



Agricultural Drought Monitoring in India

with special emphasis on NADAMS



Government of India

Ministry of Agriculture & Farmers' Welfare

Department of Agriculture, Cooperation & Farmers' Welfare

Mahalanobis National Crop Forecast Centre, New Delhi

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MNCFC: An Introduction



Established in 23rd April, 2012



Attached office of Department of Agriculture, Cooperation & Farmers' Welfare



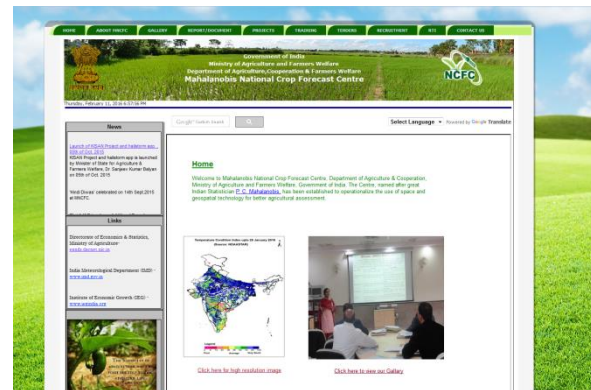
With Technical Support & Human Resources Support from ISRO



Mandate: Use of Geospatial Technology for Agricultural Assessment



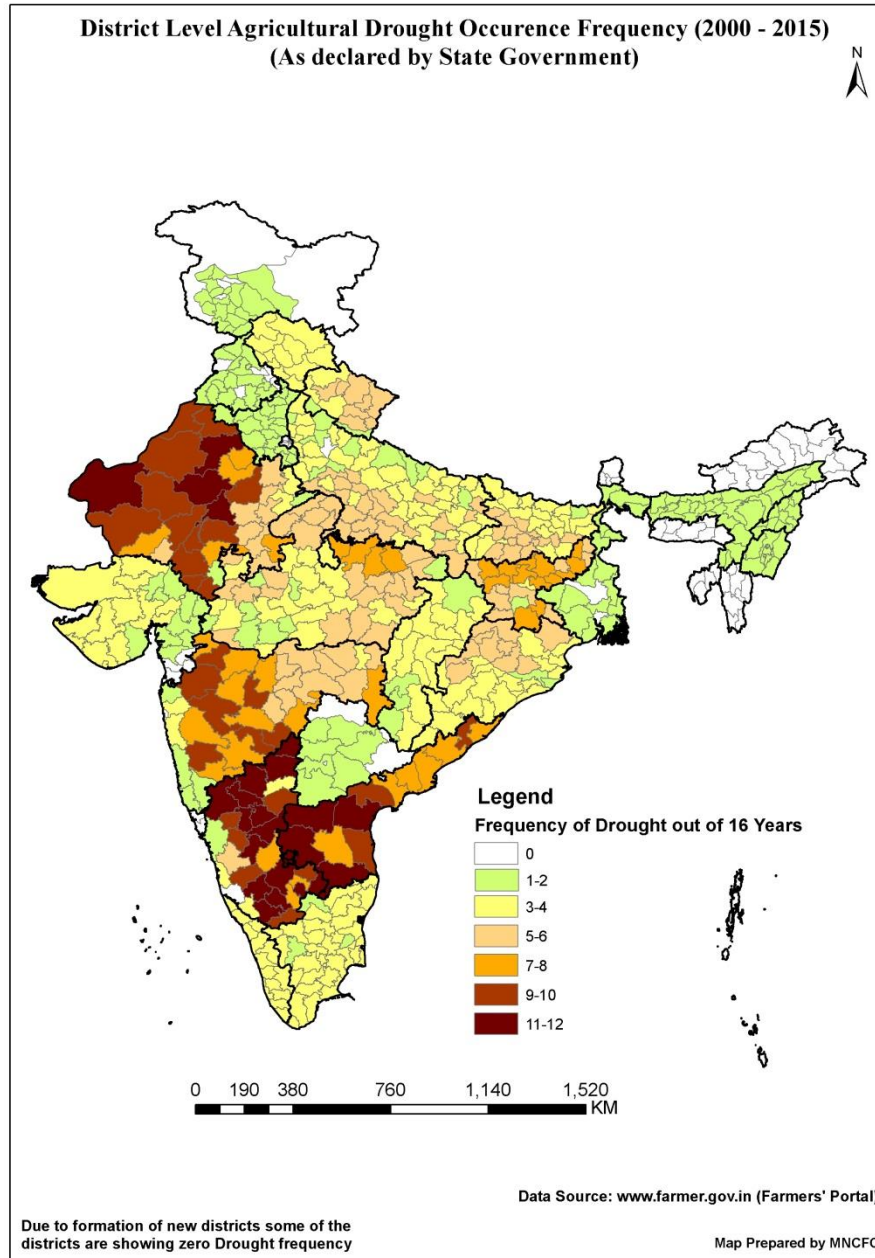
Major Programmes: FASAL, NADAMS, CHAMAN, KISAN





