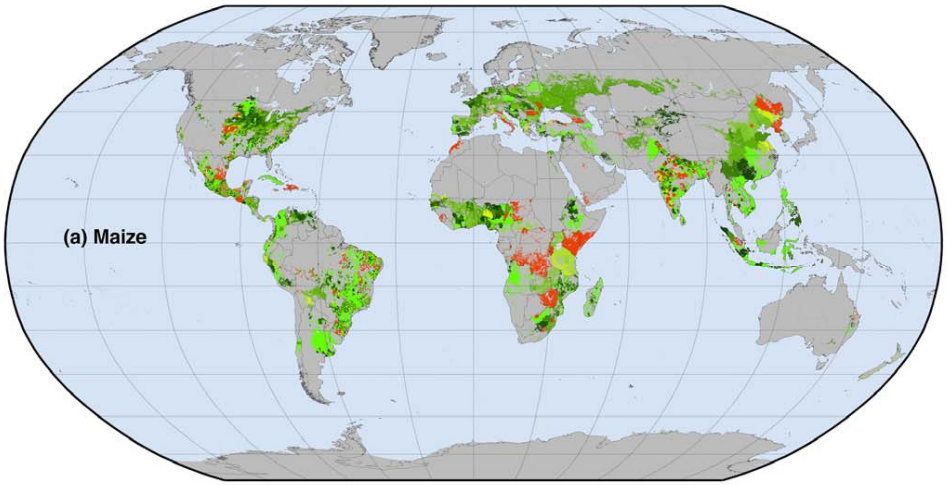
Changing Consumption Pattern

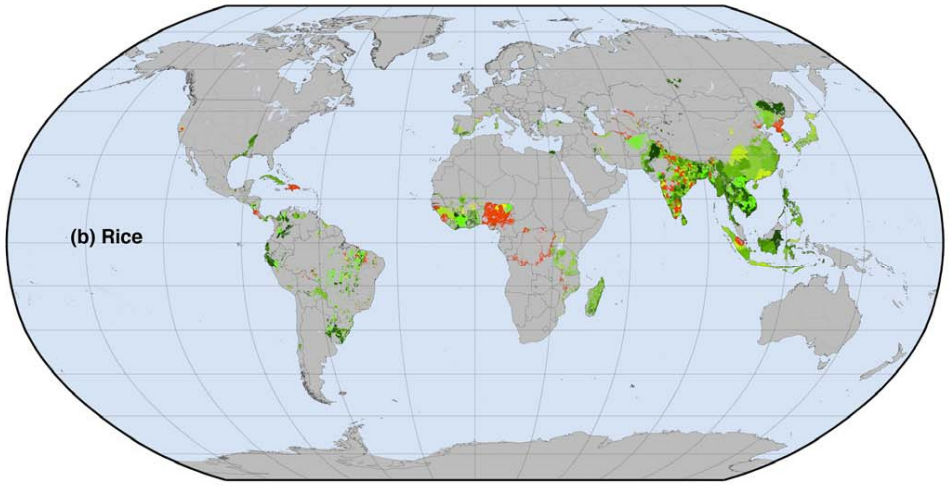
Increasing non-grain crops and animal products in daily nutritional intake

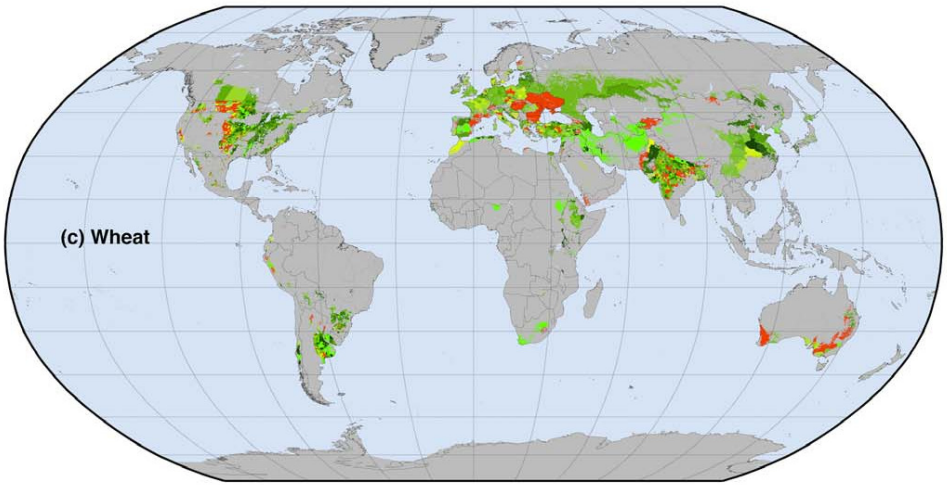


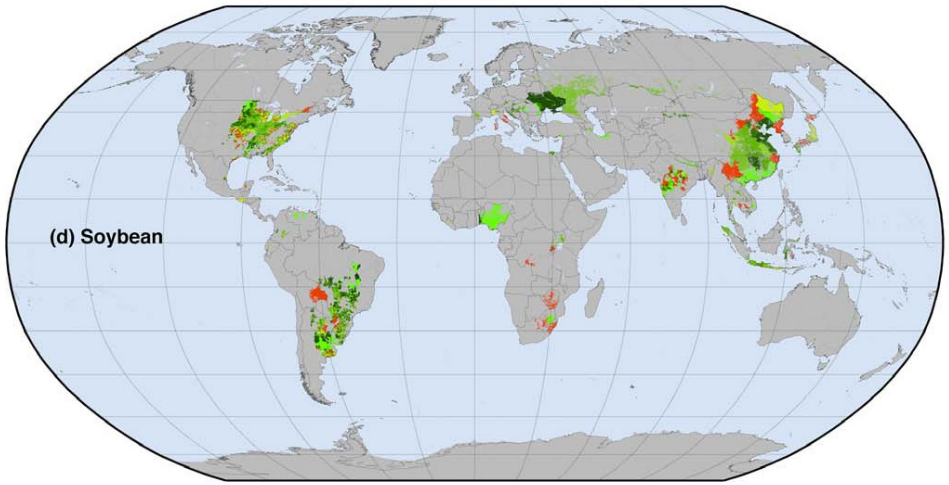


Global Trends: Observed Rates of % Yield Change Per Year



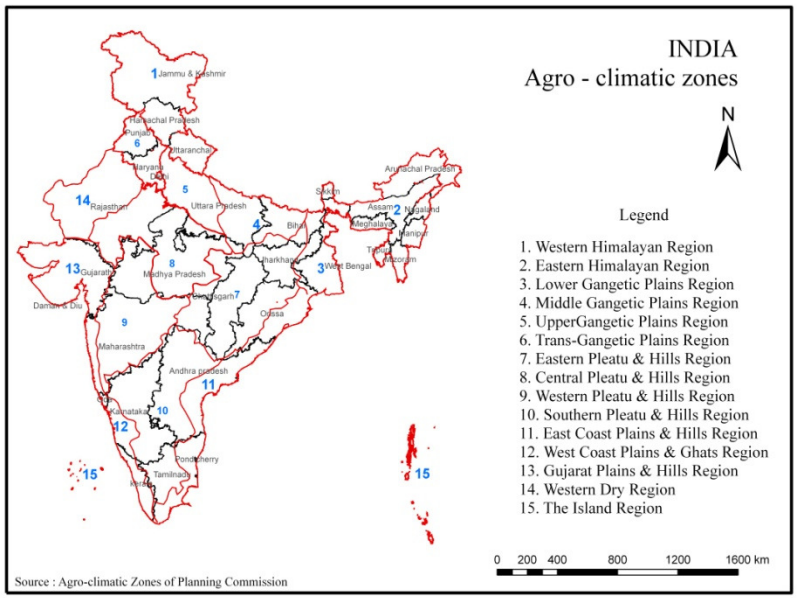






Space Applications in Agriculture

- India making significant progress in space technology
- Space technology is being used in various fields such as like
  defense, medicine, agriculture, water conservation and weather forecasting
- Satellite sensors provide valuable database to arrive at suitable decisions in maintaining productive capabilities of agro-ecosystems
- At present India has nine remote sensing satellites making it as one of the largest constellation of remote sensing satellites in the world



Space Technology and ICAR

- First remote sensing (RS) experiment in country (1969) on coconut wilt disease in collaboration with ISRO & NASA
- ISRO–ICAR Joint experimental programmes (JEP) since 1980s on Optical and Microwave RS
- RS & GIS courses (1980s) in PG Programmes of NARES
- Application in NRM, Crop Sciences, Horticulture, Fisheries and Animal Sciences

smart farming
4
small farmers

Applications in Agriculture

- Crop and Land use Planning, Soil and Water Conservation and Agroforestry Mapping
- Satellite sensors provide valuable database for suitable decisions in maintaining productive capabilities of agro-ecosystems including fisheries
- Surveillance of pests and diseases in crops and animals

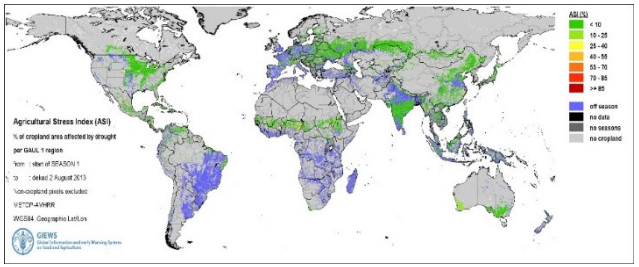
NBSS&LUP
The Nodal Institution

Data Collection, Sharing, Management and Integration

- **Soil Resource Database at different scale**
  - **Benchmark sites (1:1 M scale)**
  - **State level (1:250,000 scale) under SRM**
  - **District level (1:50,000 scale)**
  - **Farm level (1:12,500 scale)**
- **Agro-Climatic database**
- **Soil Spectral Data**

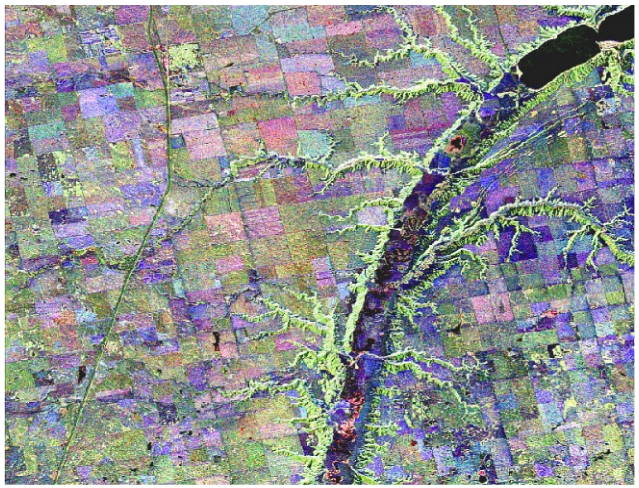
Current Research on Space Technology for Agricultural Research

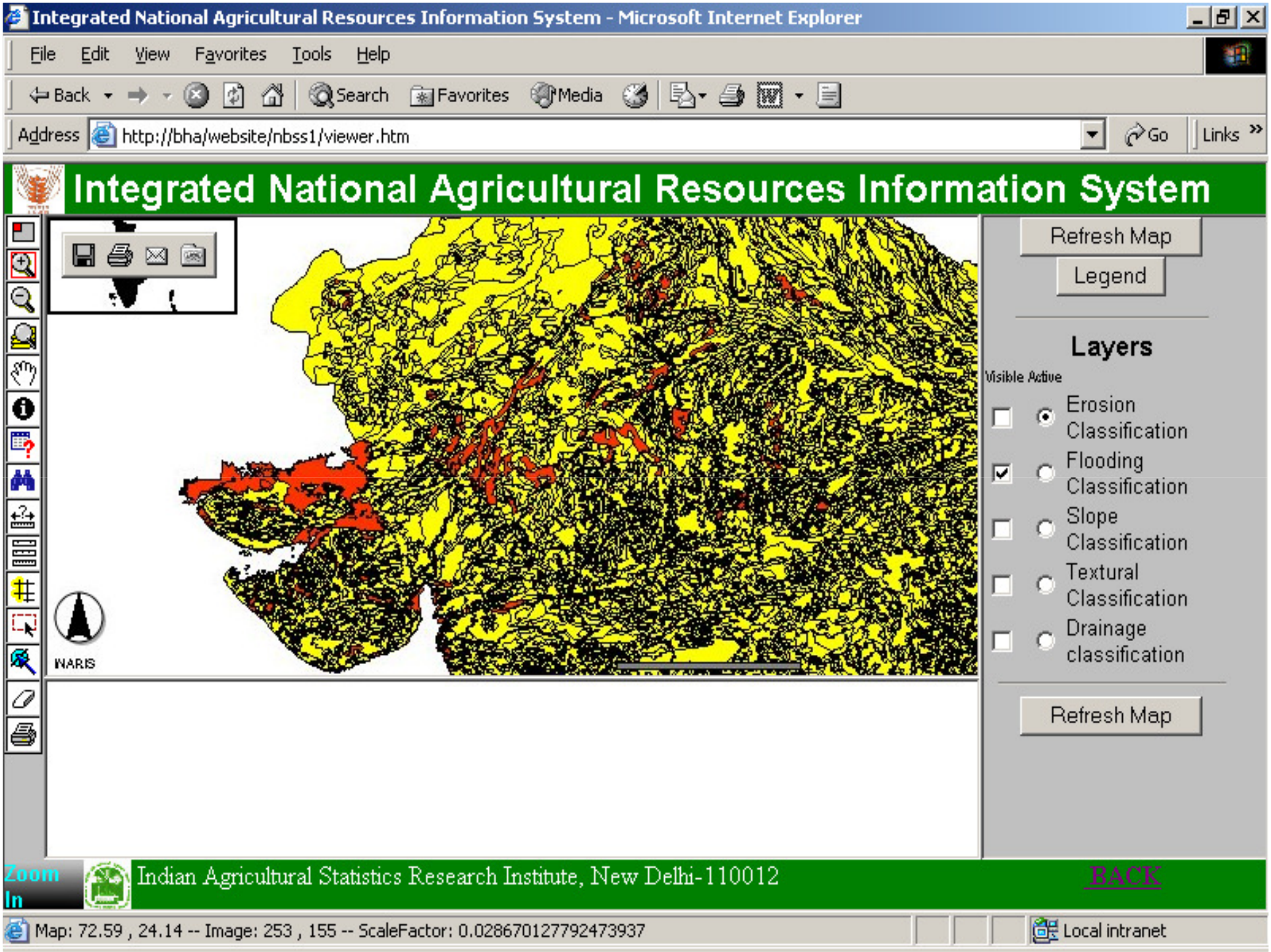
- **Mapping and Yield Modeling of different Crops**
  - * Spectral signature library of different crops and soils
  - * Research on crop discrimination techniques for mapping,
  - * Remote sensing based hybrid yield modeling
  - * Cropping systems analysis
  - * Crop biophysical parameter retrieval
  - * Mapping agroforestry areas



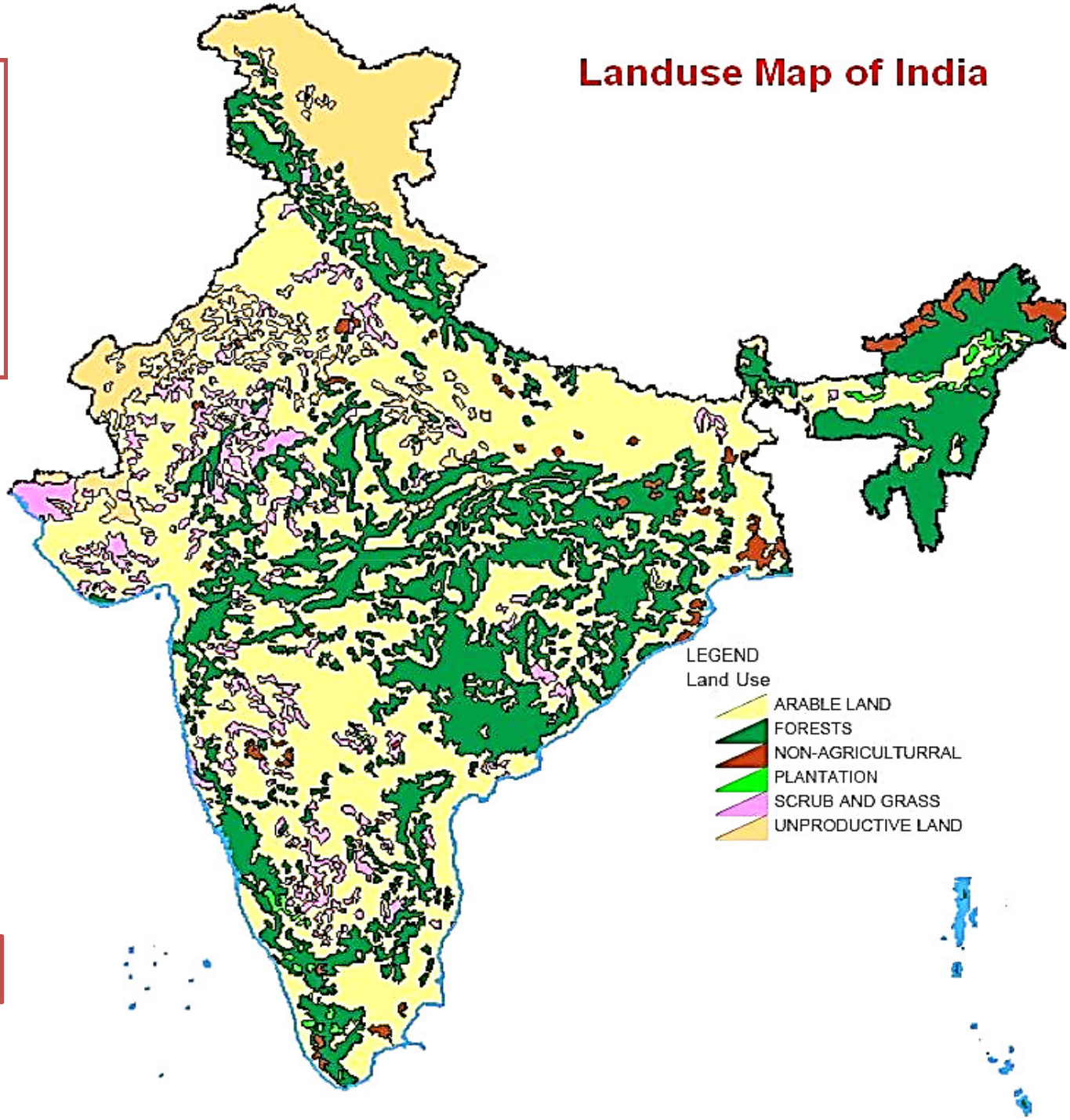
- **Crop Growth Condition Monitoring**
  - * Evaluation of Remote Sensing indices for crop health, agricultural drought
  - * Indices for pest and disease infestation
  - * Indices for water, terminal heat and nutrient stress
  - * Vulnerability assessment for drought and climate change

- **Resource Monitoring and Mapping**
  - * Soil Mapping at 1:50000 scale
  - * Land Degradation Status Map @ 1:50000 scale
  - * Land Use and Land cover and Change detection
  - * Watershed delineation, prioritization and development
  - * Crop water requirement in canal command
  - * Irrigation Command Area assessment



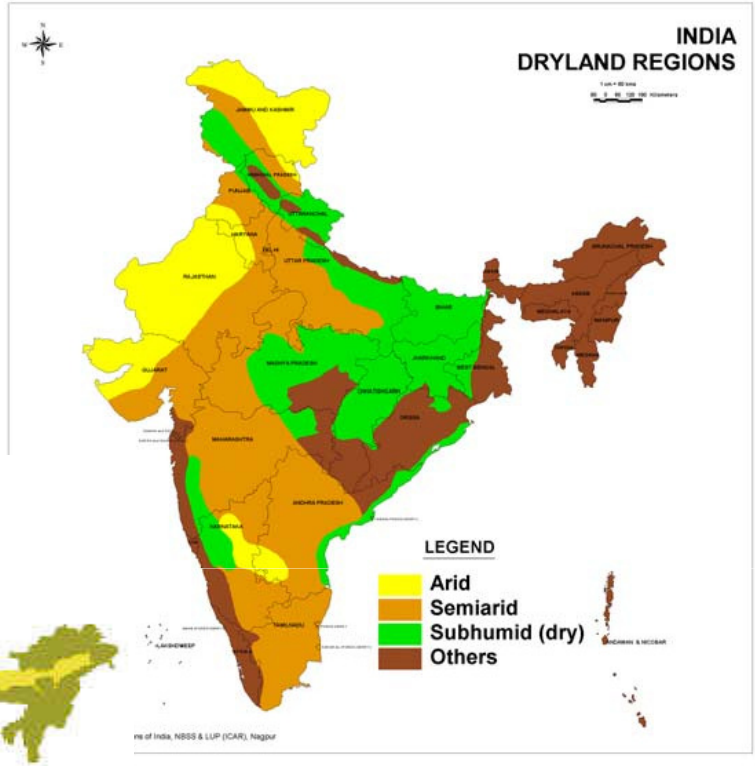

Integrated National Agricultural Resources Information System - Microsoft Internet Explorer
File Edit View Favorites Tools Help
Back Search Favorites Media
Address http://bha/website/nbss1/viewer.htm
Go Links
Integrated National Agricultural Resources Information System
WARIS
Refresh Map
Legend
Layers
Visible Active
Erosion Classification
Flooding Classification
Slope Classification
Textural Classification
Drainage classification
Refresh Map
Zoom In
Indian Agricultural Statistics Research Institute, New Delhi-110012
BACK
Map: 72.59 , 24.14 -- Image: 253 , 155 -- ScaleFactor: 0.028670127792473937
Local intranet

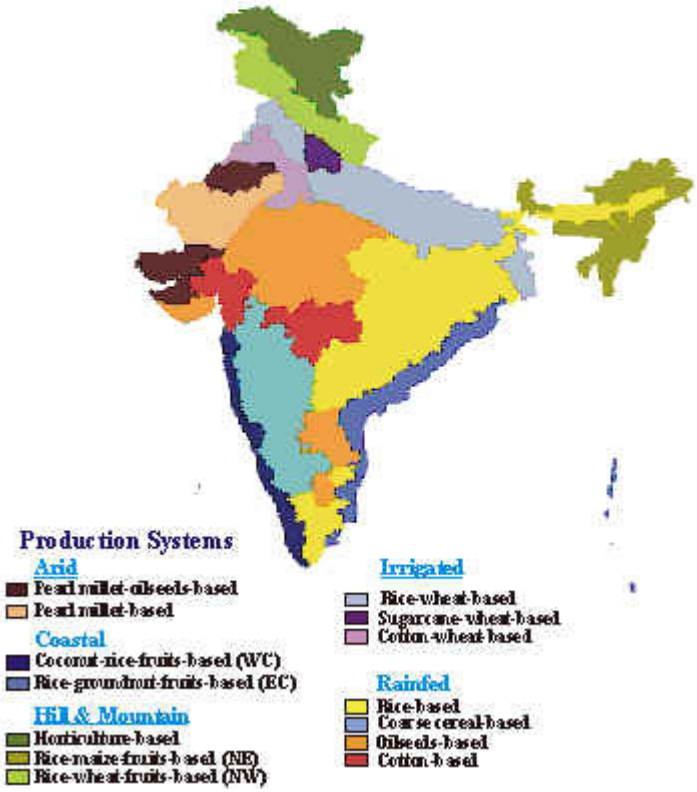
Mapping for Planning



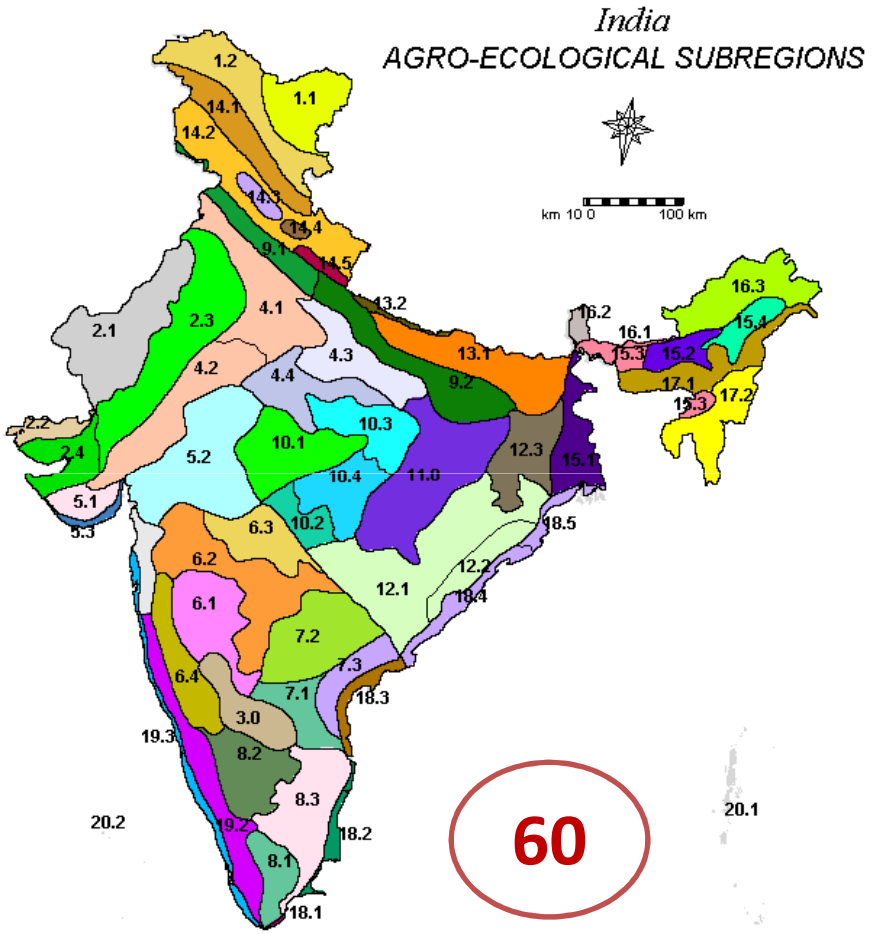
6 typologies

Agro-Ecological Zones & Production Systems

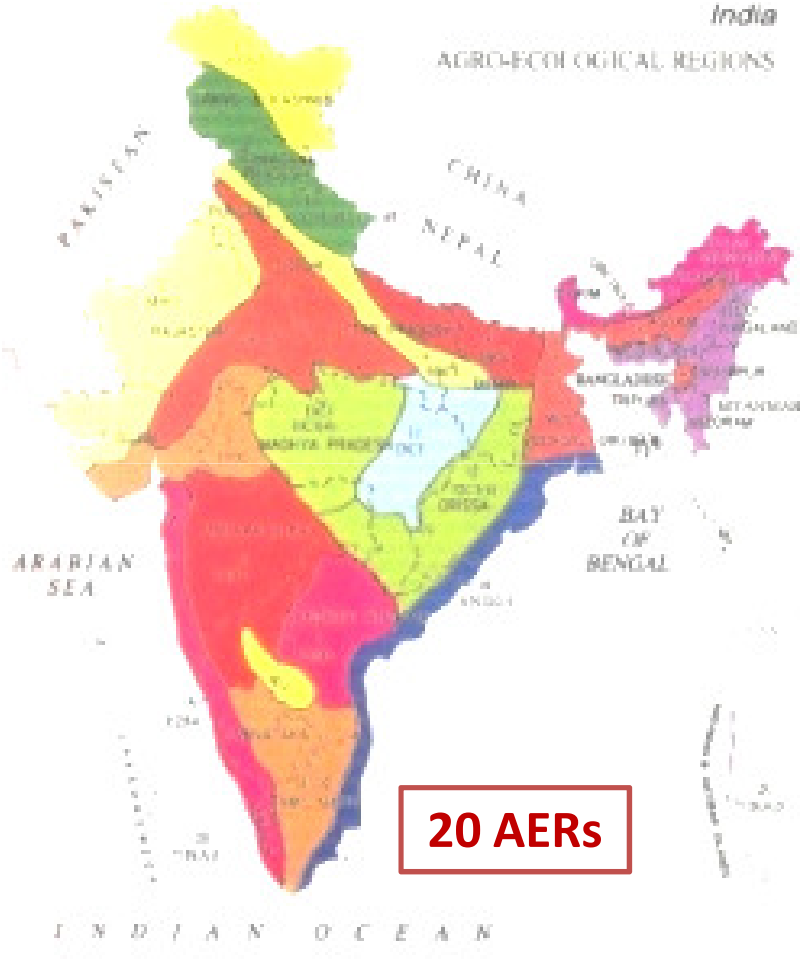




Space Data Management and Integration



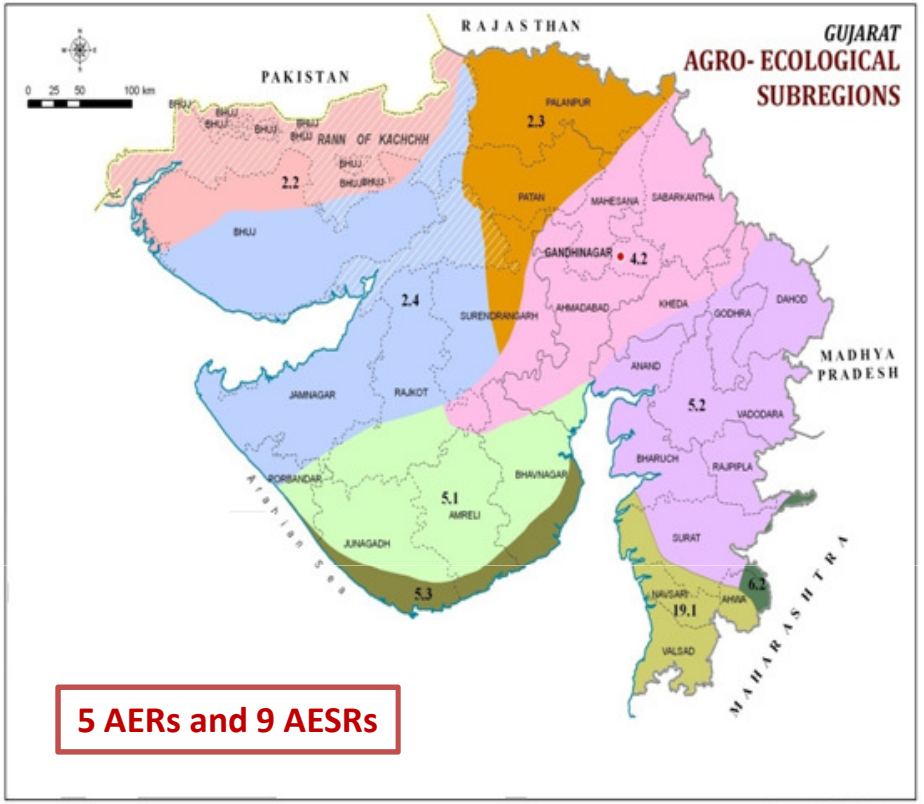
60



20 AERs

Mapping Agro-Ecological Sub-region (AESR)