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Drought Occurrence Frequency





Central Agencies involved with Drought Monitoring/Management in India



Ministry of Agriculture & Farmers' Welfare

- Overall coordination, Inter-Ministerial Crop Weather Watch Group (CWWG), Leading IMCT for Drought Assessment

India Meteorological Department

- Weather Forecasting, Rainfall Data

MoWR, RD&GR (CWC, CGWB)

- Monitoring Reservoirs and Ground water situation

Indian Space Research Organization

- Space based inputs

ICAR- CRIDA

- Contingency planning

DOLR/ MOWR/DAC&FW

- PMKSY-Watershed Development-Water Harv. Str. /Irrigation/Water Use efficiency

Mahalanobis National Crop Forecast Centre

- Agricultural Drought Monitoring : NADAMS



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Crop Weather Watch Group



Partners	Tasks
Additional Secretary, DAC&FW & Central Drought Relief Commissioner	Chairperson of the Group: overall coordination
Economics & Statistical Advisor, DAC&FW	Report behavior of agro-climatic and market indicators
Agriculture Commissioner	Crop conditions: Availability of Inputs; Contingency Planning
Animal Husbandry Commissioner	Livestock health; Fodder availability
India Meteorological Department	Rainfall forecast and monsoon conditions.
Central Water Commission & Central Ground Water Board	Monitoring data on Important reservoirs / groundwater.
Ministry of Power	Availability of power
Indian Council of Agricultural Research	Technical input and contingency planning
National Centre for Medium Range Weather Forecasting	Provide medium-term forecasts
Mahalanobis National Crop Forecast Centre	Agricultural Drought Information
Indian Space Research Organisation	Technical inputs on drought parameters



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Parameters for Drought Declaration

(Drought Manual, 2016)



Levels	Category	Parameters
Trigger 1 (Cause)	Rainfall Based	1. RF Deviation or SPI 2. Dry Spell
Trigger 2 (Impact)	1. Remote Sensing 2. Crop Situation 3. Soil Moisture 4. Hydrological	1. NDVI & NDWI Deviation or VCI 2. Area under sowing 3. PASM or MAI 4. RSI/GWDI/SFDI
Verification	Field Data	GT in 5 sites, each, of 10% of Villages

RF – Rainfall

SPI – Standardized Precipitation Index

NDVI – Normalized Difference Vegetation Index

NDWI – Normalized Difference Wetness Index

PASM – Plant Available Soil Moisture

MAI – Moisture Adequacy Index

RSI – Reservoir Storage Index

GWDI – Ground Water Drought Index

SFDI – Stream Flow Drought Index

GT – Ground Truth



National Agricultural Drought Assessment & Monitoring System (NADAMS)



Operational Drought assessment during Kharif using Remote Sensing (Methodology developed by ISRO).

Monthly/fortnightly District/Sub-District level drought assessment for 14 Agriculturally Dominant states of India (6 at Sub District level).