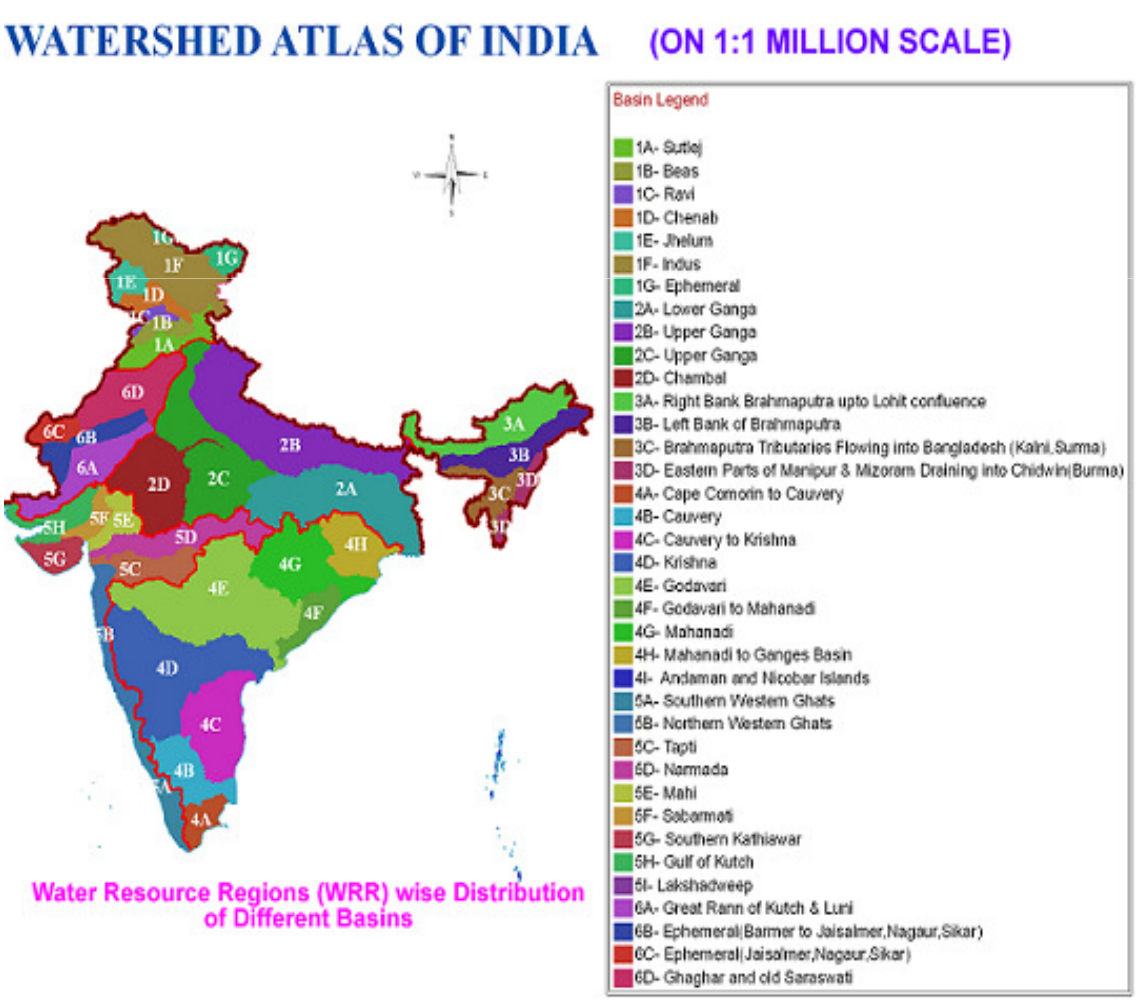
2.2	Kachchh Peninsula (Great Rann of Kachchh as inclusion), hot hyper-arid ESR with deep loamy Saline and Alkali soils, low AWC and LGP < 60 days [L12Eh1].
2.3	Rajasthan Bagar, North Gujarat Plain and South –Western Punjab Plain, hot typic-arid ESR with deep, loamy Desert soil (Inclusion of saline phase), low AWC and LGP 60-90days [M9Et2].
2.4	South Kachchh and North Kathiawar Peninsula, hot arid ESR with deep loamy Saline and Alkali soils, low AWC and LGP 60-90 days [L12Et2].
4.2	North Gujarat plain (Inclusion of Aravalli range and east Rajasthan Upland), hot dry semi-arid ESR with deep loamy Grey Brown and alluvium-derived soils, medium AWC and LGP 90-120 days[P14Dd3].
5.1	Central Kathiawar Peninsula, hot dry Semi-Arid ESR with shallow and medium loamy to clayey Black soils (deep black soil an inclusion medium AWC and LGP 90-120 days [L4Dd3].
5.2	Mahdya Bhart Plateau, Western Malwa Plateau , Easter Gujarat Plain, Vindhyan and Satpura range and Narmada Valley hot moist semi arid ESR with medium and deep clayey Black soils (Shallow Black soils as inclusion), medium to high AWC and LGP 120-150 days [I5Dm4]
5.3	Costal Kathiawar Peninsula, hot moist semi -arid ESR with deep loamy costal alluvium-derived soils (saline phases inclsion), low to medium AWC and LGP 120-150 days [L7Dm4].
6.2	Central and western Maharashtra Plateau and North Karnataka Plateau and North Western Telangana Plateau, hot moist semi-arid ESR with shallow and medium loamy to clayey Black soils (medium and deep clayey Black soils as inclusion), medium to high AWC and LGP 120-150 days [K4Dm4].
19.1	North sahyadris and Konkan Coast, hot humid ESR with medium to deep loamy to clayey mixed Red and Black soils, medium to high AWC and LGP 210-240 days [E6B8].



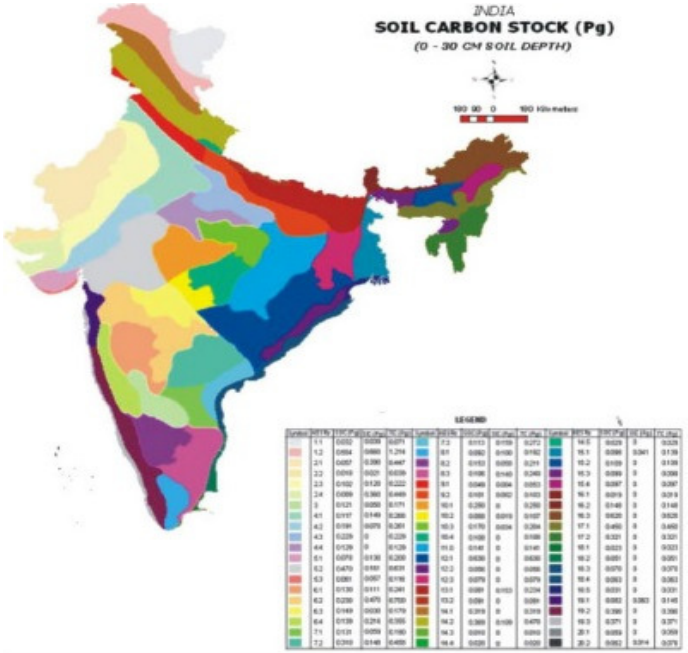
5 AERs and 9 AESRs

Gujarat divided into 5 AERs and 9 AESRs depending on the Length of Growing Period (LGP) and Soil Properties

Natural Resources Assessment & Management



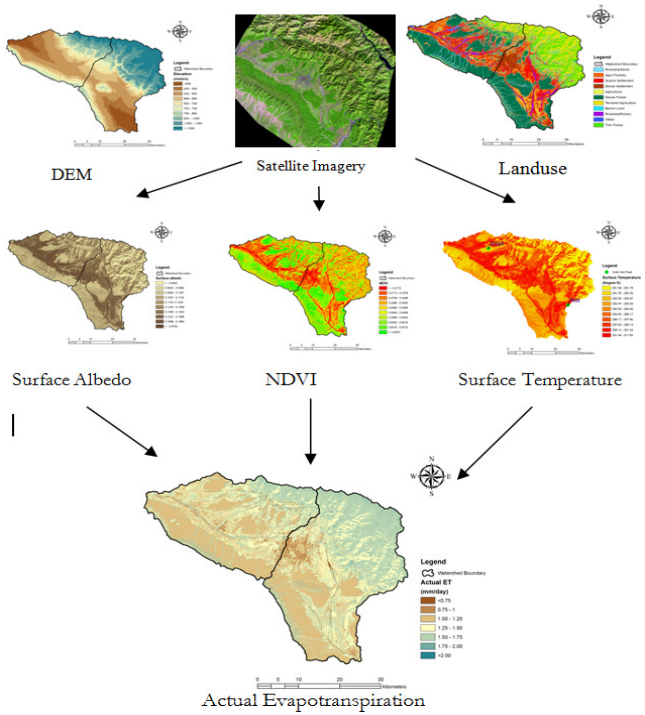
Water Resource Regions (WRR) wise Distribution of Different Basins



Potential exists for sequestering 10-14 Tg C yr^{-1} in India (Lal 2004)

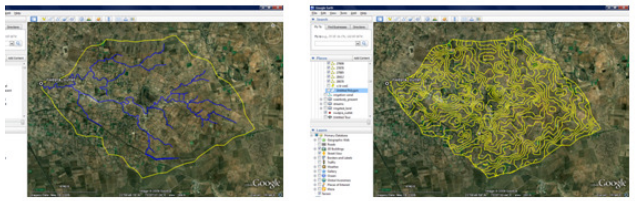
Satellite Data in Watershed Management

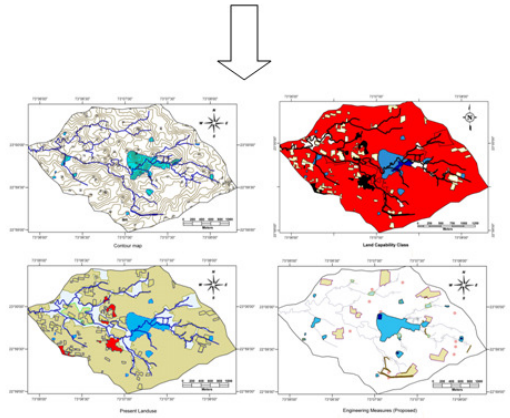
- Quick assessment of watershed health and forecasting crop health based on satellite data and Surface Energy Balance Algorithm (SEBAL)
- Appraisal of the natural resources status (including areas prone to degradation) for prioritizing areas that need urgent attention
- Watershed delineations, preparation of various thematic maps
- Assessment of impact of climate change on water demands

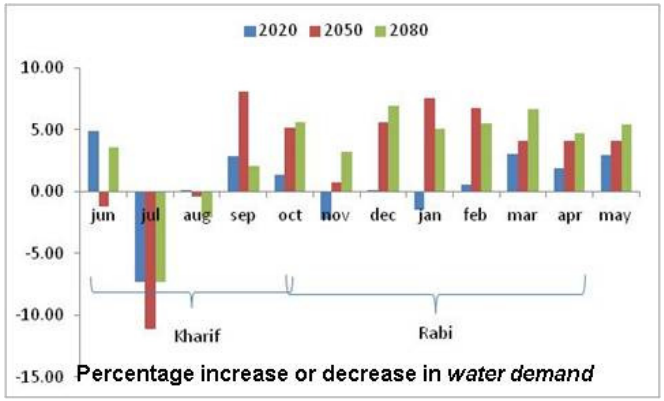


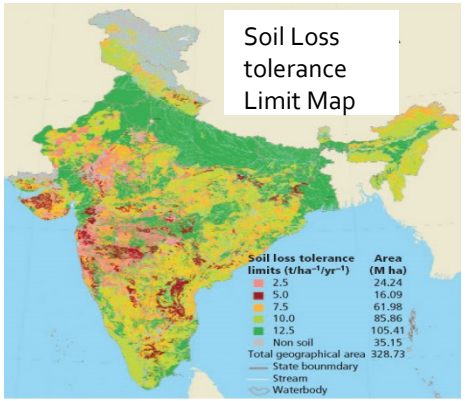
LUMPED MODELS - No account of spatial variability of processes, input, boundary conditions, and system geometry

DISTRIBUTED MODELS - Explicit account of spatial variability of processes, input, boundary conditions, and watershed characteristics

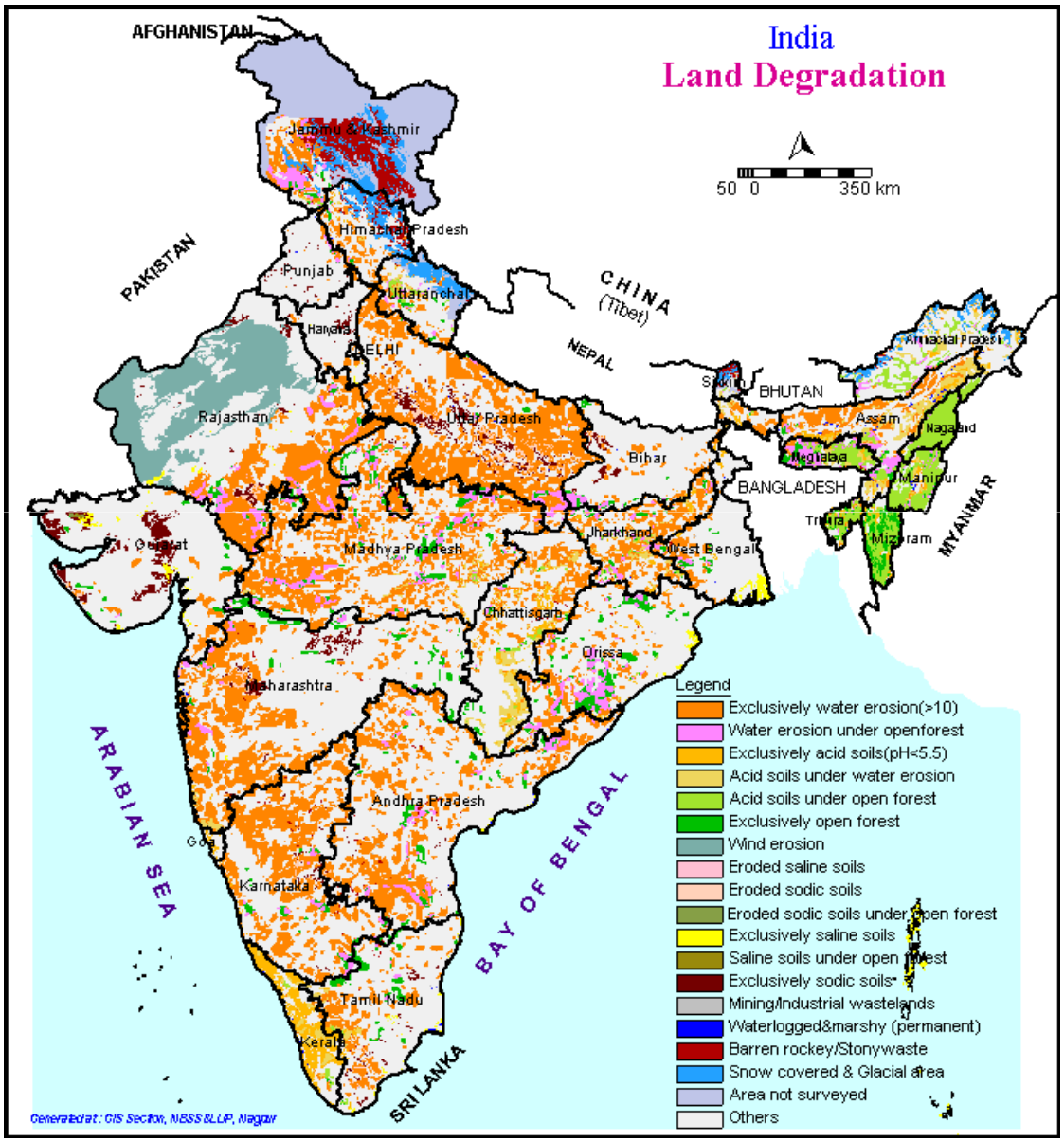


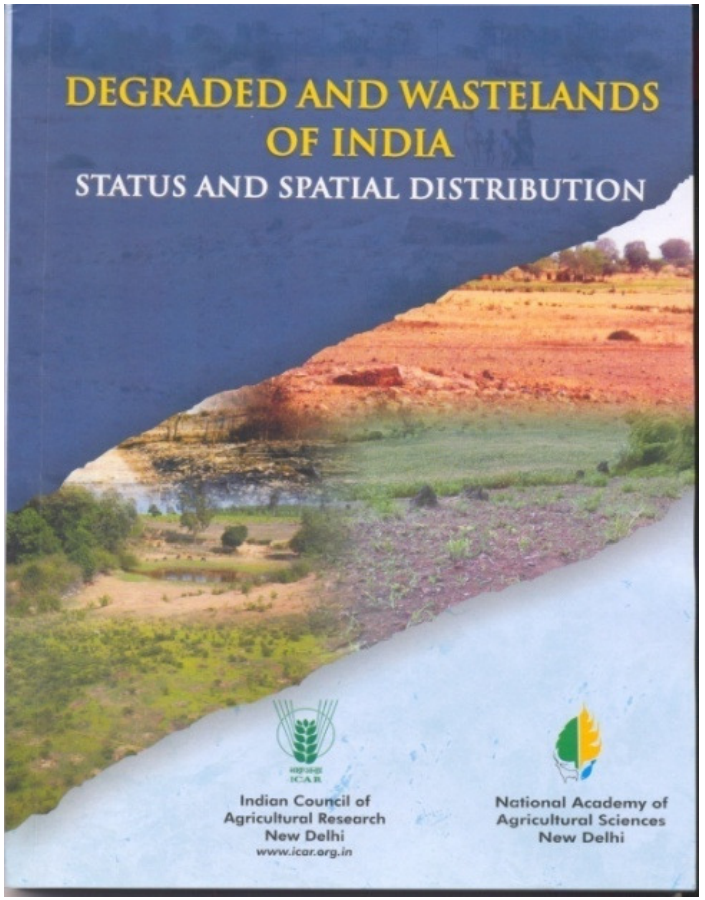






Land Degradation and Wastelands Information System





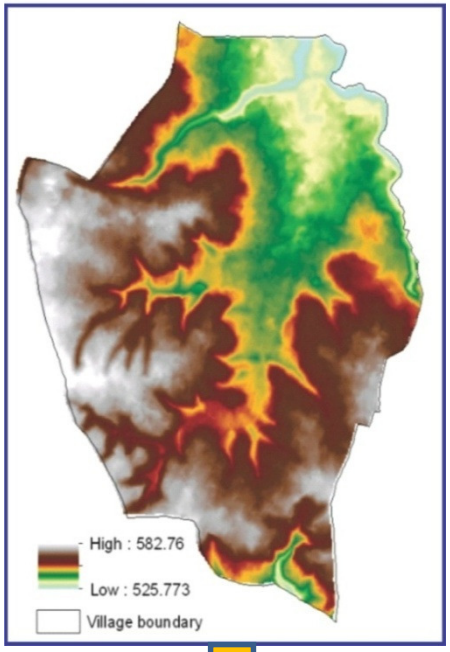
ICAR-NASS joint Publication

120.7 m ha

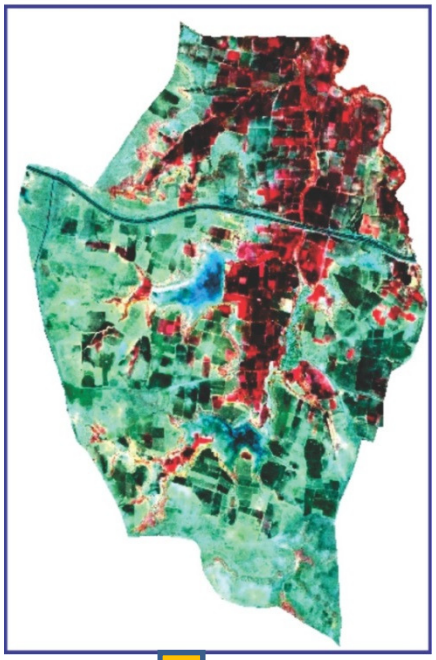
Understanding the Land Features

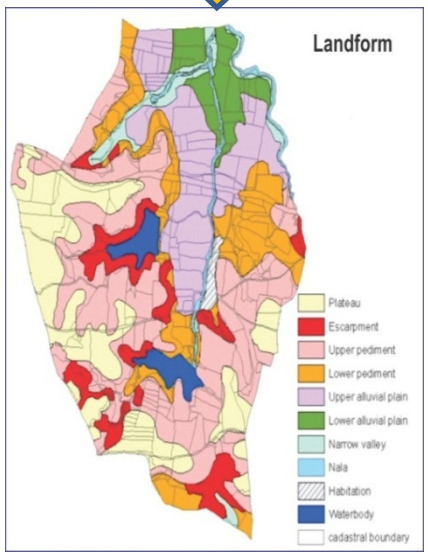
Use of Digital Elevation Model and Cartostat-1 merged LISS 4 image for mapping of Undulating Terrain on 1:10000 scale

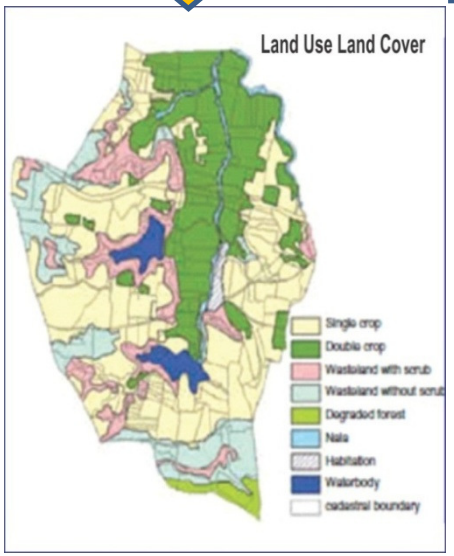
Digital Elevation Model



Cartosat-1 Merged LISS 4 Image



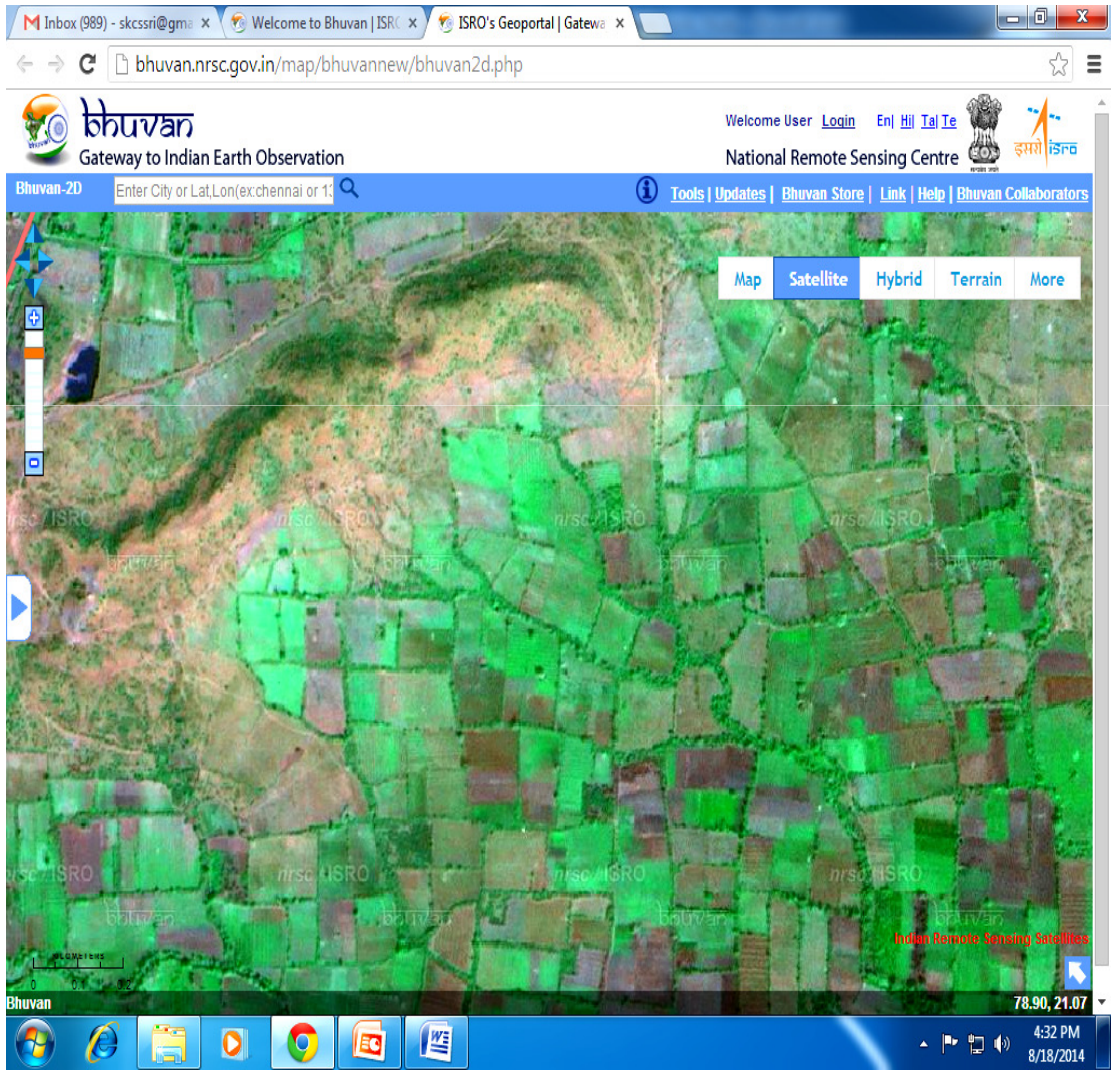




Landform - Land Use Unit

(Use of CARTOSAT and RESOURCE SAT)

Use of High Resolution Cartosat Merged Satellite Data in Land Resource Inventory

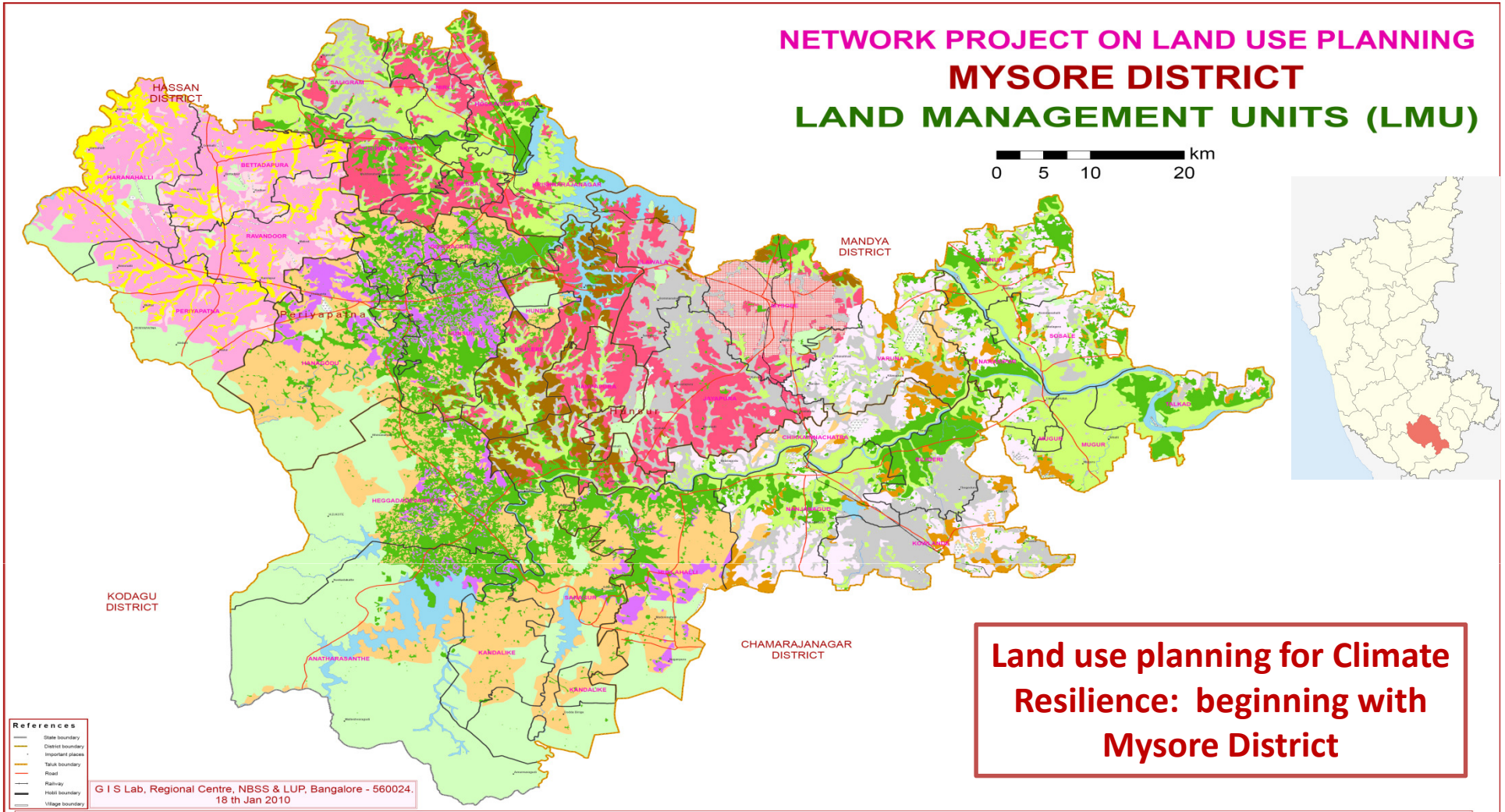


- Satellite data
- Land Use / Land Cover
- Digital Surface Model (DSM)
- Online interpretation tools for preparation of base map

NETWORK PROJECT ON LAND USE PLANNING

MYSORE DISTRICT

LAND MANAGEMENT UNITS (LMU)



Land use planning for Climate Resilience: beginning with Mysore District

LEGEND

Agricultural production system (Area %)

- 1 Irrigated (Command area);Rice/Sugarcane/Banana/Veg. on red shallow mod. deep and deep soils occuring on AEUII,III & IV., 94164.55, 14.91
- 2 Irrigated (Command area);Rice/Sugarcane/Banana/Veg. on black mod. deep to deep soils in AEU II,III & IV., 68004.60, 10.76
- 3 Irrigated (G water);Rice/maize on red shallow,mod. deep and deep soils in AEU I., 13642.61, 2.16
- 4 Rainfed;Tabacco - ragi/pulses on red shallow soils in AEU I., 5892.12, 0.93
- 5 Rainfed;Tabacco - ragi/pulses on red mod. deep to deep soils in AEU I., 48990.54, 7.75
- 6 Rainfed;Ragi/Tobacco on red shallow soils in AEU II., 17443.08, 2.76
- 7 Rainfed;Tabacco-ragi/pulses/cotton on red mod. deep to deep soils in AEU II., 72335.27, 11.47 5
- 8 Rainfed;Ragi/Jowar on red shallow soils in AEU II., 13854.92, 2.19
- 9 Rainfed;Cotton/Ragi/Maize on red mod. deep to deep soils in AEU III., 45921.57, 7.27
- 10 Rainfed;Ragi/Jowar on red shallow soils in AEU IV., 9981.84, 1.58
- 11 Rainfed;Ragi/Jowar/Maize on red mod. deep to deep soils in AEU IV., 37194.97, 5.88
- 12 Rainfed;Cotton/Ragi/Jowar/Maize on black mod. deep to deep soils in AEU III & IV., 57669.45, 9.13

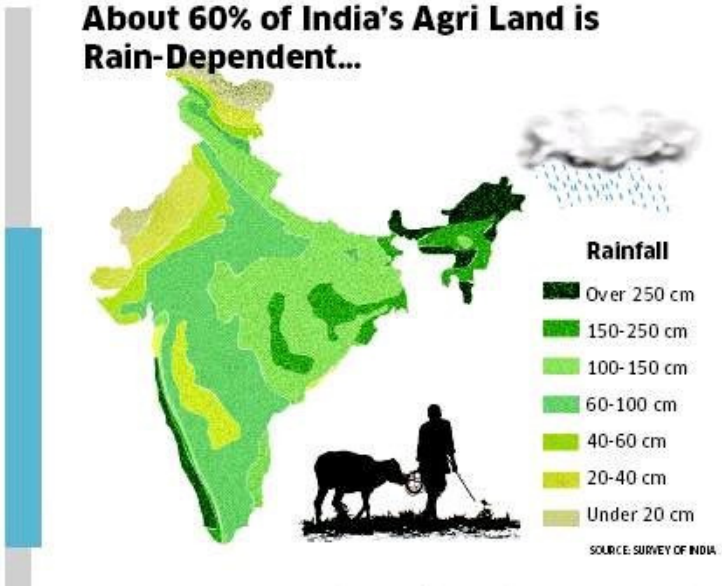
Other land uses

- Forest, 105260.46, 16.66
- Dyke ridges, 45.23, 0.007
- Industrial/mining, 435.27, 0.06
- Misc.land, 809.55, 0.12
- Rock outcrop, 2147.50, 0.34
- Habitation, 11619.95, 1.84
- Water body, 25196.54, 3.98
- Mandya district, 904.64, 0.14

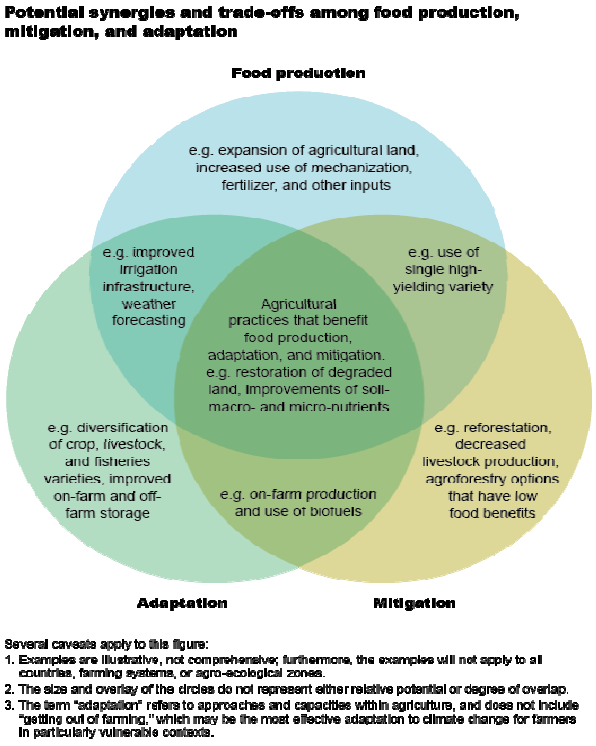
NICRA on the move….

Achieving Climate Resilience in Agriculture

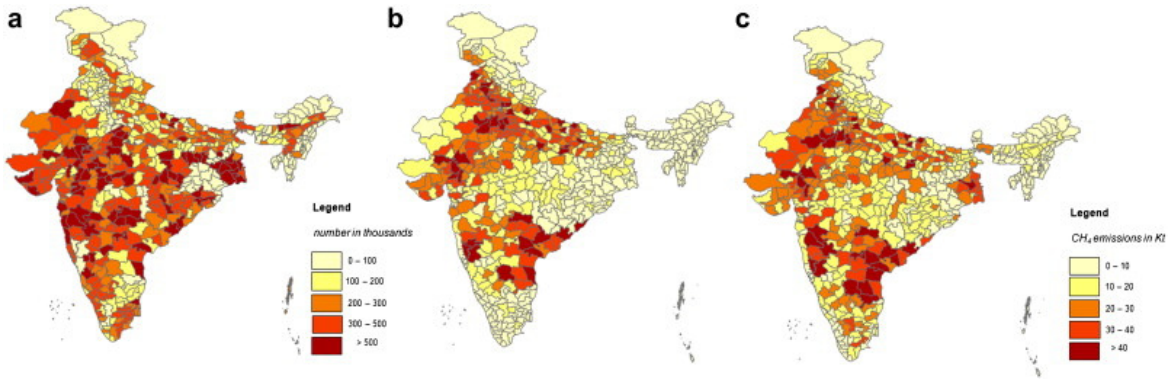
Information on climate critical for agriculture



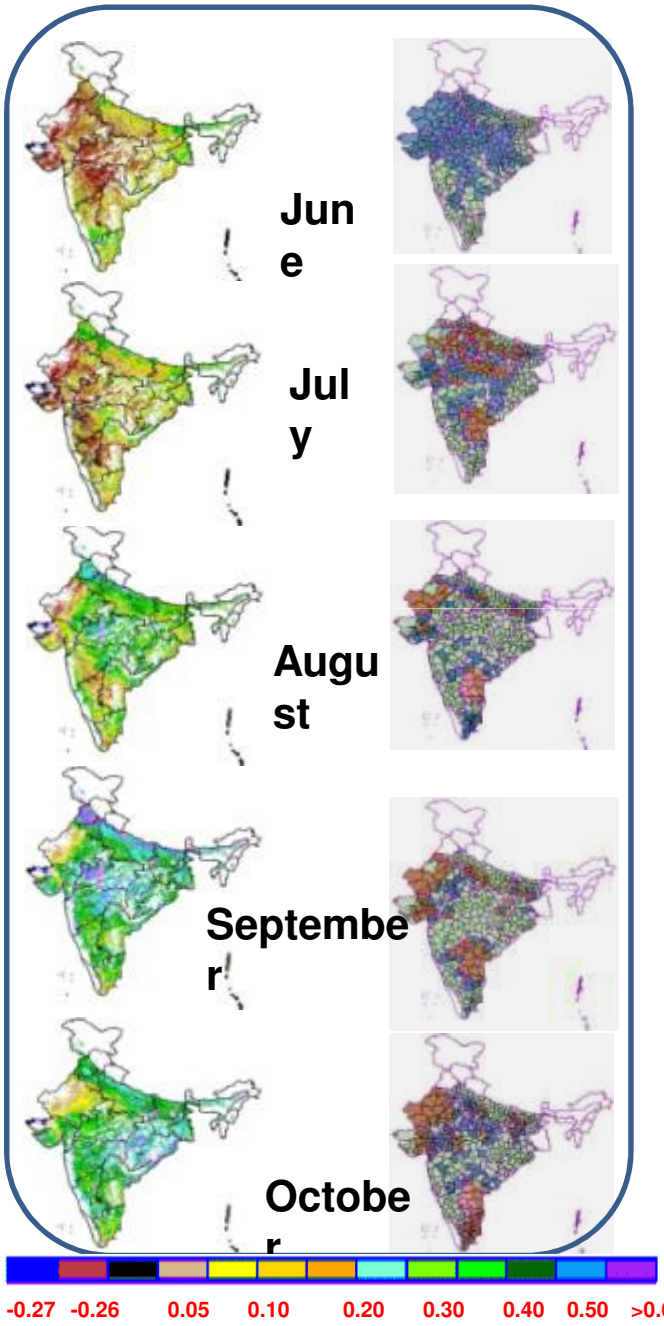
Convergence and Continuum



580 Contingency Plans



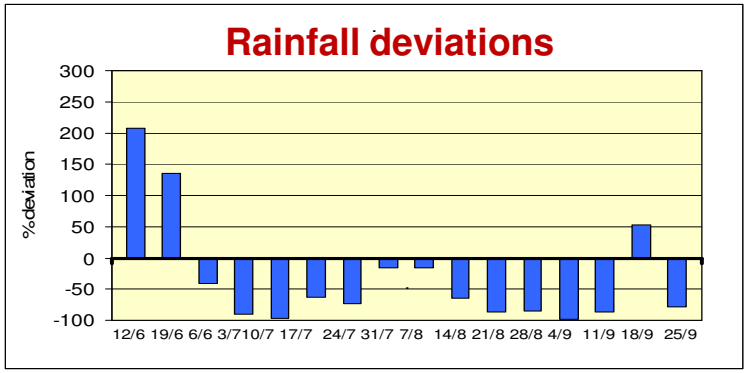
National Agricultural Drought Assessment & Monitoring System

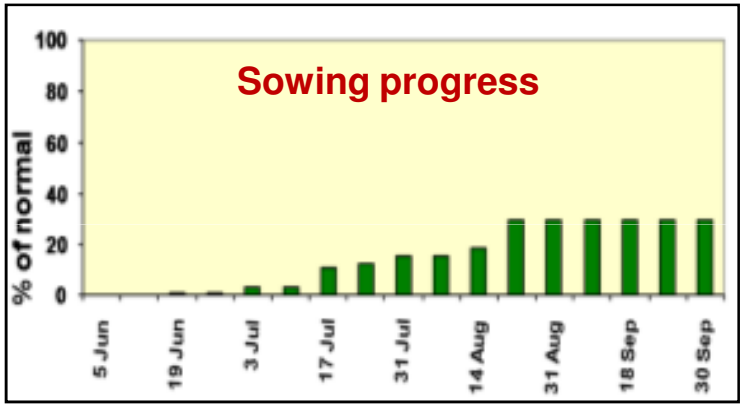


No. of districts under drought

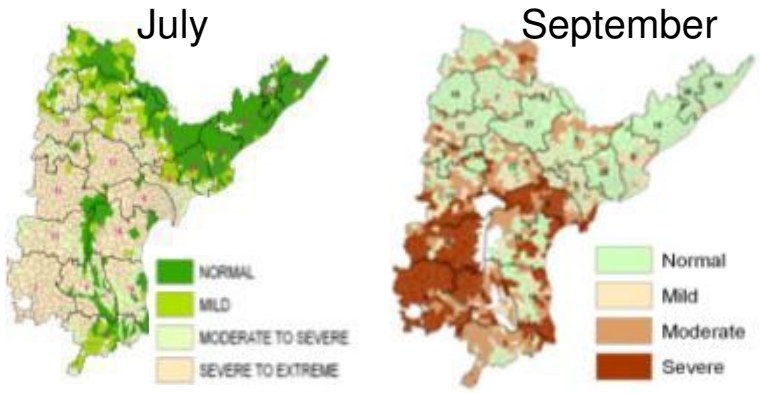
June	215 dist
July	226 dist
August	124 dist
Sept.	115 dist
Oct.	179 dist

Normal
Mild Drought
Moderate Drought
Severe Drought





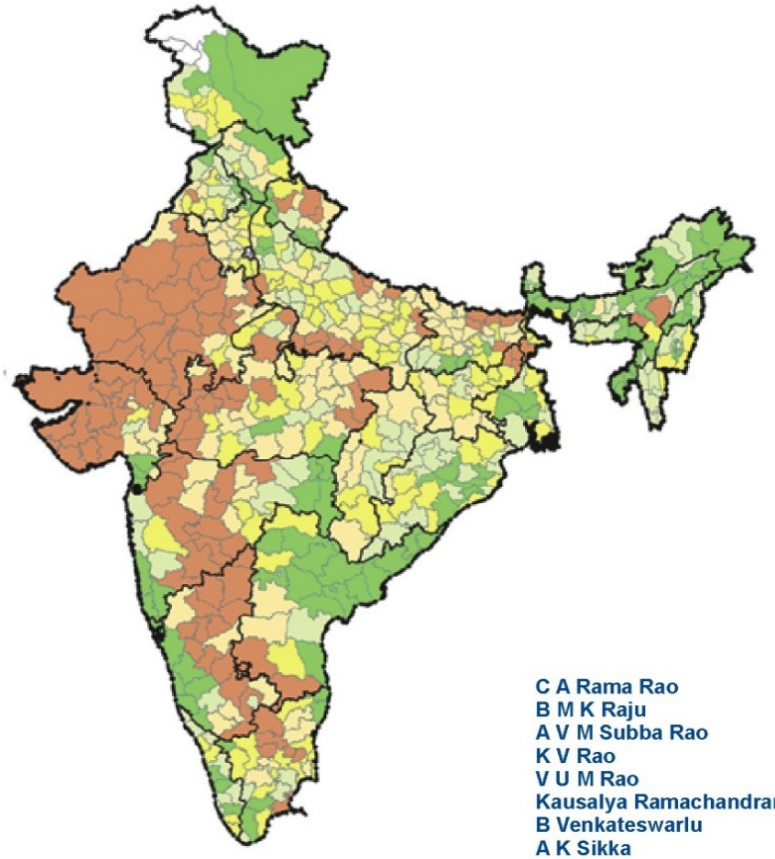
Integration with ground data



District/ Sub-District Level Drought Monitoring

ATLAS on

Vulnerability of Indian Agriculture to Climate Change



C A Rama Rao
B M K Raju
A V M Subba Rao
K V Rao
V U M Rao
Kausalya Ramachandran
B Venkateswarlu
A K Sikka

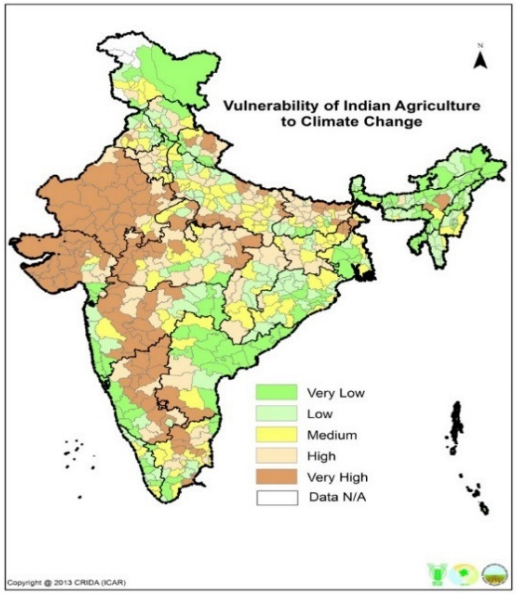
National Initiative on Climate Resilient Agriculture (NICRA)
Central Research Institute for Dryland Agriculture
(Indian Council of Agricultural Research)
Santoshnagar, Hyderabad - 500 059

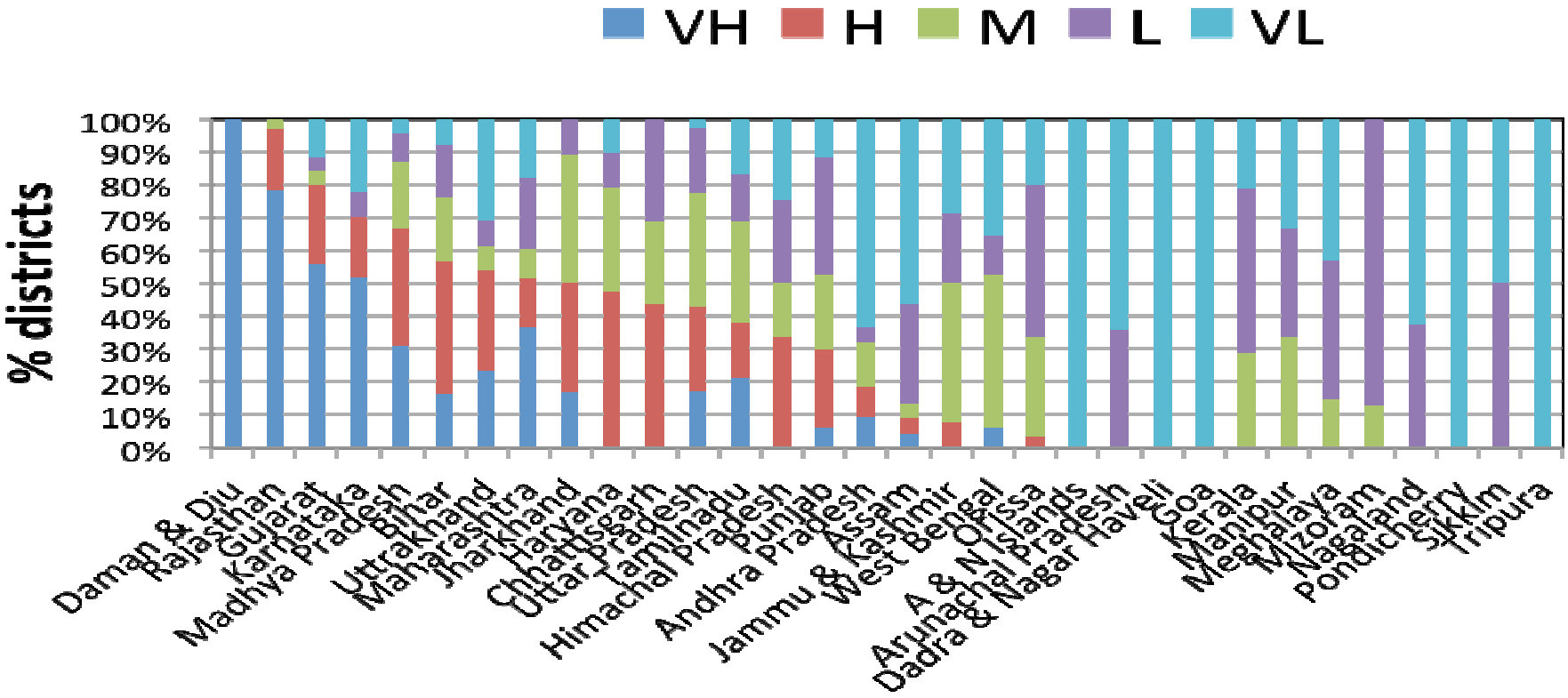
District Level Vulnerability Maps

- District level vulnerability atlas for agriculture
- District level sensitivity factors mapped and opportunities for investments on technology and infrastructure provided for adaptation and mitigation
- User - NABARD for funding projects under global adaptation fund

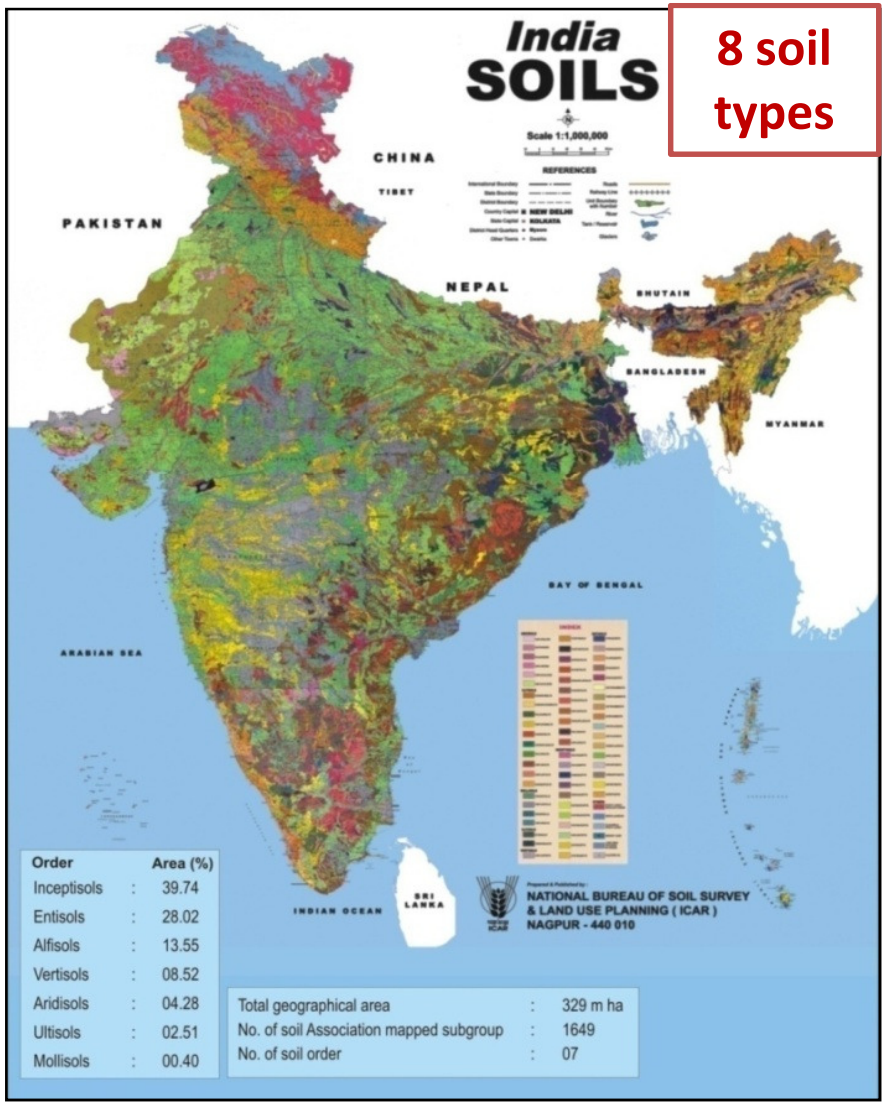
District Level Vulnerability Mapping

Vulnerability mapping done at district level with IPCC protocol of exposure, sensitivity and adaptive capacity