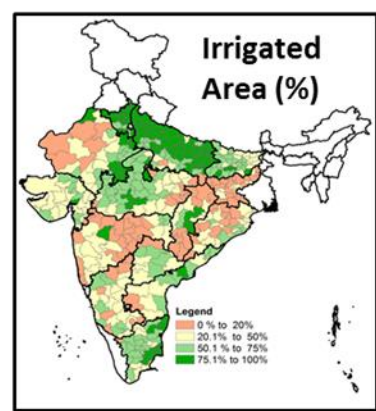
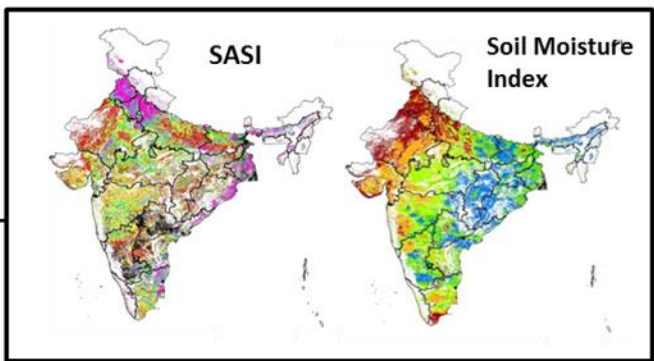
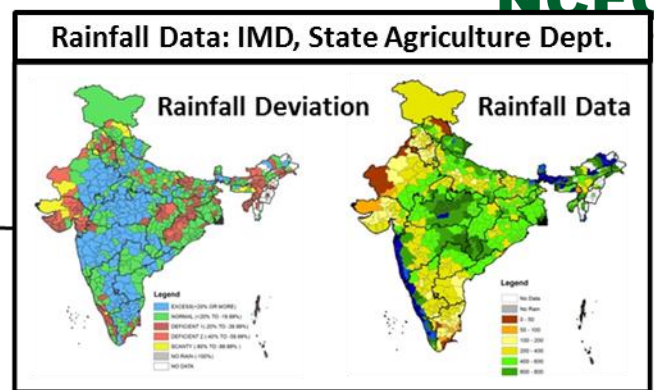
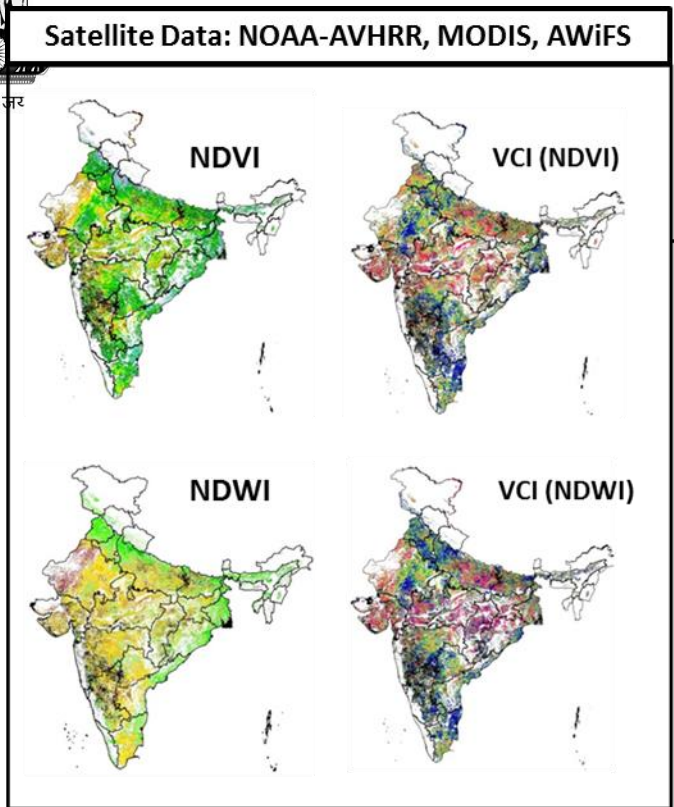
Satellite based indices, Rainfall data, Soil moisture, Ground information on Sowing progression and Irrigation Statistics are used for drought assessment.

Drought Warning (Normal, Watch & Alert) is given in June July & August, while Drought Assessment (Mild, Moderate & Severe) in September & October.

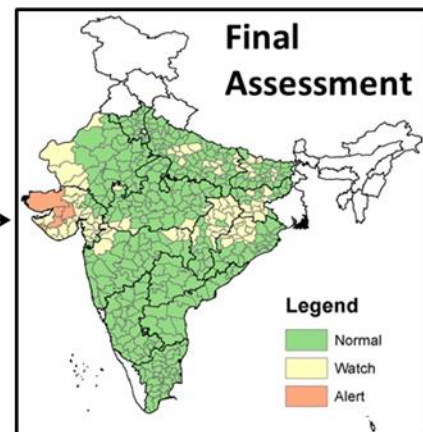
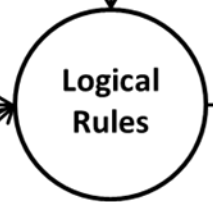
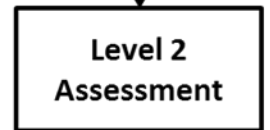
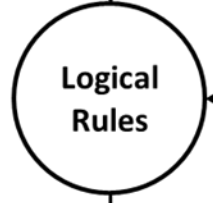
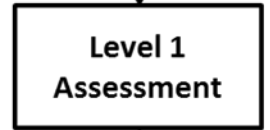
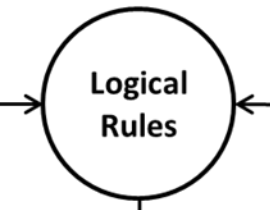
Many states, proactively, use NADAMS assessments for support in Drought Declaration.



NADAMS: Multi-parameter Integrated Approach



Other ancillary Data (Sowing area etc.)