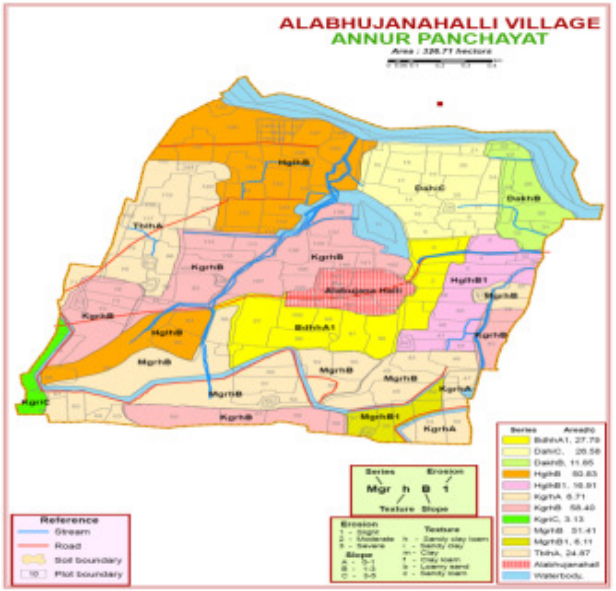
Soil Resource Mapping (SRM) of different States (1:250000 scale) and the Country (1:1 million)



8 soil types

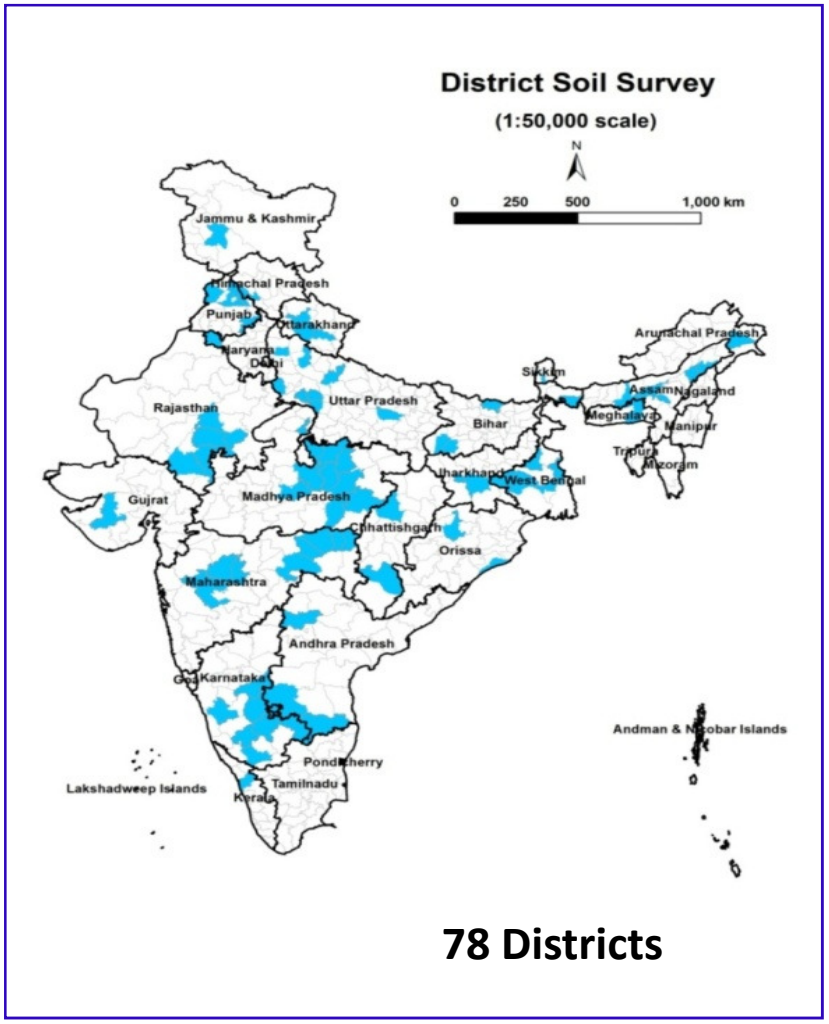
False colour composites (FCC) of Landsat MSS and IRS-1A/1B data were used to prepare physiography and soil maps of different states of India on 1:250000 scale and Union Territories

Village Soil Map

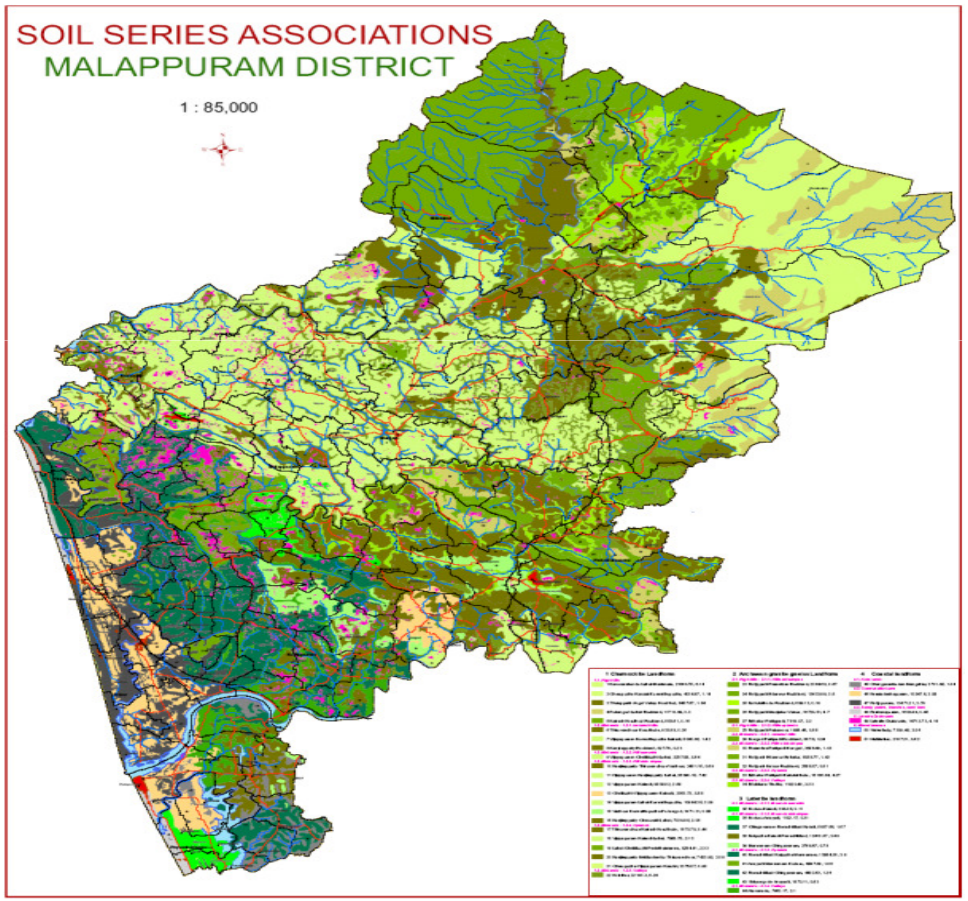


District Level Soil Resource Mapping on 1:50000 scale

IRS-LISS III sensor data from Indian Remote Sensing Satellites used for mapping of landform and soils



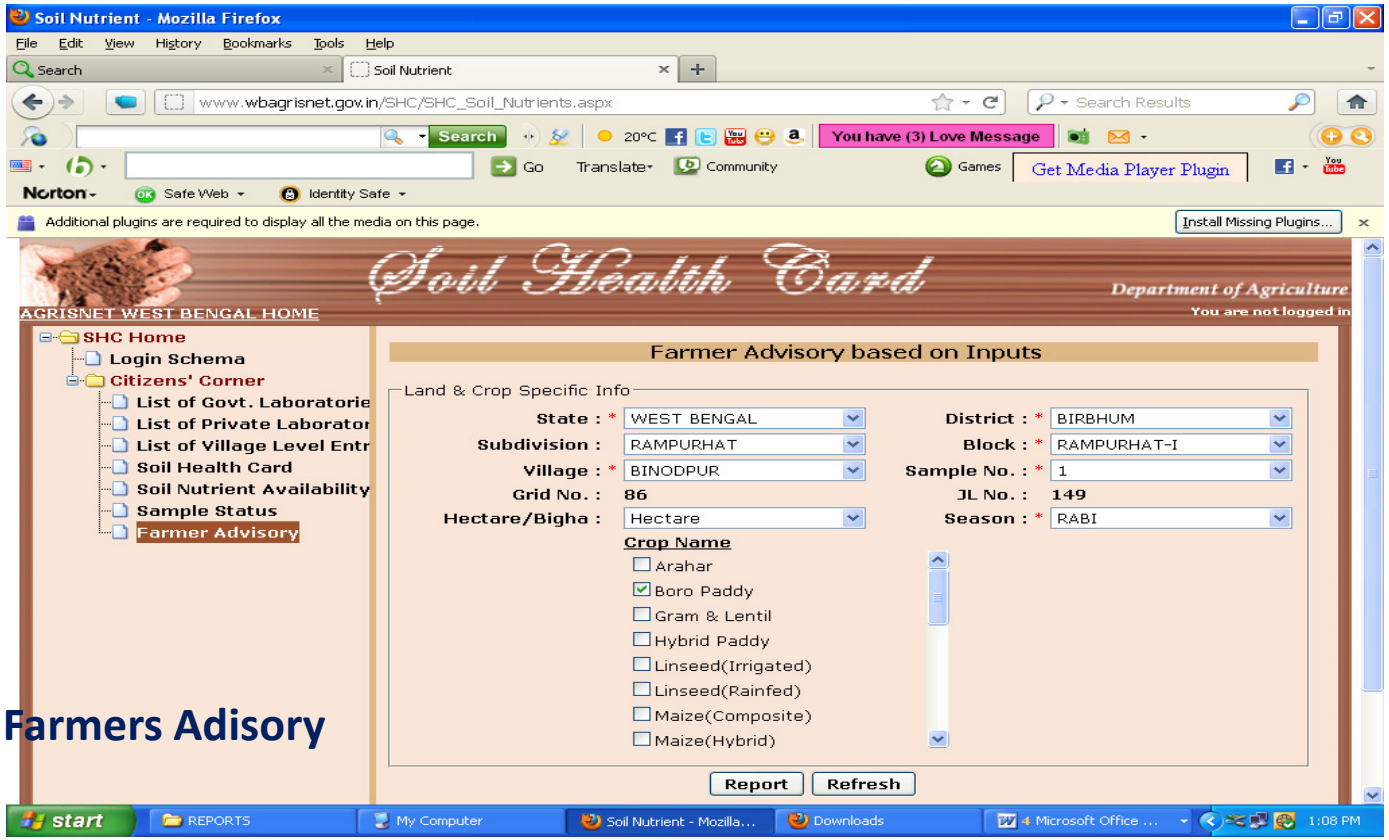
78 Districts



Soil Map of Malappuram district, Kerala

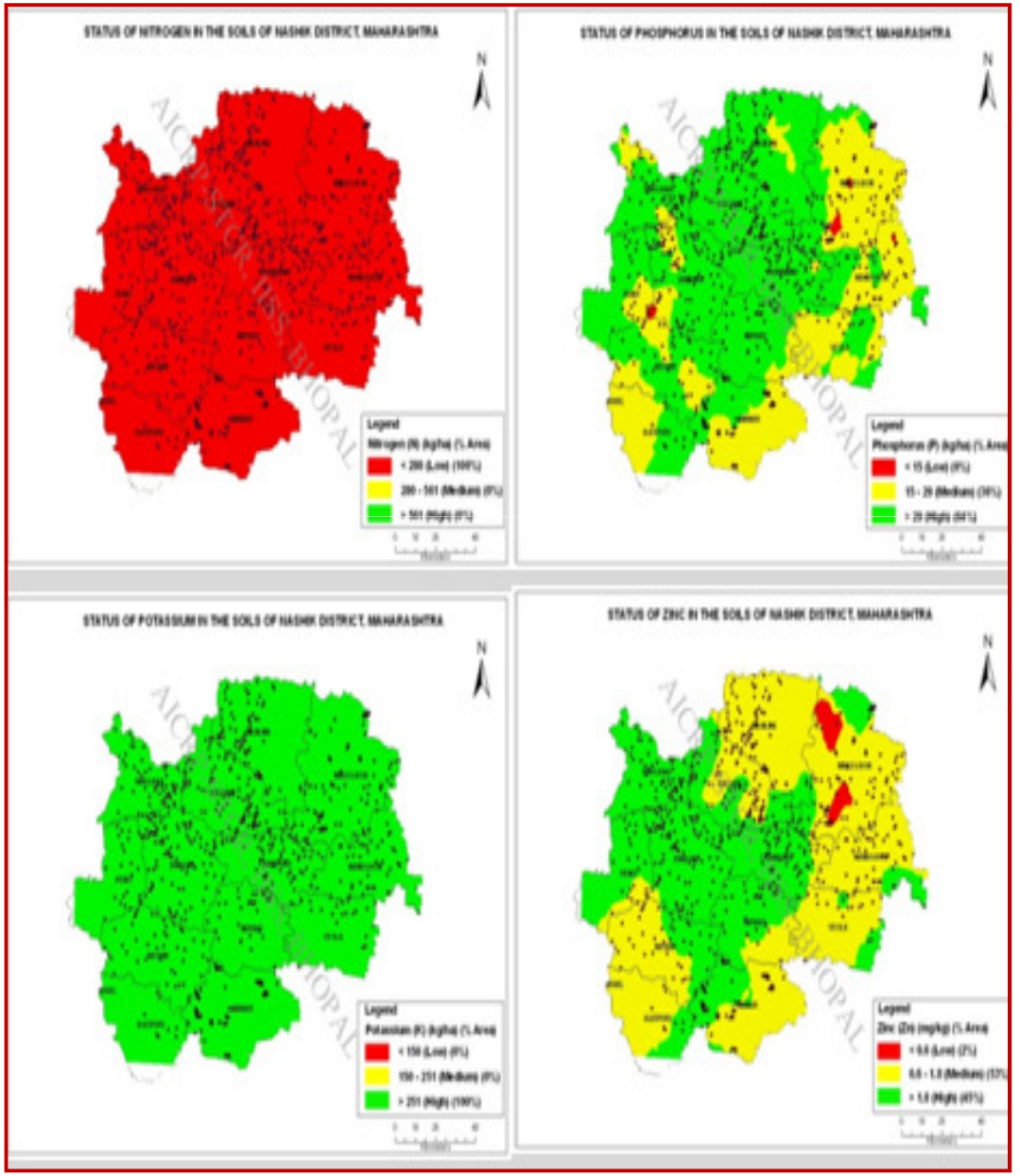
Use of Geo-informatics in Soil Nutrient Mapping for 300 Districts

- **Soil Nutrient Status Mapping on the basis of intensive soil sampling at 1-2 km grid interval was carried out in Tripura, Jharkhand, Assam and West Bengal states for site specific fertilizer recommendations**
- **On the basis of such data, web-based decision support system for farmers advisory was developed for the state of West Bengal**



GPS & GIS Based Soil Fertility Maps of India

GIS based soil fertility maps of Nasik District of Maharashtra

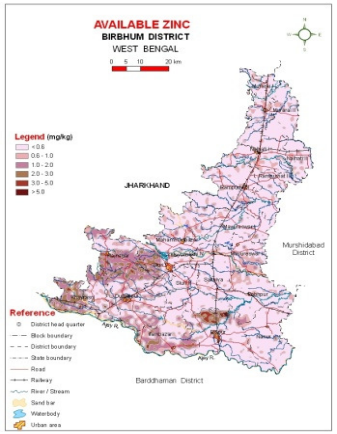


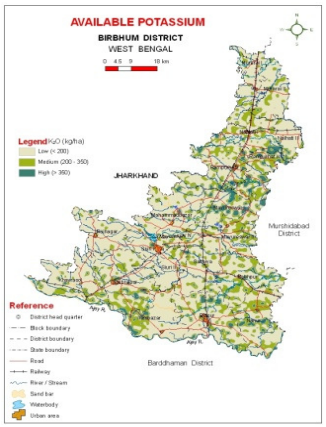
Parameters: pH, EC, organic carbon, N, P, K, S and Micronutrients (Zn, Cu, Fe, Mn, B) have been generated for 170 districts spread across 19 states

Snail Shell Powder extracted from Giant African Snail

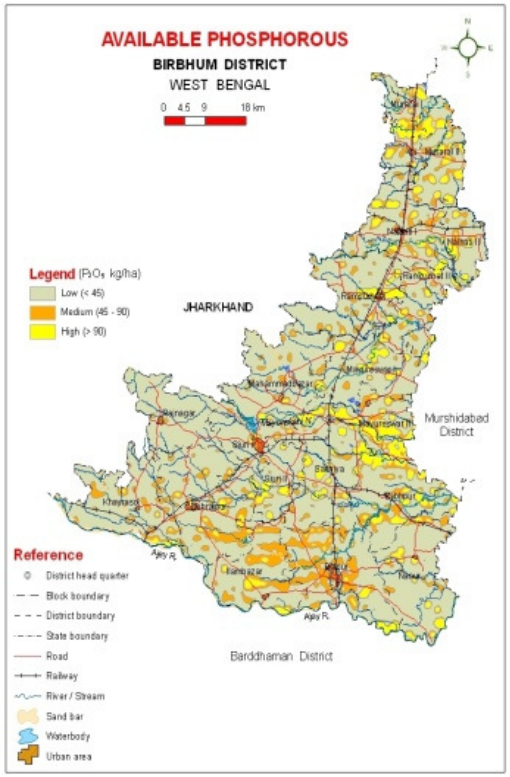
Carrier material for biofertilizer

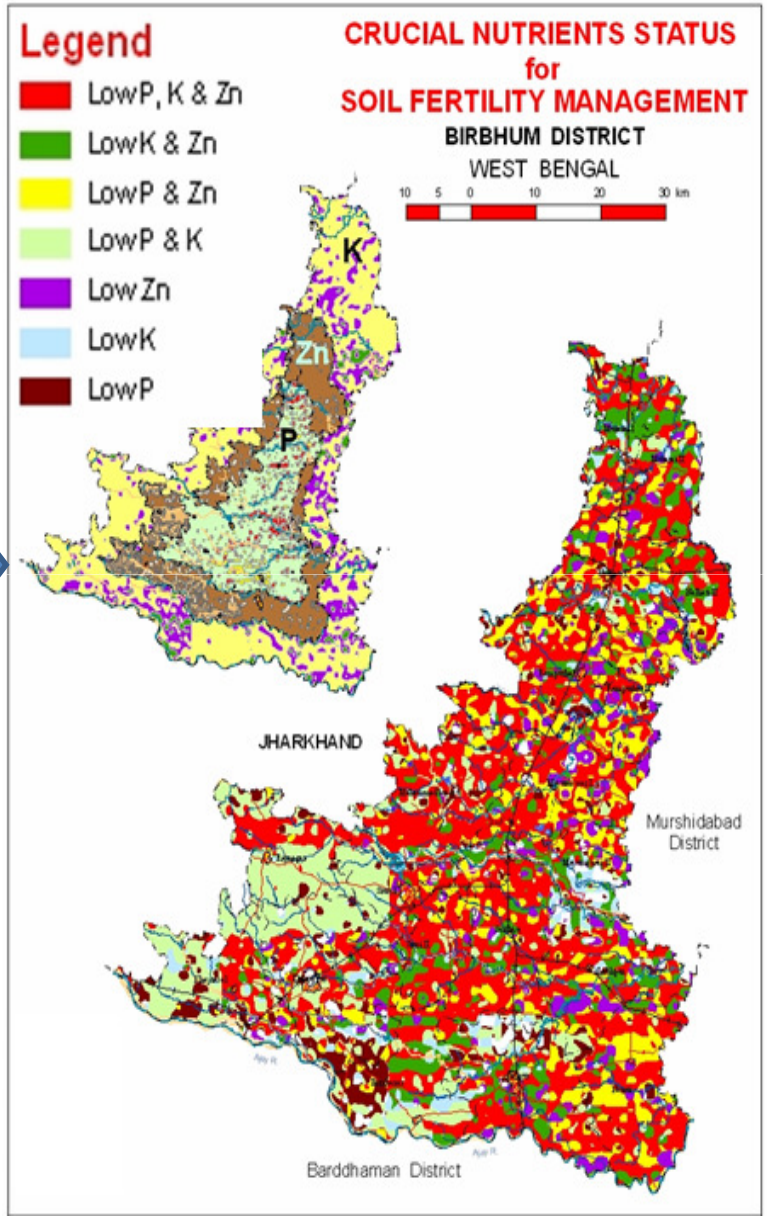
Geo-referenced Soil Fertility Mapping





Merging maps through intersection command in GIS





Multiple nutrient deficiency in intensively cultivated areas

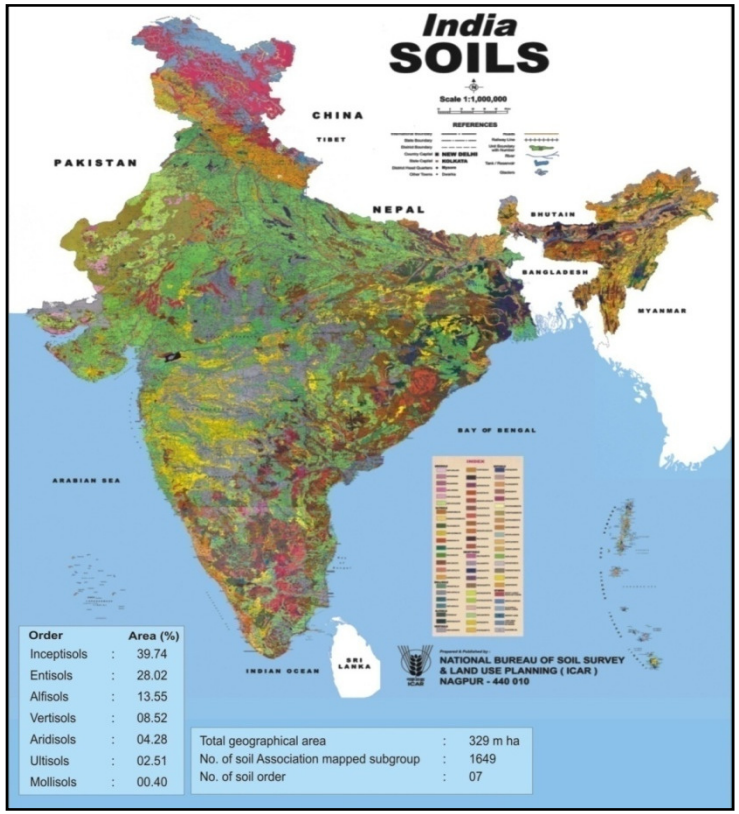
Soil Information Systems

Spatial thematic database generated at state level

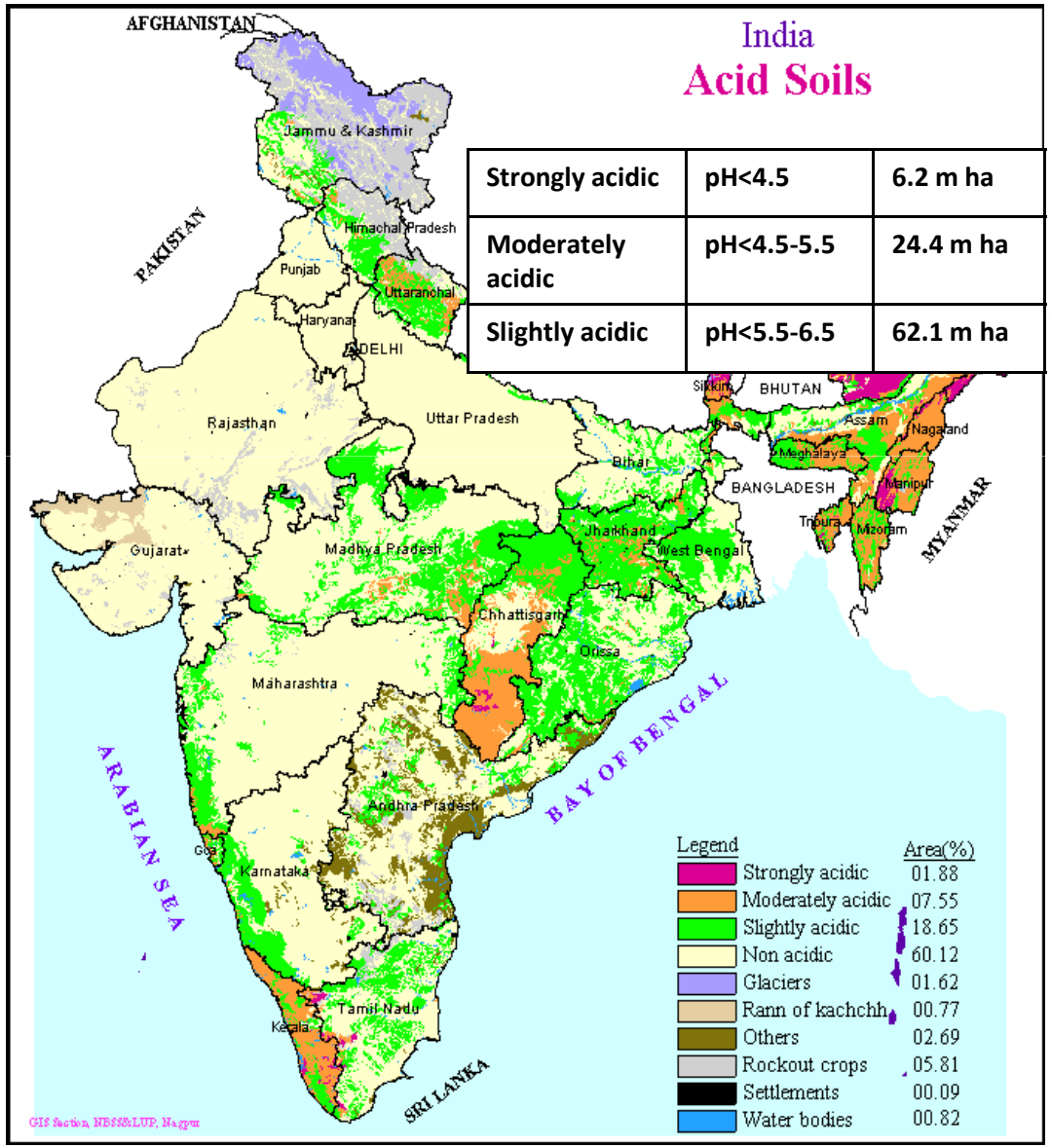
Crop Suitability Mapping at State level

Harmonization of Degraded/Wastelands of India

- Soil Information System (1:1 M scale)
- State wise soil Information System (1:250,000 scale)
- Soil loss information system (1:250,000 scale)
- Degraded and wastelands database (1:250,000 scale)
- Acid soil information system (1:250,000 scale)
- District level soil survey data (45 districts)
- Farm level soil information system (12,500 scale)
- Soil-Climatic Database
- Soil Spectral Data



Addressing Problem Soils and Abiotic Stress



Strongly acidic	**pH<4.5**	**6.2 m ha**
Moderately acidic	**pH<4.5-5.5**	**24.4 m ha**
Slightly acidic	**pH<5.5-6.5**	**62.1 m ha**

Soil Loss: 7 classes

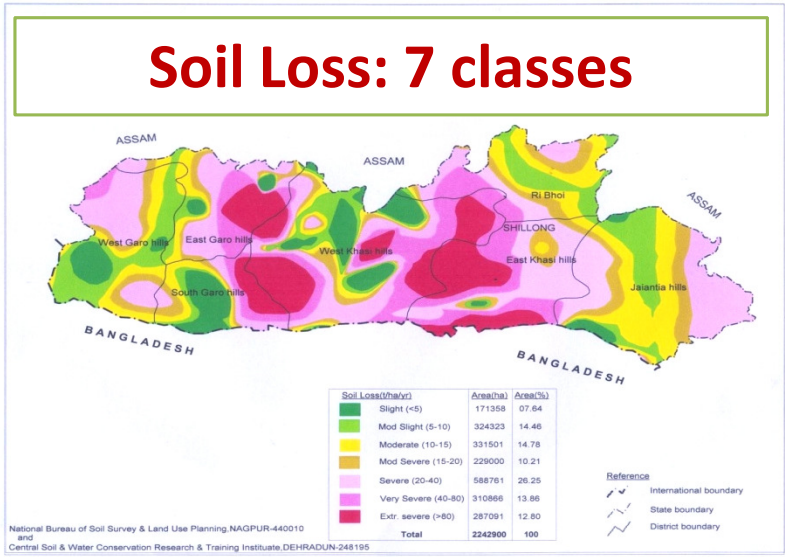
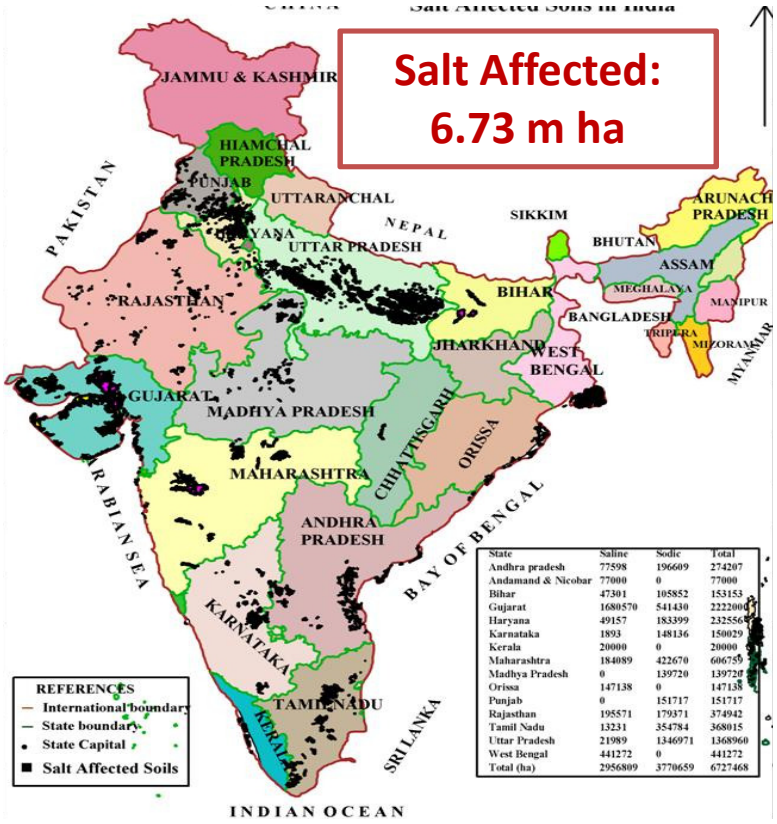


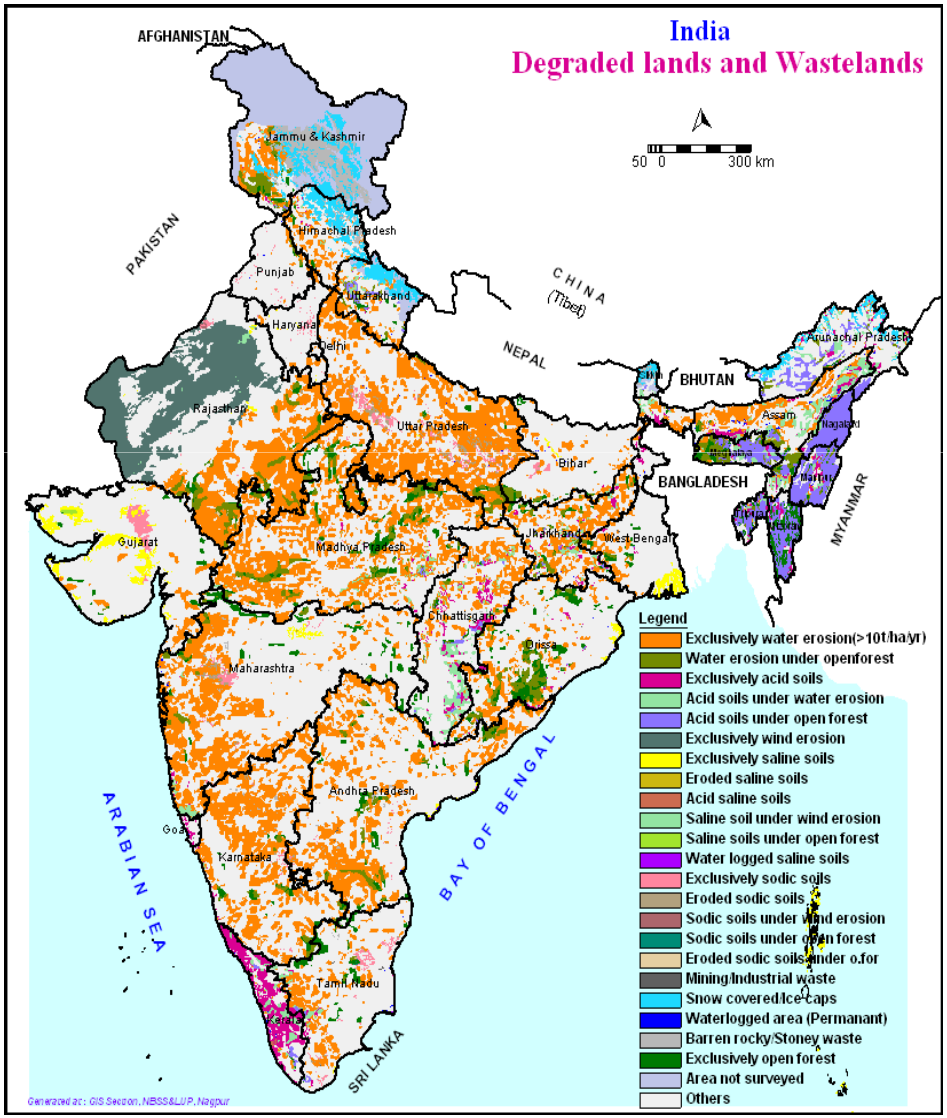
Fig. 7

Salt Affected: 6.73 m ha



Soil Degradation Mapping

Harmonization of degraded lands and waste lands of India



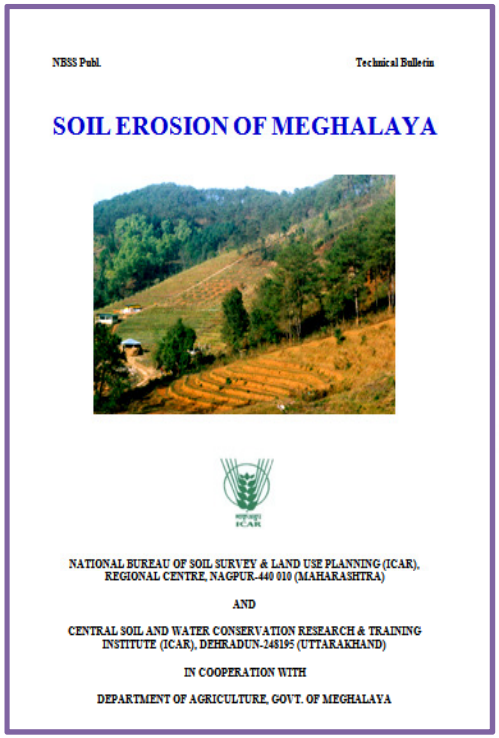
Space-based satellite technology (Landsat /IRS data) used to map and assess the status of soil degradation in the country

Collaborative institutes-

- **NBSS&LUP**
- **CSWCR&TI**
- **CSSRI**
- **CAZRI**
- **NRSC**
- **FSI**
- **NAAS**

Total area 120.41 million ha (NAAS , 2006)

Estimated Soil Loss under Different Land Use Systems


NBSS Publ. Technical Bulletin

SOIL EROSION OF MEGHALAYA

NATIONAL BUREAU OF SOIL SURVEY & LAND USE PLANNING (ICAR), REGIONAL CENTRE, NAGPUR-440 010 (MAHARASHTRA)

AND

CENTRAL SOIL AND WATER CONSERVATION RESEARCH & TRAINING INSTITUTE (ICAR), DEHRADUN-248195 (UTTARAKHAND)

IN COOPERATION WITH

DEPARTMENT OF AGRICULTURE, GOVT. OF MEGHALAYA

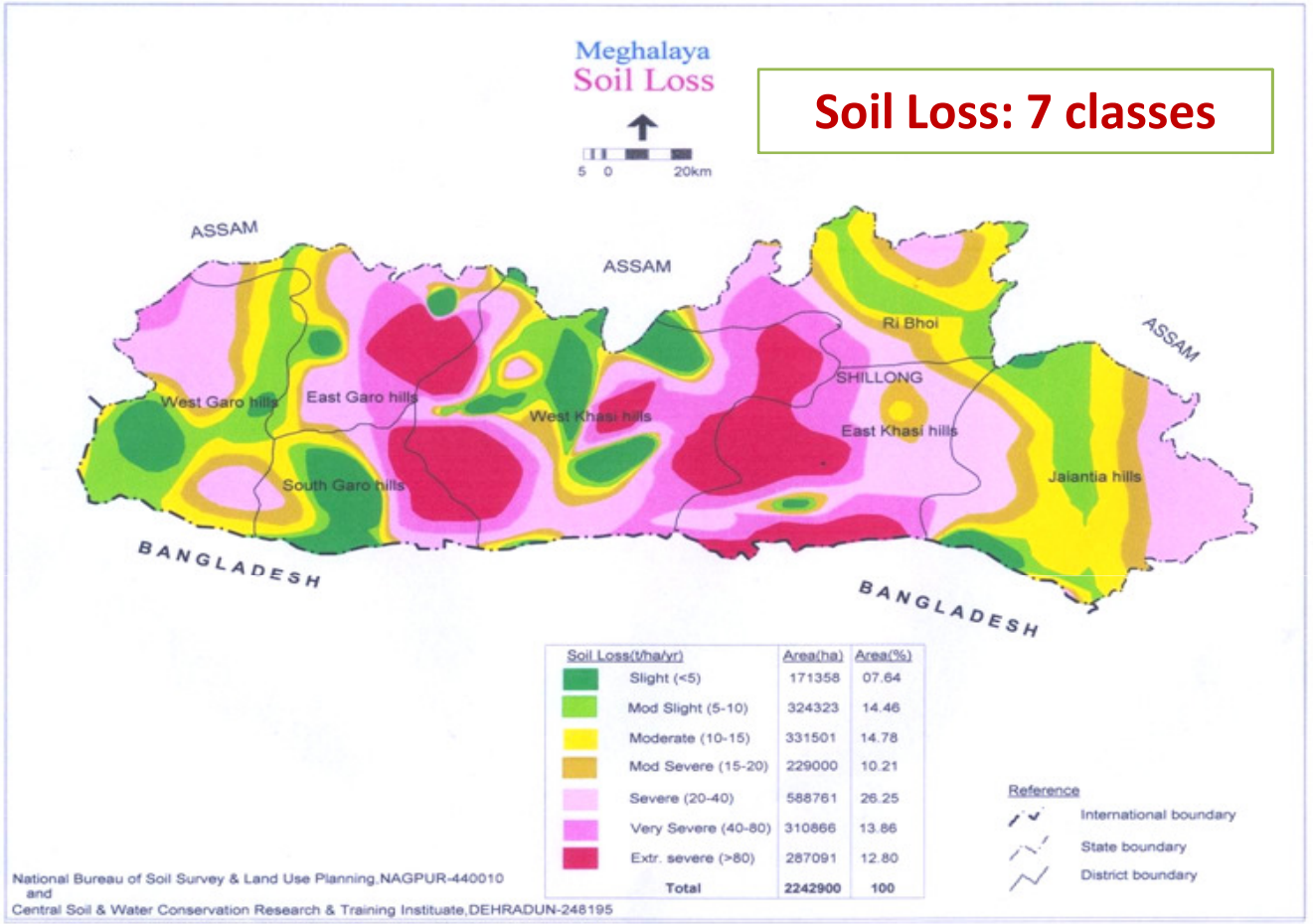
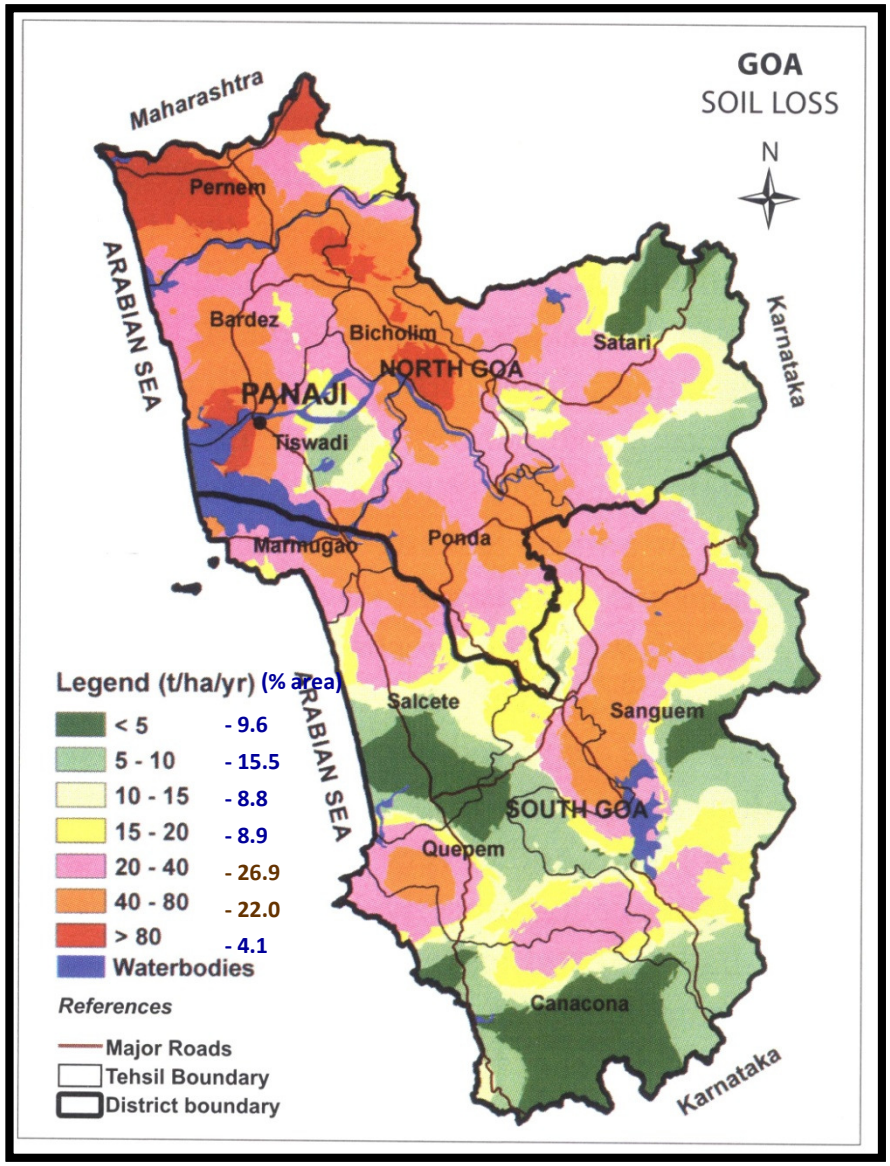


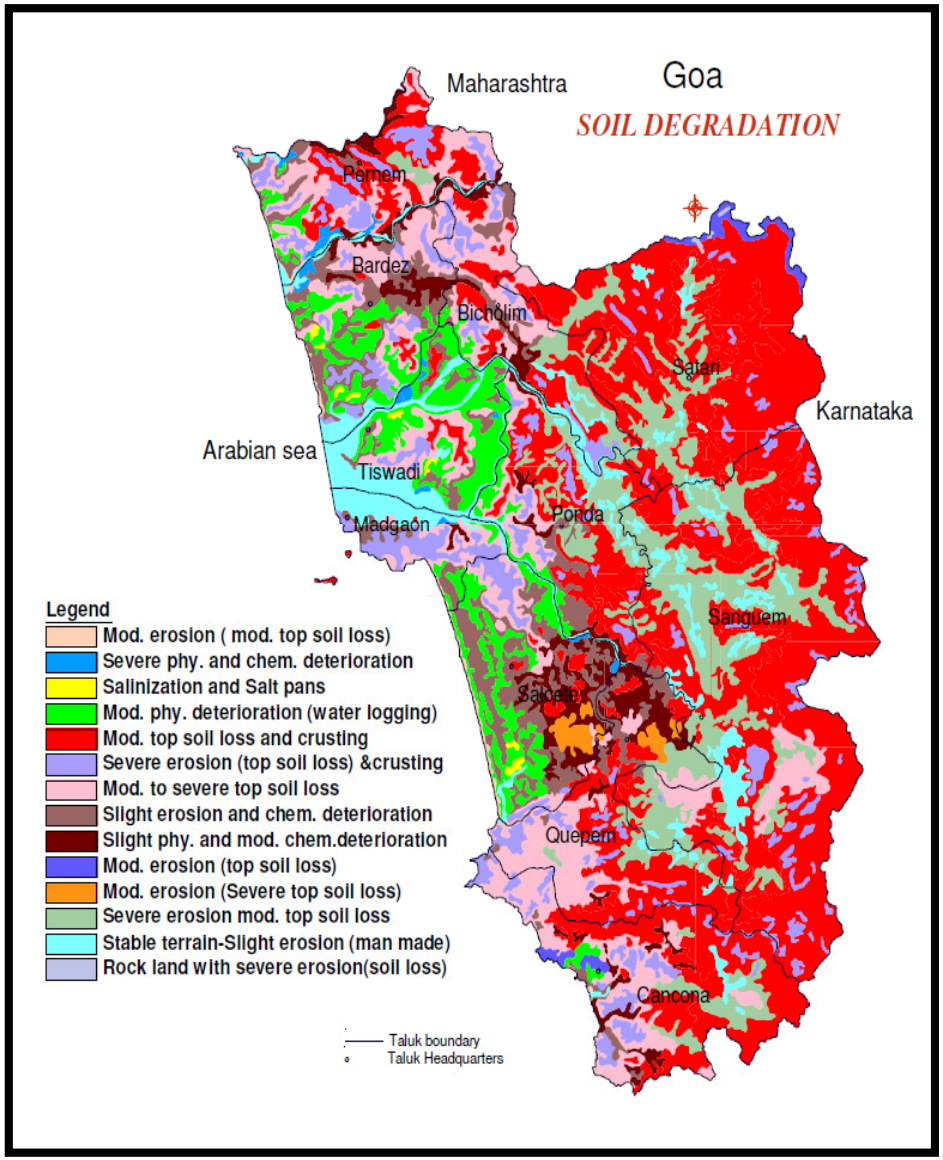
Fig. 7

Estimated soil loss

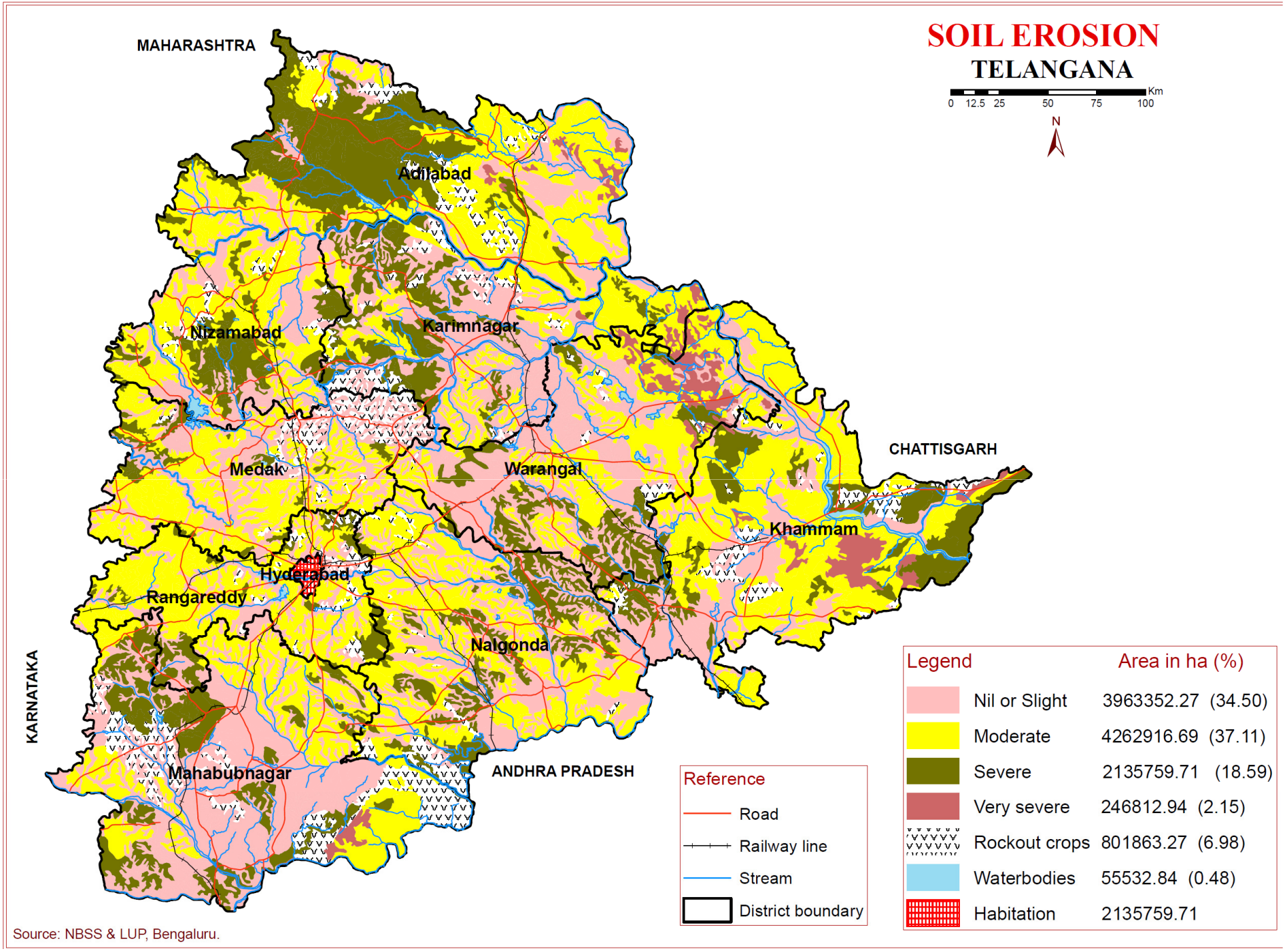


Source : Soil Erosion in Goa, NBSS&LUP Publ. No. 155 (2013)

Estimated soil degradation



Source : Soils of Goa for Optimising Land Use, NBSS&LUP Publ. No. 74 (1999)

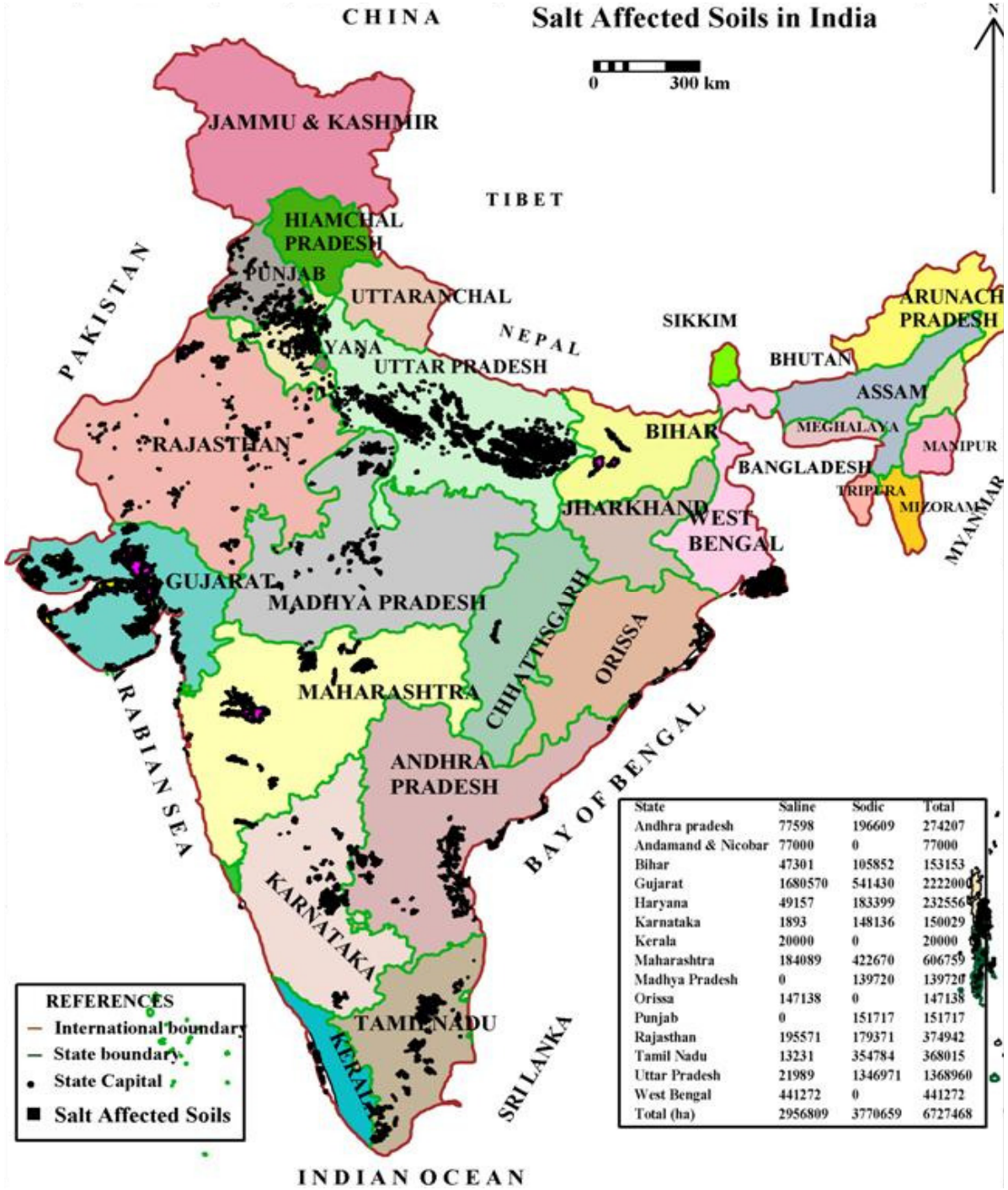


Source: NBSS & LUP, Bengaluru.

Mapping Saline Soils for Reclamation

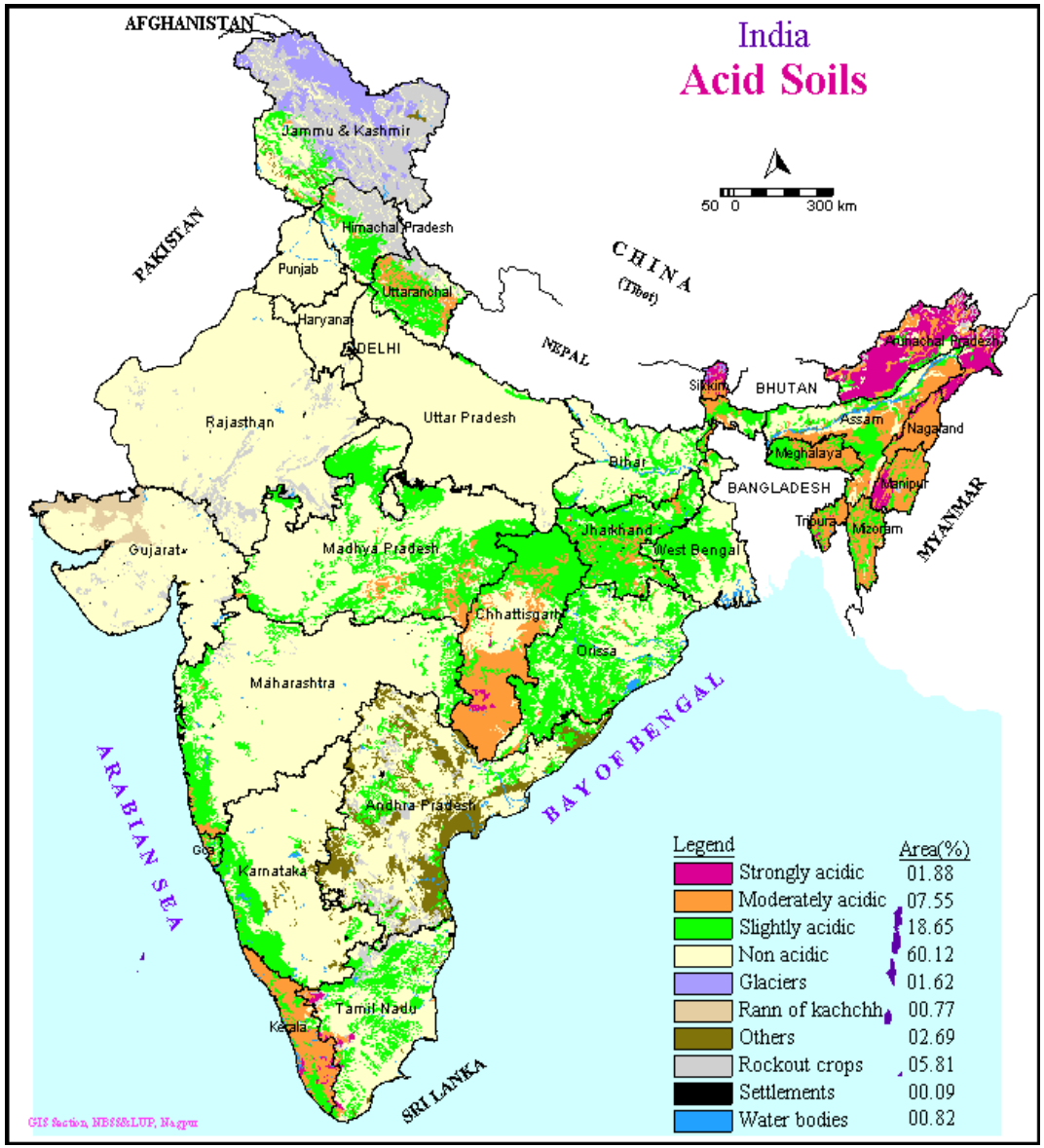
Reclamation of ~7m ha of salt affected soils for increased nutrient use efficiency and productivity

Salt Affected: 6.73 m ha



State	Saline	Sodic	Total
Andhra pradesh	77598	196609	274207
Andamand & Nicobar	77000	0	77000
Bihar	47301	105852	153153
Gujarat	1680570	541430	2222000
Haryana	49157	183399	232556
Karnataka	1893	148136	150029
Kerala	20000	0	20000
Maharashtra	184089	422670	606759
Madhya Pradesh	0	139720	139720
Orissa	147138	0	147138
Punjab	0	151717	151717
Rajasthan	195571	179371	374942
Tamil Nadu	13231	354784	368015
Uttar Pradesh	21989	1346971	1368960
West Bengal	441272	0	441272
Total (ha)	2956809	3770659	6727468

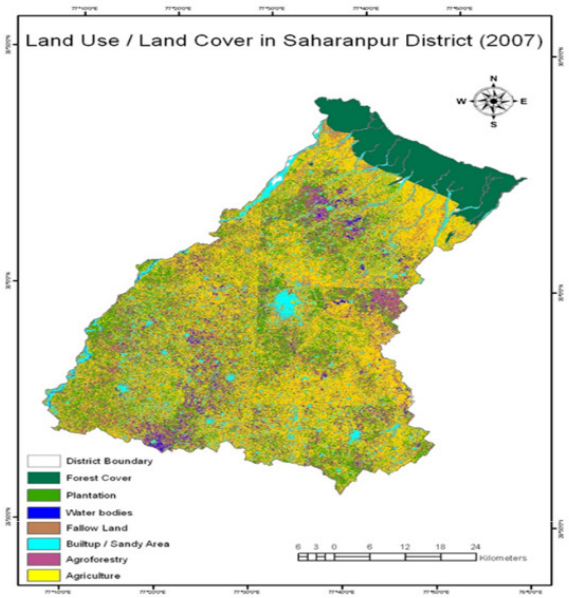
Mapping Acid Soils for Enhancing Productivity



Strongly acidic	pH<4.5	6.2 m ha
Moderately acidic	pH<4.5-5.5	24.4 m ha
Slightly acidic	pH<5.5-6.5	62.1 m ha

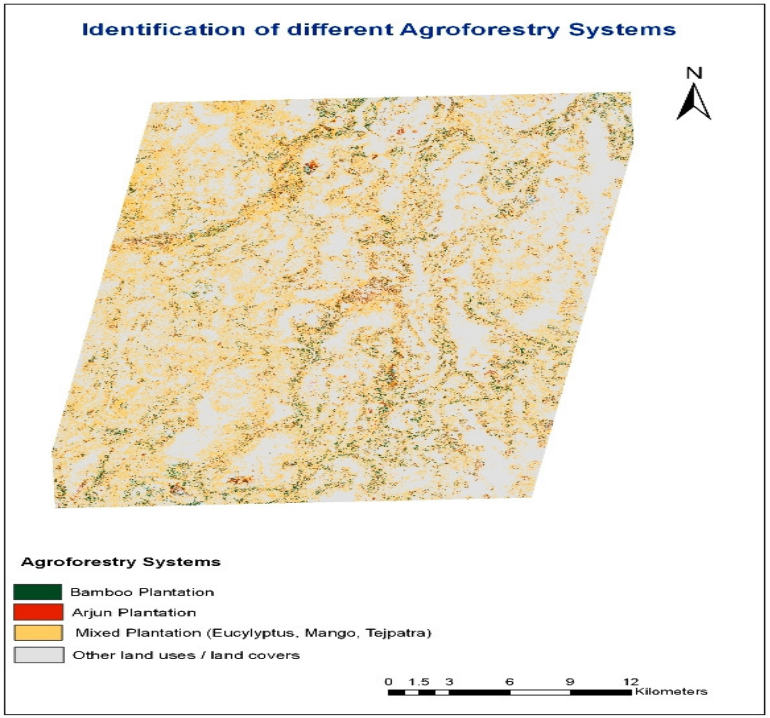
- About 12 m ha of arable acid soils with pH<5.5 have low nutrient use efficiency and crop productivity
- Liming to enhance nutrient use efficiency and productivity of crops, especially of pulses and oilseeds
- The practice saves 50% fertilizers

Mapping Agroforests



40746 ha

Saharanpur, UP



ACZ No.	Agro-climatic Region	Geog. area of Agro-climatic region (M ha)	AF area in Agro-climatic region (M ha)
3	Lower Gangetic plains	6.73	0.47 (6.99%)
5	Upper Gangetic plains	14.44	1.37 (9.51%)
6	Trans-Gangetic plains	11.60	0.51 (4.38%)
13	Gujarat plains & hill region	18.98	1.16 (6.14%)

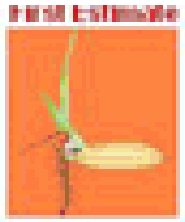
S.No.	Land use / land cover	Area (in ha)	Area (%)
1.	Agroforestry	40746.06	11.3
2.	Plantation	71539.20	19.8
3.	Agriculture	140631.00	38.8
4.	Forest	31000.00	8.6
5.	Bare / fallow land	43772.30	12.1
6.	Builtups / sandy area	25158.60	6.9
7.	Water/ water bodies	8889.34	2.5
	Total	361736.50	

Forecasting Agriculture Output using Space, Agromet and Land based observations (FASAL)

Nationwide Multiple Wheat & Rice Crop Forecasting

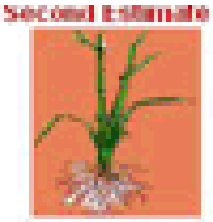
- In-season Crop Forecasts
- Impact of Drought & Flood Assessment
- Early Warning – Crop condition & Stress Scenario
- FASAL Centre /NCFC with Ministry of Agriculture

Pre-harvest Production Forecast at National, State and District levels for Major Crops like Paddy, Wheat, Sorghum, Rapeseed, Mustard, ...



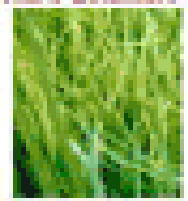
First Estimate

Econometric Models



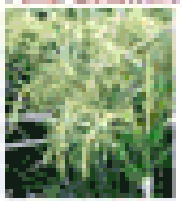
Second Estimate

Agromet Models



Third Estimate

Spectral & Agromet Models

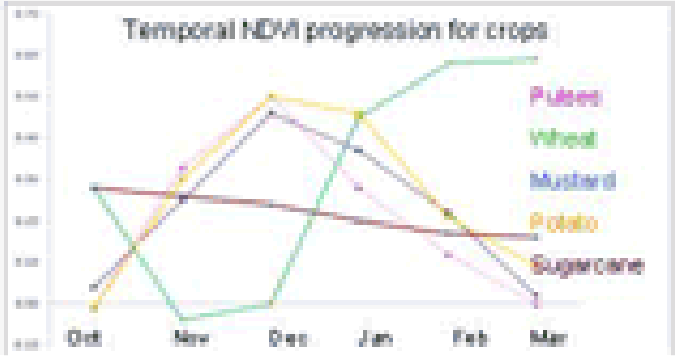


Final Estimate

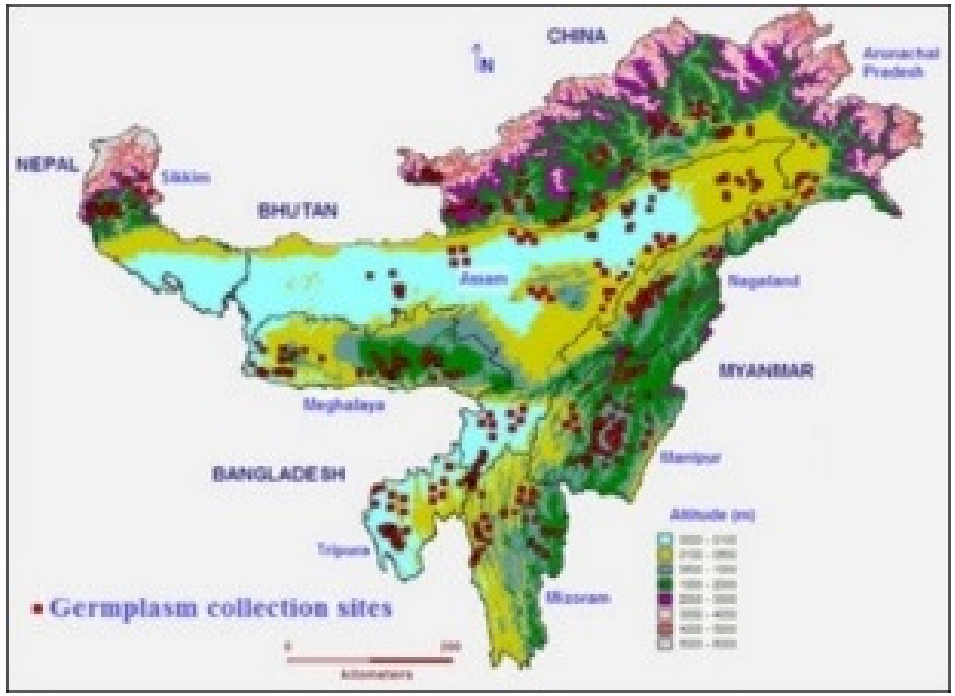
Spectral, Agromet & Econometric Models

Forecasts

Crop	Year	Acreage (mha)	Production (mt)
Rice	2008-09	35.97	78.37
Rice	2009-10	31.31	64.65
Wheat	2008-09	26.96	73.59
Wheat (2nd Estimate)	2009-10	28.19	80.01



Biodiversity: The Treasure



Collection sites from NEH under Special Exploration Mission (2011-14)

Geo-informatics studies of PGR

Agro-biodiversity

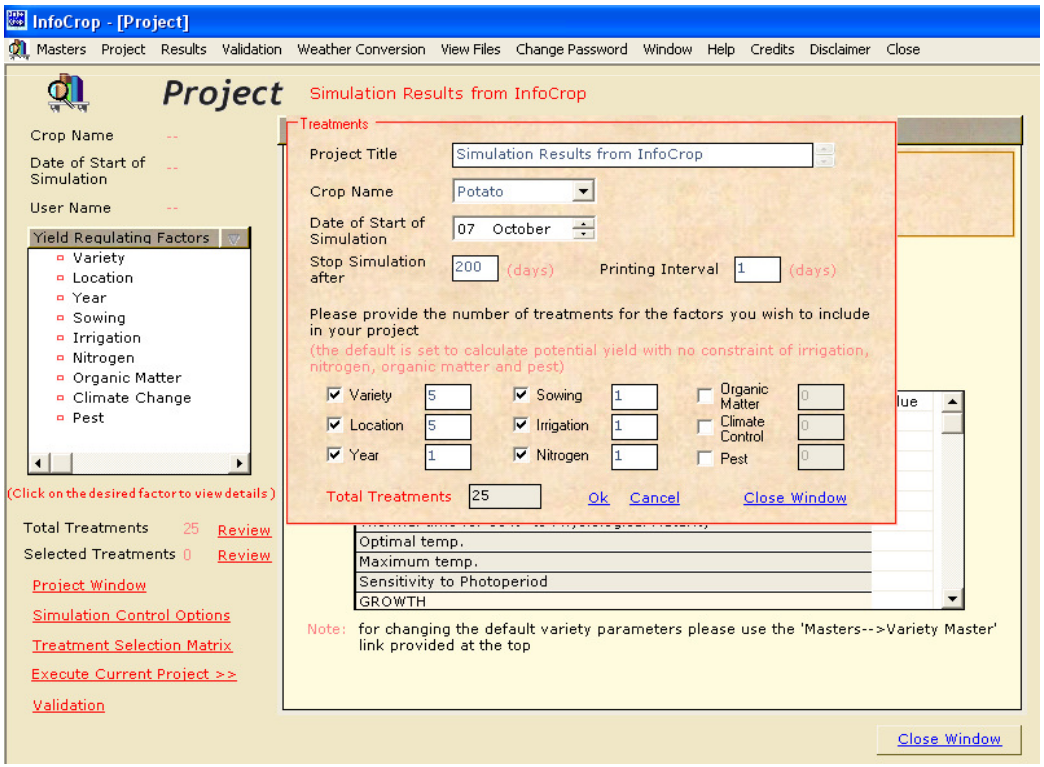
Digital Mapping of Weeds in India

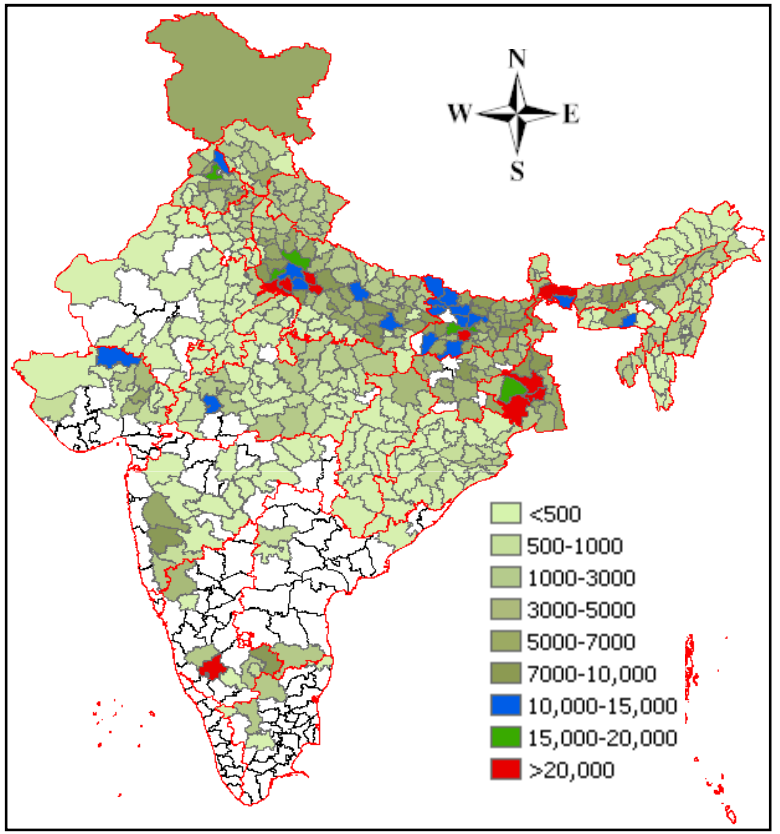
- Assisted in generation of weed maps for some of the states based on the data provided by NRCWS, Jabalpur
- The maps at state level for on groundnut, rice, wheat crops was generated showing degree of infestation of different weeds

- Haryana
- Punjab
- Andhra Pradesh
- Assam
- Chhattisgarh
- Arunachal Pradesh
- Nagaland
- Maharashtra
- Meghalaya
- Mizoram

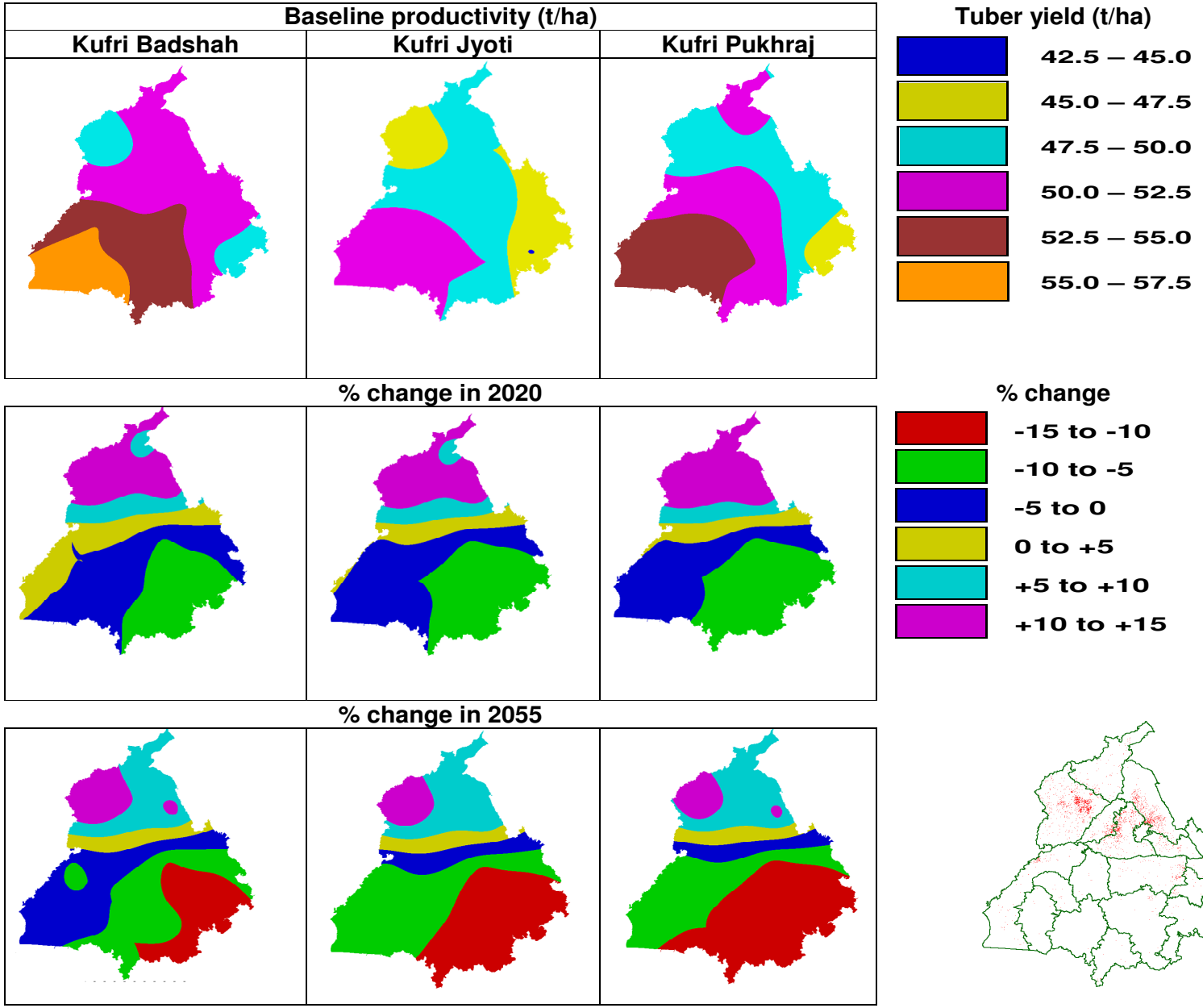
Acreage and Production Estimation of Potato Using Remote Sensing, GIS and Crop Modelling

- ISRO Collaboration
- INFOCROP-POTATO simulation model

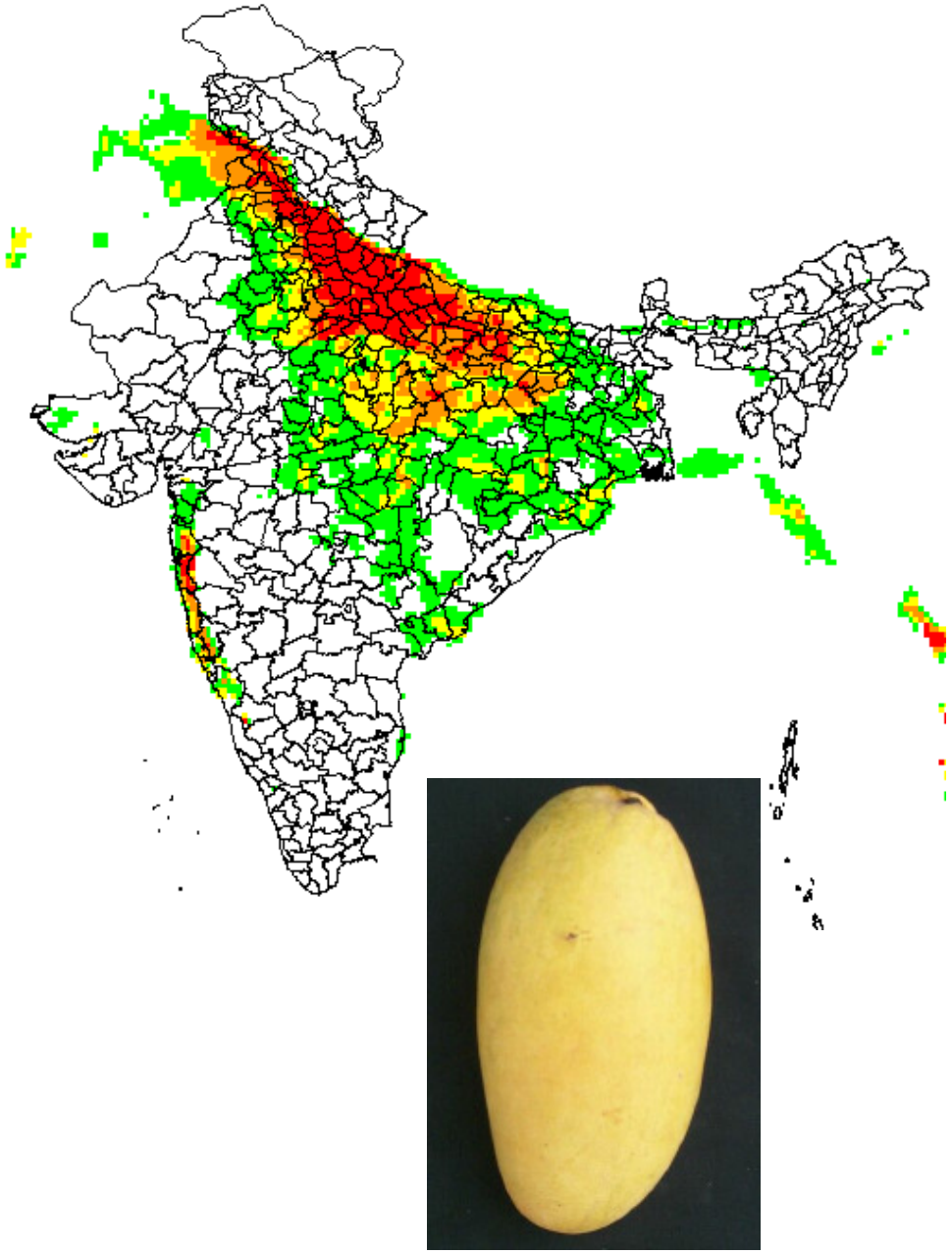


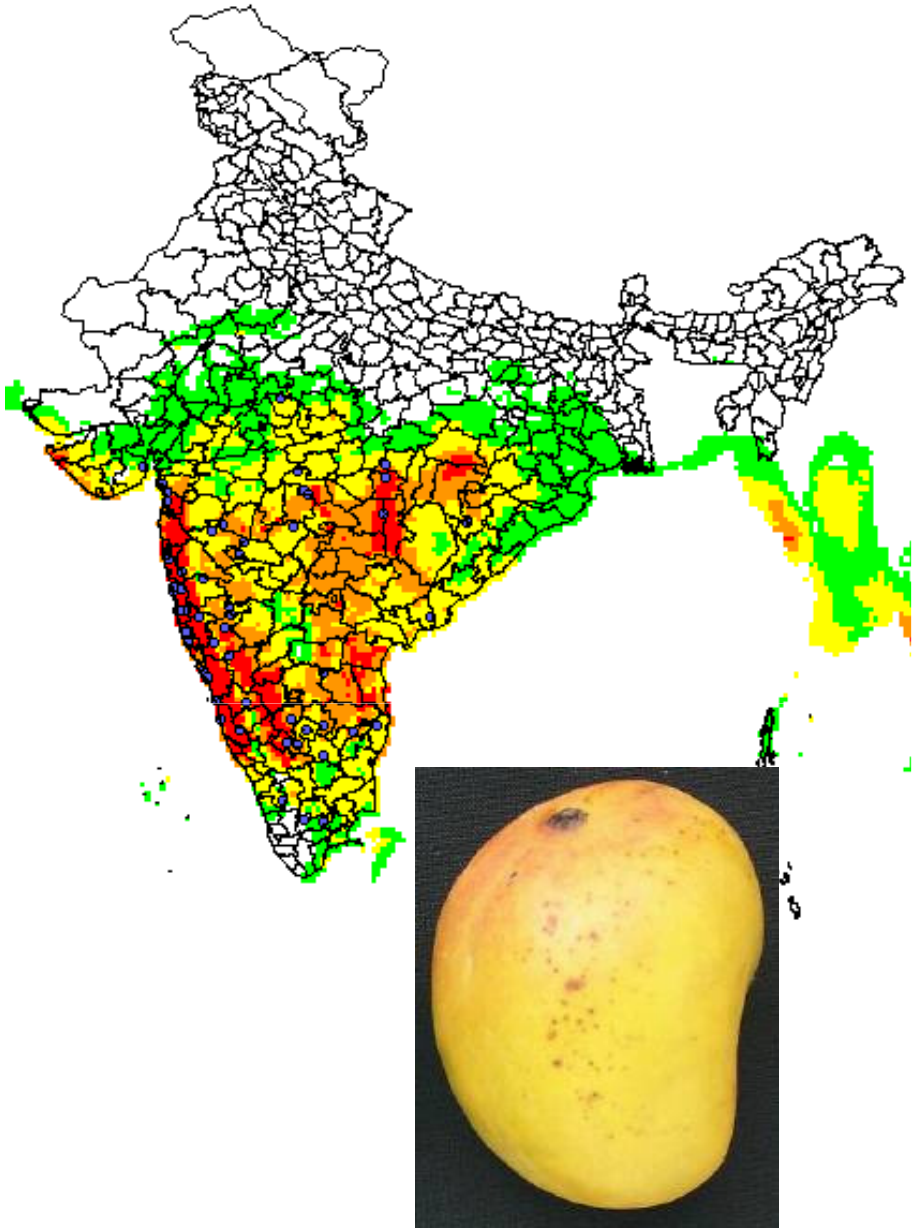


AWiFS image from IRS-P6 satellite showing potato crop distribution in Punjab

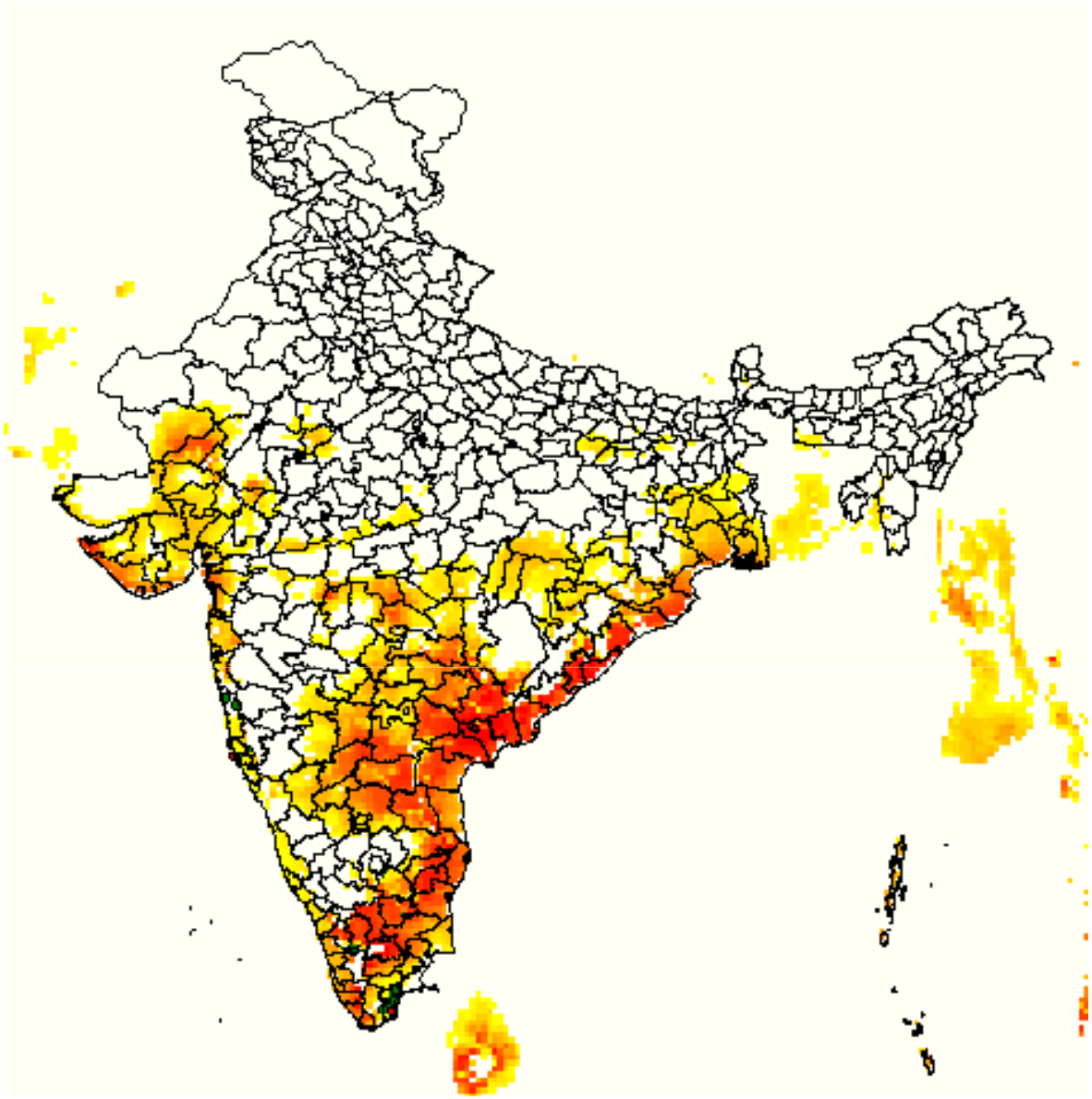


Productivity of different potato cultivars under baseline and changes in future climatic scenario in Punjab

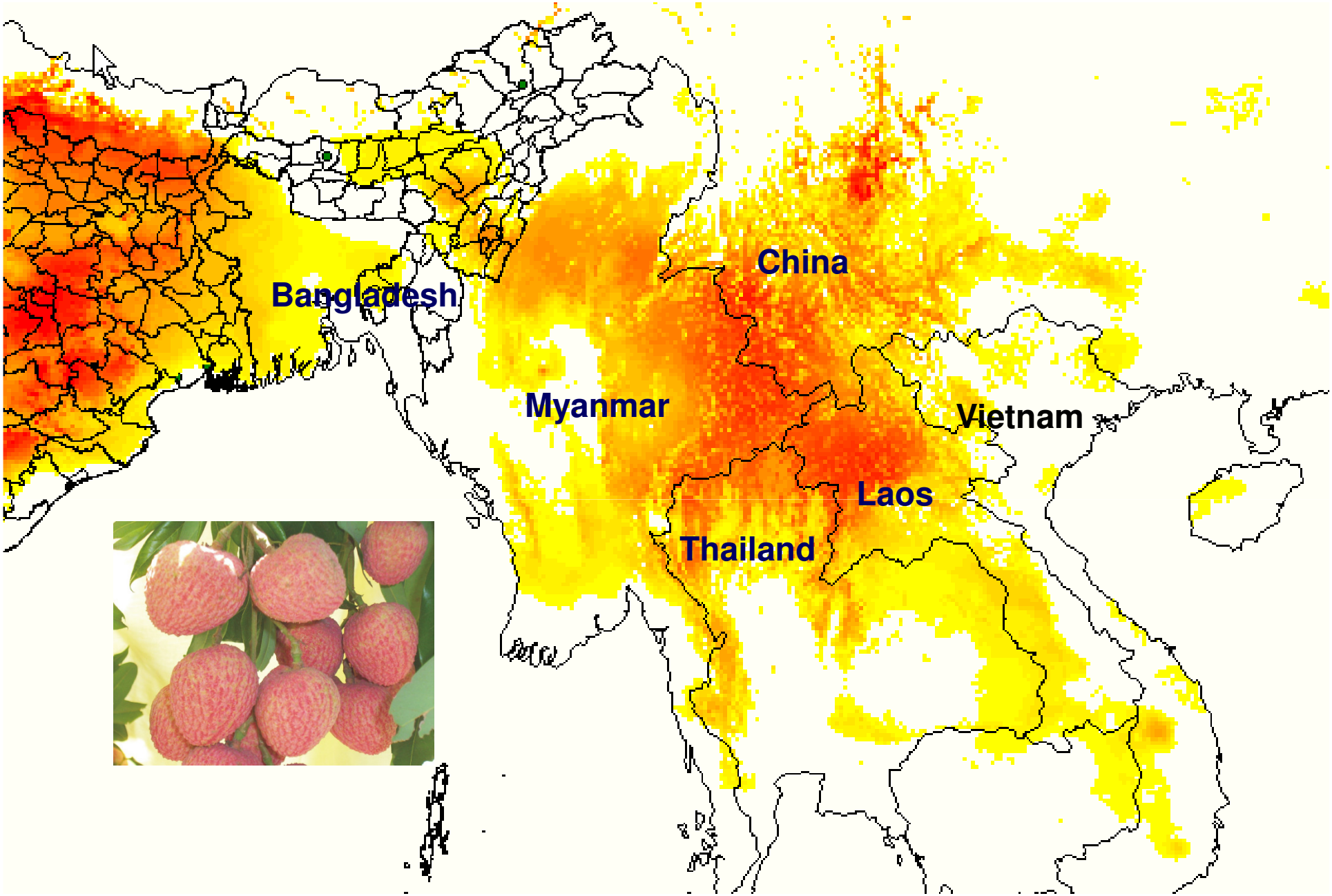




Prediction of suitable area for *Dashehari* and *Alphonso* mango



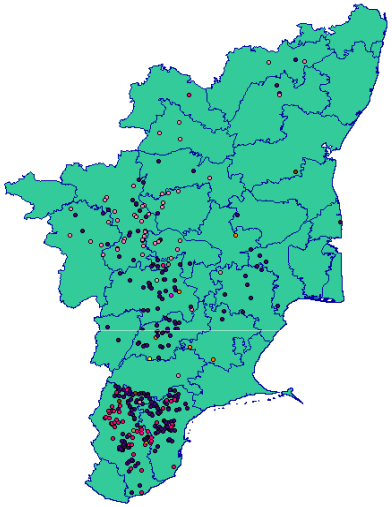
Projected areas suitable for producing two *aonla* harvests in a year



Areas suitable for introduction of litchi germplasm from exotic sources

Animal Epidemiology and Disease Identification

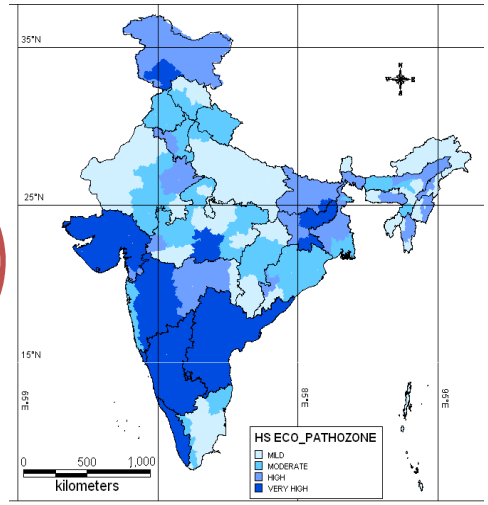
Disease Mapping

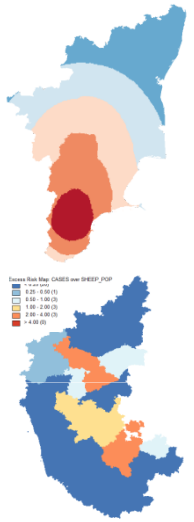


Blue tongue

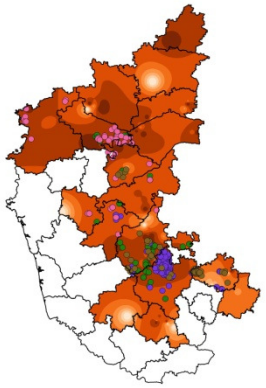
Anthrax

Identification of eco-pathozones & areas with elevated disease risk

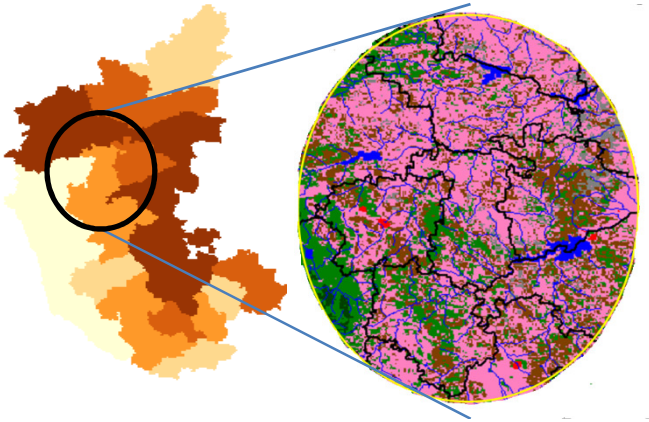




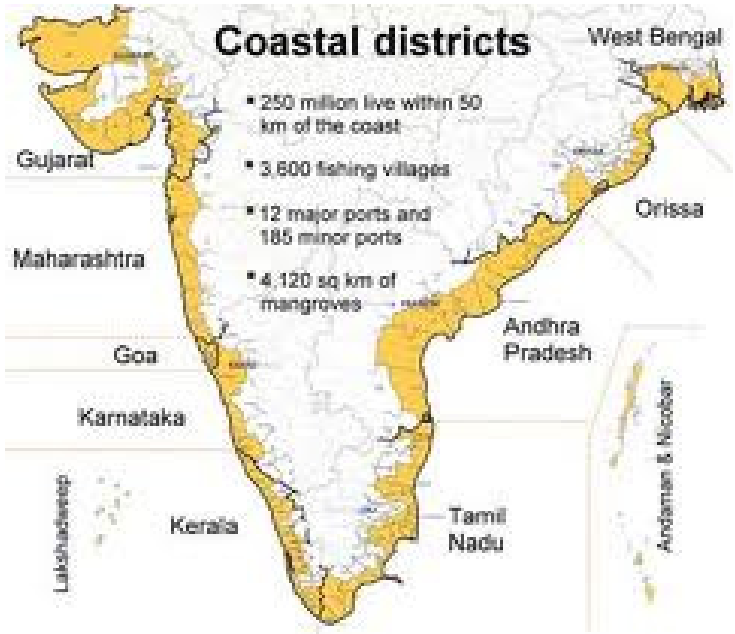
Mapping of Disease Prevalence



Spatial Cluster Analysis



Focus on Coastal Ecosystem of India



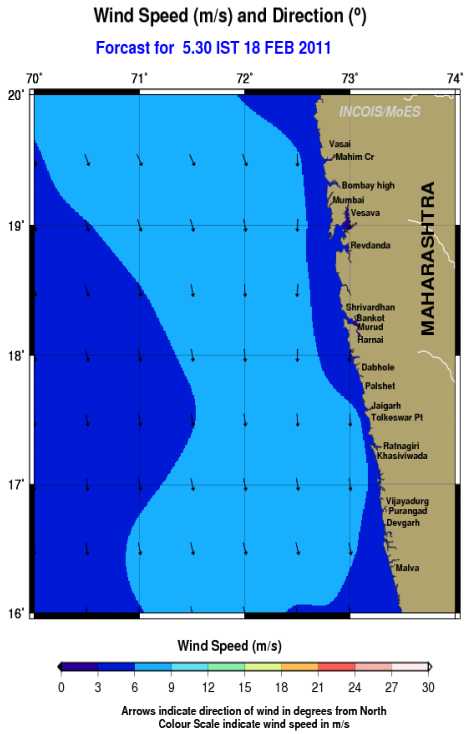
A large number of applications requires data from ocean color sensors, few such applications are:

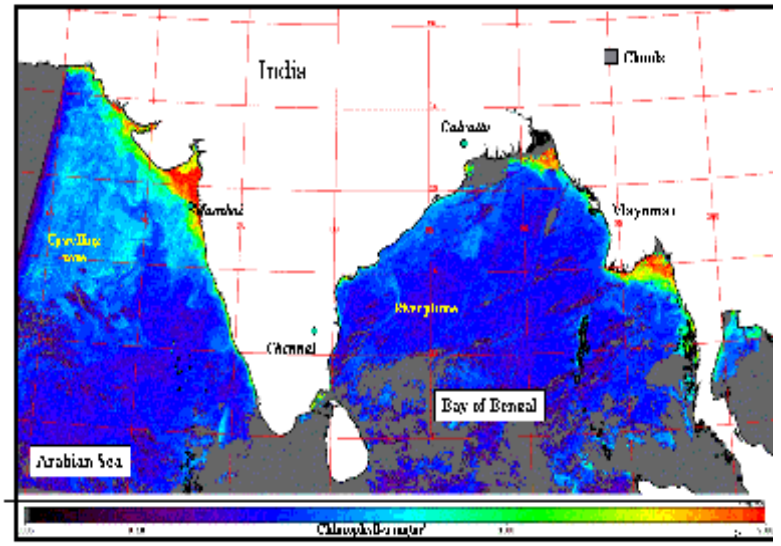
- Fisheries Research for potential fish zone forecasting
- Ocean optical properties
- Primary and new production in oceans
- Algal bloom detection
- Coastal Processes
- Coastal pollution

- Home of ¼th of the world population
- Cover 5.5 % of the country's TGA
- Current urban population is 220 million.
- Major States in East Coast: West Bengal, Orissa, Andhra Pradesh, Tamil Nadu & Pondicherry
- Major States in West Coast: Maharashtra, Goa, Karnataka, Kerala, Gujarat, Diu & Daman
- India has two distinct major island ecosystems: the Andaman and Nicobar group of islands and the Lakshadweep

m-Krishi Fisheries Advisory Service

- Provides oceanic wind speed and direction advisories 4 times daily and 5 days in advance
- PFZ advisories 3-4 days in advance
- Advisory being mobile based, ensures continuity and dependability in reaching the fishermen
- Saves fuel and time

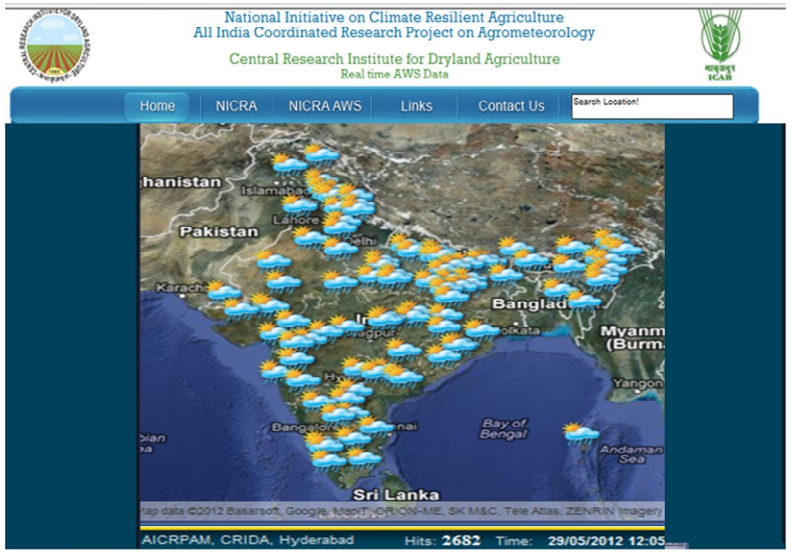




IRS P4 OCM derived chlorophyll a image for Arabian Sea and Bay of Bengal. Higher chlorophyll a concentration in southern Arabian Sea is associated with winter cooling phenomenon, leading to nutrient enrichment of upper surface layer in deep ocean. A large scale river plume is also seen in Bay of Bengal, emerging out of Krishna-Godavari delta. (Data from pass 010 & 11, Dated : 29th, 30th January, 2000)

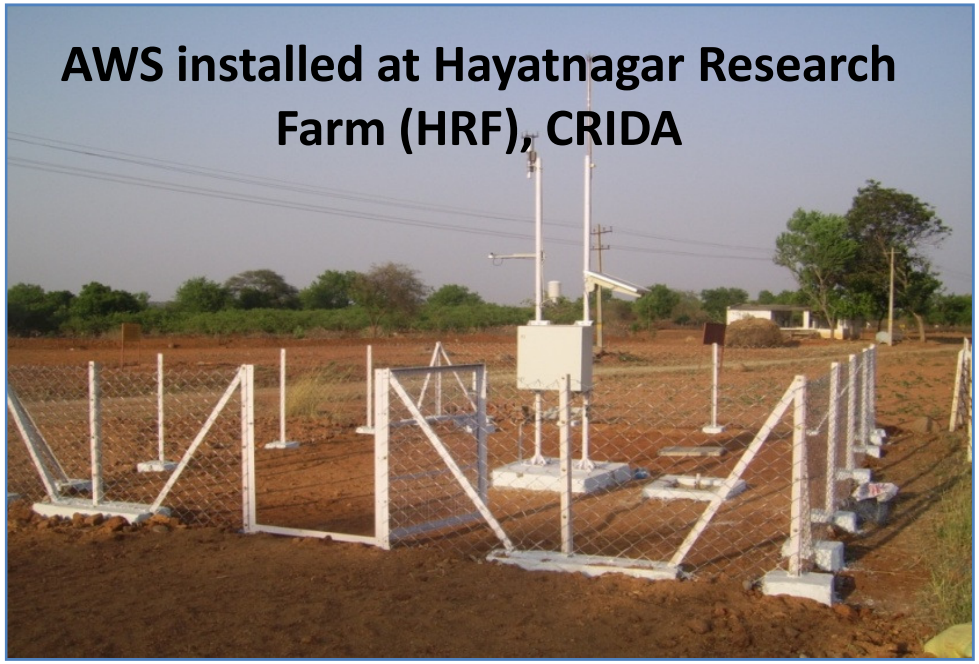
Agro-advisories: Real Time Weather Data

Pilot testing of customized agro-advisories at village level through SAU-KVK interface based on real time feed back- 25 AICRPAM centres and KVKs



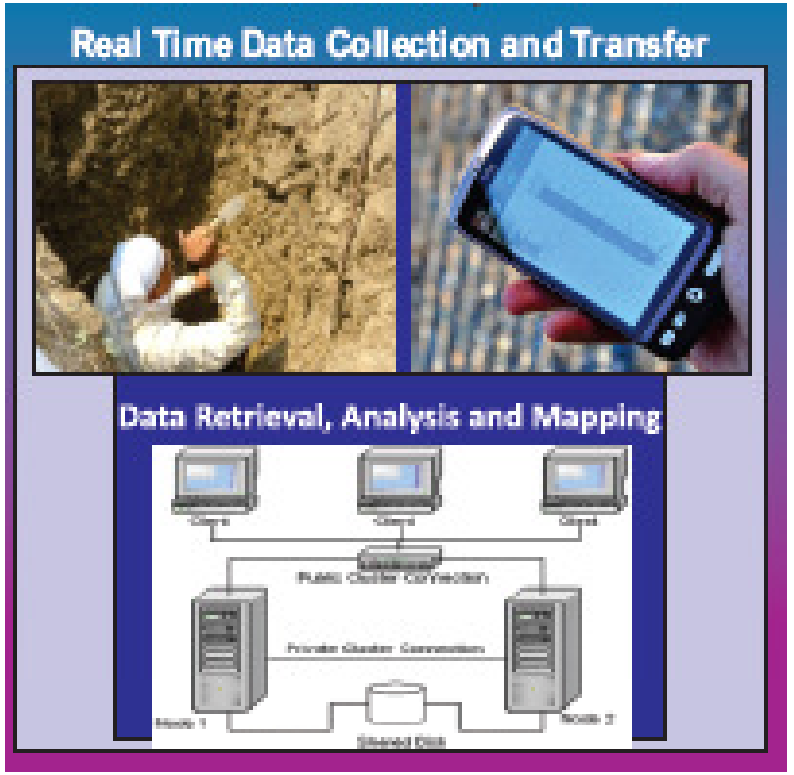
100 AWS installed in KVKs for collection of Real time weather and crop data for modeling and agro-advisories

AWS installed at Hayatnagar Research Farm (HRF), CRIDA



‘Reaching the Unreached’
Use of ICT: Web-based Agro-Advisories

- e-Connectivity hub for 192 KVKs and 8 ZPDs
- Comprehensive Weather-Crop-Market Advisories
- KVK Mobile Advisory Launched by H.E. Governor of Karnataka, 2010



‘Reaching the Unreached’
Use of ICT: Web-based Agro-Advisories

- Satellite-based e-Connectivity hub for 192 KVKs and 8 ZPDs
- Real-time Weather Advisory
- Comprehensive Weather-Crop-Market Advisories
- Community Radio

100 AWS installed in KVKs

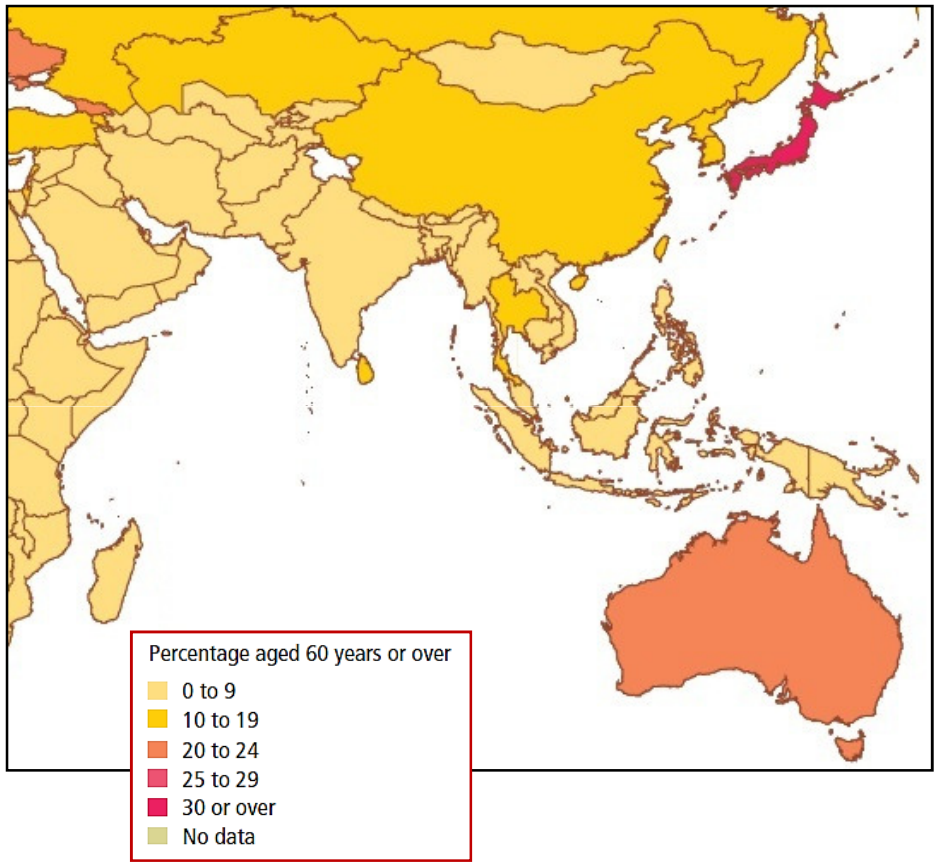
SMS Portal for Farmers

NICRA

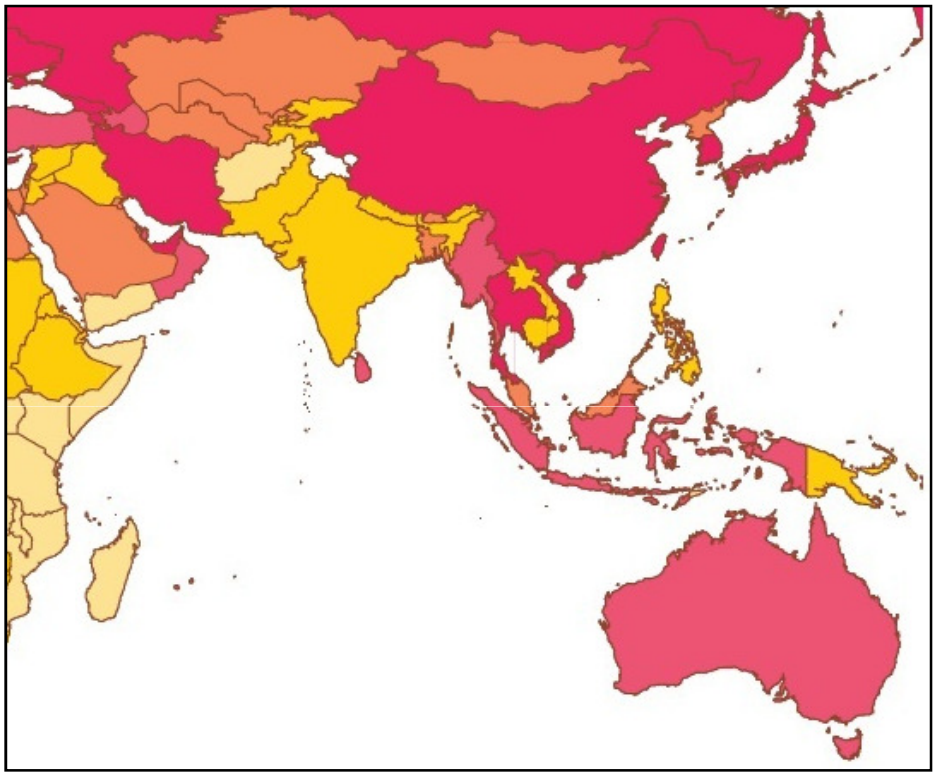
580 Contingency Plans

Opportunity: Skill Development

2012



2050



India 2050: 50-50

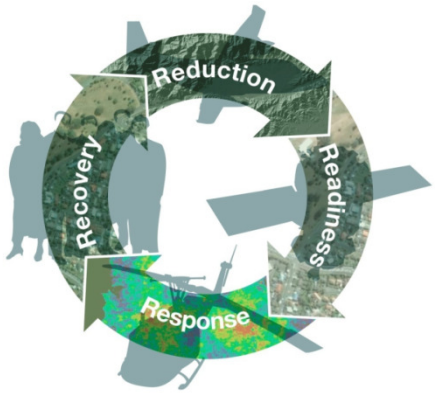
Source: UN 2011

ICAR Collaboration with other Ministries/Departments

DAC	Seed, Farm mechanization, Climate Resilient Agriculture
DAHD&F	Feed & Fodder, Diagnostics and Vaccines
DBT	Molecular Breeding and GM Foods
CSIR	Secondary Agriculture
ICMR	Health Foods and Zoonotics
DRDO	High Altitude Agriculture
MFPI	Agri-processing and Value Addition
MoEF	Climate Change, Global Warming
MoES	Medium range Agro-advisory services
DoS	Monitoring of Natural Resources, Crop Acreage & Yield Forecasting
MHRD	Higher Education and Skill Development
MoRD	Technologies for convergence with MNREGA

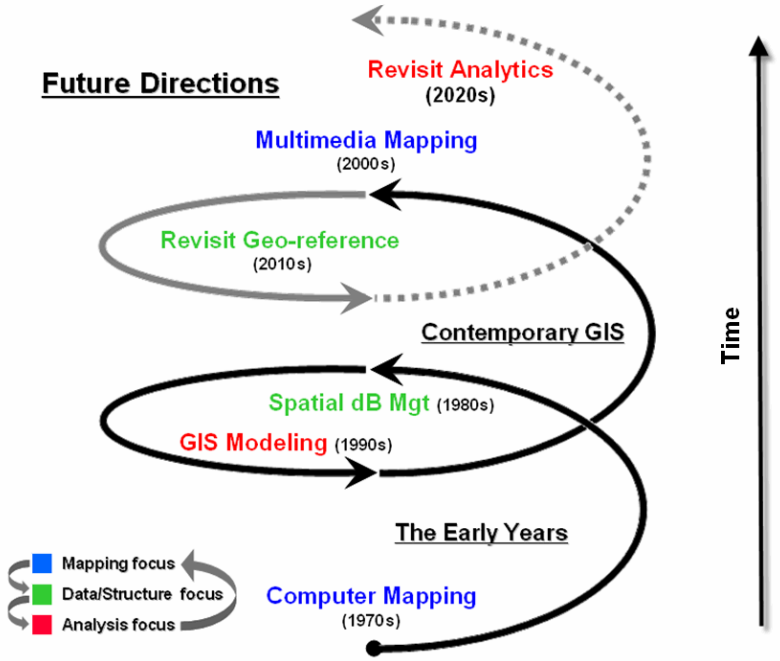
Flagship Programs

- Development of Soil Resource Inventory
- Basic and Strategic Research in Pedology, Agro-ecological Regionalization and Land Use Planning
- Land Evaluation and Land Use Planning for Rational Use of Land Resources
- Human Resource development



Need of the hour

- Data Integration (Soil with Crop)
- Land Resource Assessment for climate resilience
- Assessing the Carrying Capacity of the Ecosystems



ICT in Agriculture

Way Forward in Space Technology for Agriculture

Land Resource Inventory and Land Use Planning

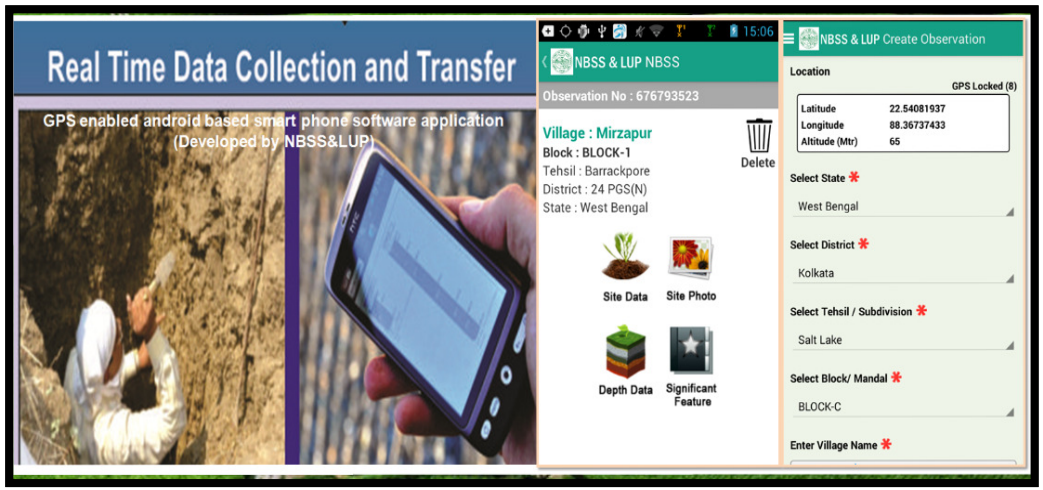
Land Resource Inventory (1:10000 scale)

Data Integration : Socio-economics and scientific land use planning in GIS environment

Site Specific information on soils and situation specific recommendations

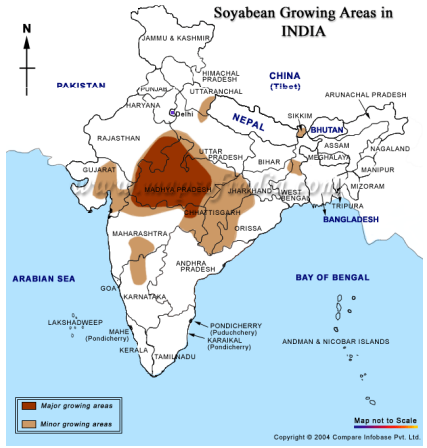
Improved Resource Inventorying & Monitoring

- Digital soil mapping : 1:10000 scale
- Modelling for prediction of land/soil degradation
- Inputs for generation of soil health cards
- Monitoring soil quality/land degradation
- Stress on arable land and its management



Way Forward in Space Technology for Sustainable Agriculture

Altitudinal Shift in Apple



Focus on Soybean

Animal Migration

- Monitoring and forecasting tools of crop conditions for
  - * Pest & Disease Surveillance – Crops and Animals
  - * Temperature, water and nutrient stress on crops
  - * Value added improved agro-advisories
- Improving coastal agriculture
- Management decision and effective dissemination tools for enhancing input use efficiency
- Conservation agriculture/ crop residue management
- Carbon sequestration in different agricultural land use management scenarios
- Potential Fish Zone mapping and timely forewarning; including marine turbidity and algal blooms

Precision Farming

Way Forward in Space Technology for Agriculture

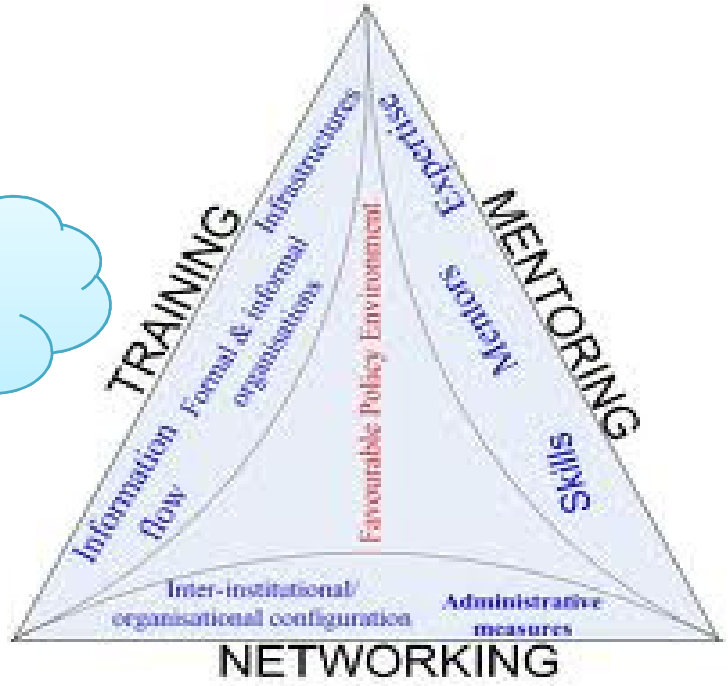
Capacity Building

Human Resource development

- **Skill**
- **Technology Updates for Real-time Datasets**

Geo-portals

Cloud



2	Central Agricultural Universities
107	Research Institutes incl. 4 Deemed Universities
641	Krishi Vigyan Kendras (KVKs)
65	State Agricultural Universities
78	AICRPs & AINPs

Institutional Linkages:

ISRO, NRSC, SAC, MoES, MoEF, ICAR, DST

Good Governance Day – 25 December 2014

(Salient points on e-Governance in DARE/ICAR)

- e-Governance for transparency and efficiency
- *e-Office* introduced
- *e-procurement*
- *Online RTI*
- *CCMS* (Court Case Monitoring System)
- *VOICE* (Vigilance Online Integrated Complaint & Enquiry)
- *Biometric Attendance System*
- Online monitoring of Result Framework document (RFD)
- *GHMS* (Guest House Management System)
- Rice Knowledge Management Portal (RKMP), http://www.rkmp.co.in
- Microbial Genetic Resource Portal, http://www.mgrportal.org.in/
- Knowledge Innovation Repository Of Agriculture In The North East, http://www.kiran.nic.in
- e-Learning Portal On Agricultural Education *(e-KrishiShiksha),* http://ecourses.iasri.res.in
- e-Publishing And Knowledge System In Agricultural Research, http://epubs.icar.org.in
- Consortium For e-Resources In Agriculture, http://cera.iari.res.in
- *Krishikosh*, http://krishikosh.egranth.ac.in
- Agropedia, http://www.agropedias.iitk.ac.in
- ICAR Website, http://www.icar.org.in
- ICAR YouTube Channel http://www.youtube.com/user/icarindia?feature=results_main
- *Kisan* Mobile Advisory
- Caneinfo, http://caneinfo.nic.in
- Facebook page of ICAR www.facebook.com/InAgrisearch

Currently 147 institutions in NARES have 24x7 online accesses to agricultural research journals on CeRA platform through IP authentication

ASHOKA

Smart Farmer ?

- Data
- Studies are project based
- ST – Farmer friendly
- ST on hand-held gadgets
- Scale-up

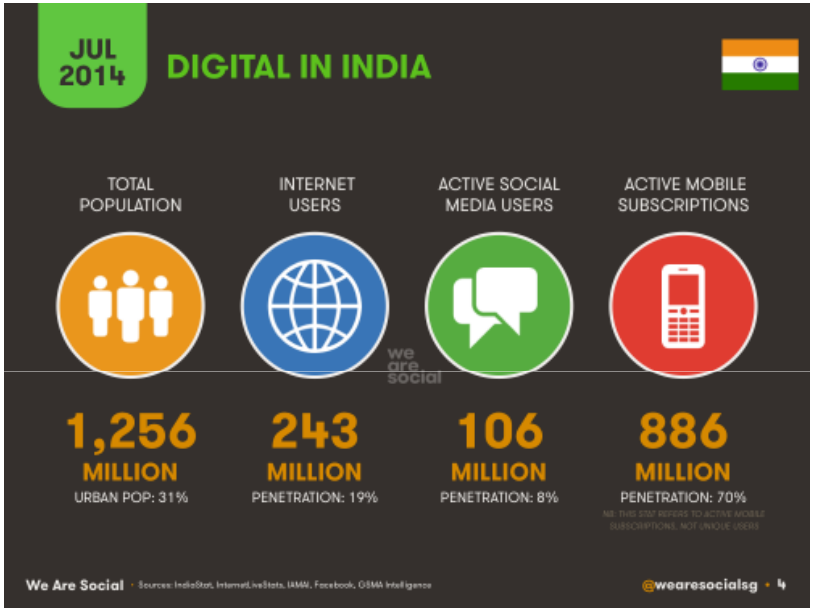
- Farmer's Interest
- Acquaintance
- Climate Smart Villages
- PPP
- Community Radio
- My Village, My Pride

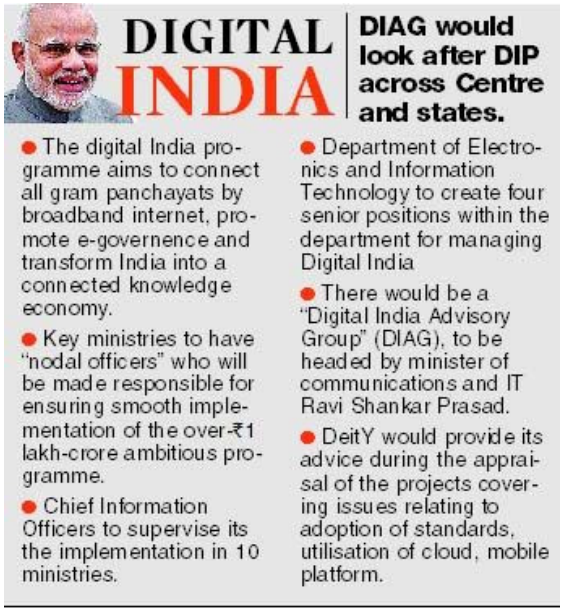
Suitable areas for organic farming

Sustainable Intensification

Catering to the Needs - FARMERS

Digital India





DIGITAL INDIA

DIAG would look after DIP across Centre and states.

- The digital India programme aims to connect all gram panchayats by broadband internet, promote e-governence and transform India into a connected knowledge economy.
- Key ministries to have "nodal officers" who will be made responsible for ensuring smooth implementation of the over-₹1 lakh-crore ambitious programme.
- Chief Information Officers to supervise its the implementation in 10 ministries.
- Department of Electronics and Information Technology to create four senior positions within the department for managing Digital India
- There would be a "Digital India Advisory Group" (DIAG), to be headed by minister of communications and IT Ravi Shankar Prasad.
- DeitY would provide its advice during the appraisal of the projects covering issues relating to adoption of standards, utilisation of cloud, mobile platform.

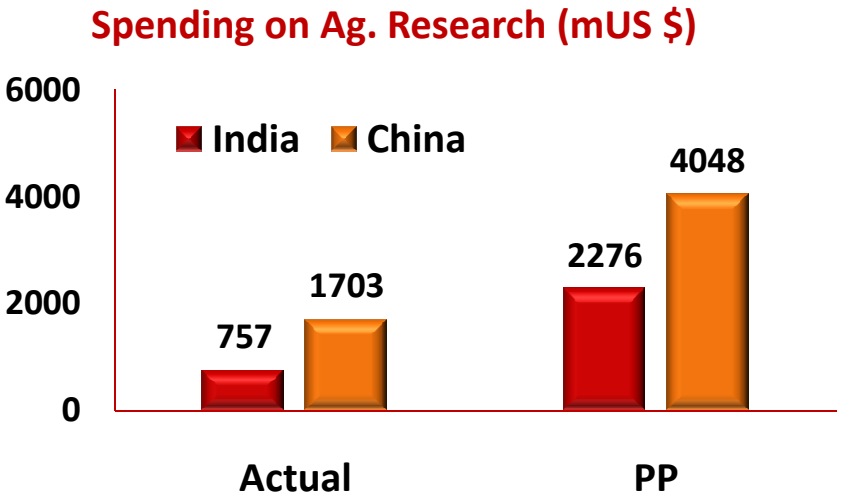
Transforming Indian Agriculture - GeoAGRI

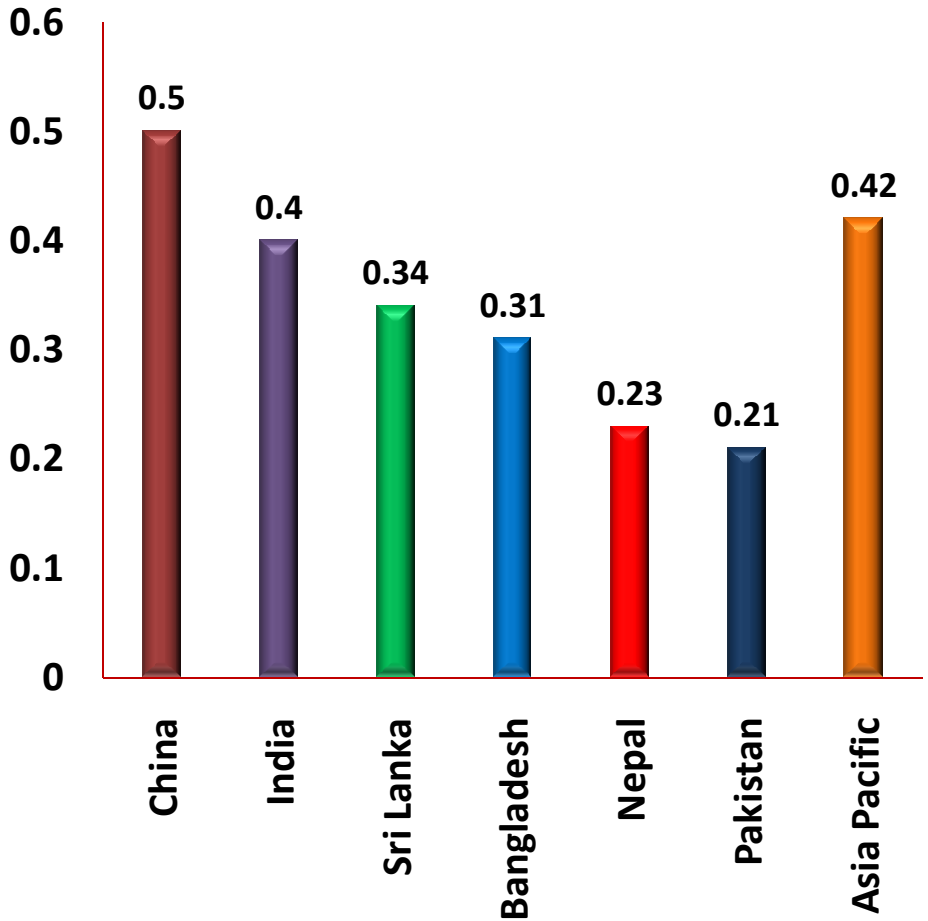
Investments in Ag R&D - High Returns

	China	India	Thailand	Ghana	Uganda	Tanzania	Ethiopia
	Returns to Agriculture or Rural income (local currency/local currency spending)						
Agric. R&D	6.8	13.5	12.6	16.8	12.4	12.5	0.14
Education	2.2	1.4	2.1	-0.2	7.2	9	0.56
Health	n.e.	0.8	n.e.	1.3	0.9		
Roads	1.7	5.3	0.9	8.8	2.7		
Ranking in returns to poverty reduction							
Agric. R&D	2	2	1	n.e.	1	2	n.e.
Education	1	3	3	n.e.	3	1	n.e.
Health	n.e.	4	n.e.	n.e.	4	n.e.	n.e.
Roads	3	1	2	n.e.	2	3	n.e.

Share of TFP in Crop Output Growth: 17-32%

Public Agricultural Research Spending



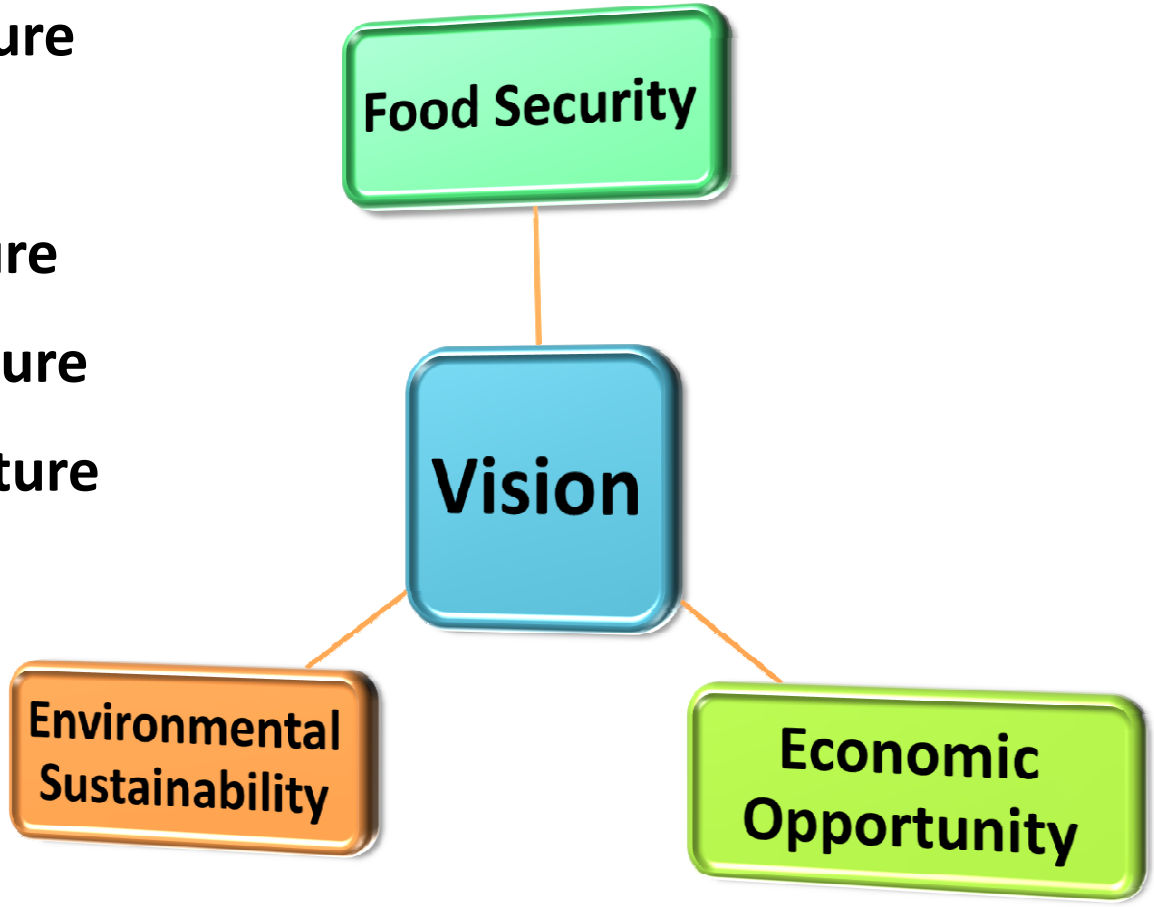


Spending in African Countries	
➢ South Africa	2.18%
➢ Kenya	1.21%
➢ Malawi	1.03%
➢ Ghana	0.69%
➢ Africa	0.51%
Latin American & Caribbean	
➢ Brazil	1.52%
➢ Mexico	1.15%
➢ LA & C	1.10%

(Source: GFPR 2014)

'I' factor for New Agriculture in India

- Information for agriculture
- Innovations in agriculture
- Inputs management
- Incentives for agriculture
- Investments in agriculture
- Institutional infrastructure



smart farming 4 small farmers

Appropriate geo-referenced information on physical and socio-economic resources for agriculture in the broadest sense (including fisheries and forestry) of substantial value in the analysis of economic feasibility and environmental accessibility of agricultural and rural development and food security programs

THANK YOU

www.icar.org.in

स्वच्छ भारत

एक कदम स्वच्छता की ओर

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch

Digital ICAR: Geo-portal

http://krishi.icar.gov.in