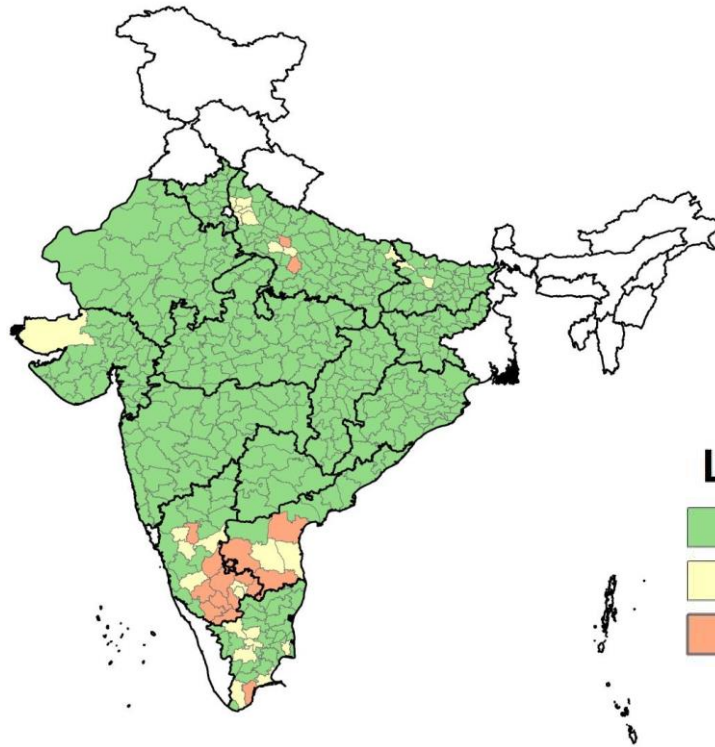


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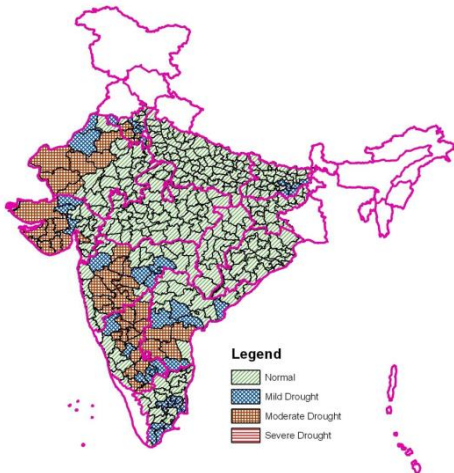
NADAMS: Drought Assessment, 2016



Legend

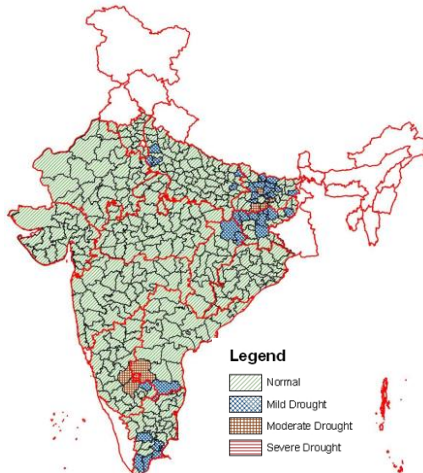
- Normal
- Mild
- Moderate

2012



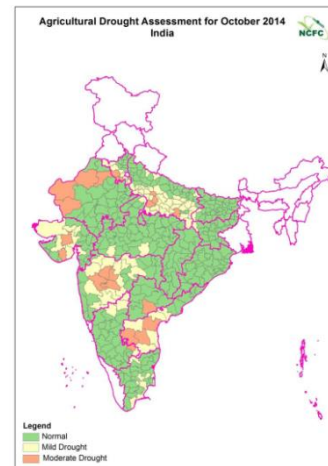
- Legend
- Normal
 - Mild Drought
 - Moderate Drought
 - Severe Drought

2013



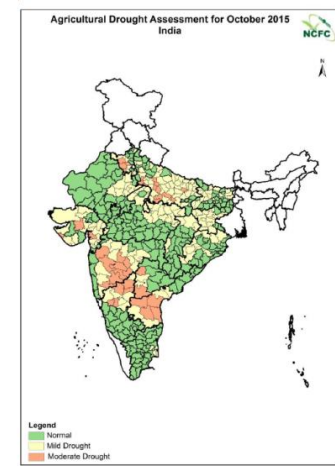
- Legend
- Normal
 - Mild Drought
 - Moderate Drought
 - Severe Drought

2014



- Legend
- Normal
 - Mild Drought
 - Moderate Drought

2015



- Legend
- Normal
 - Mild Drought
 - Moderate Drought



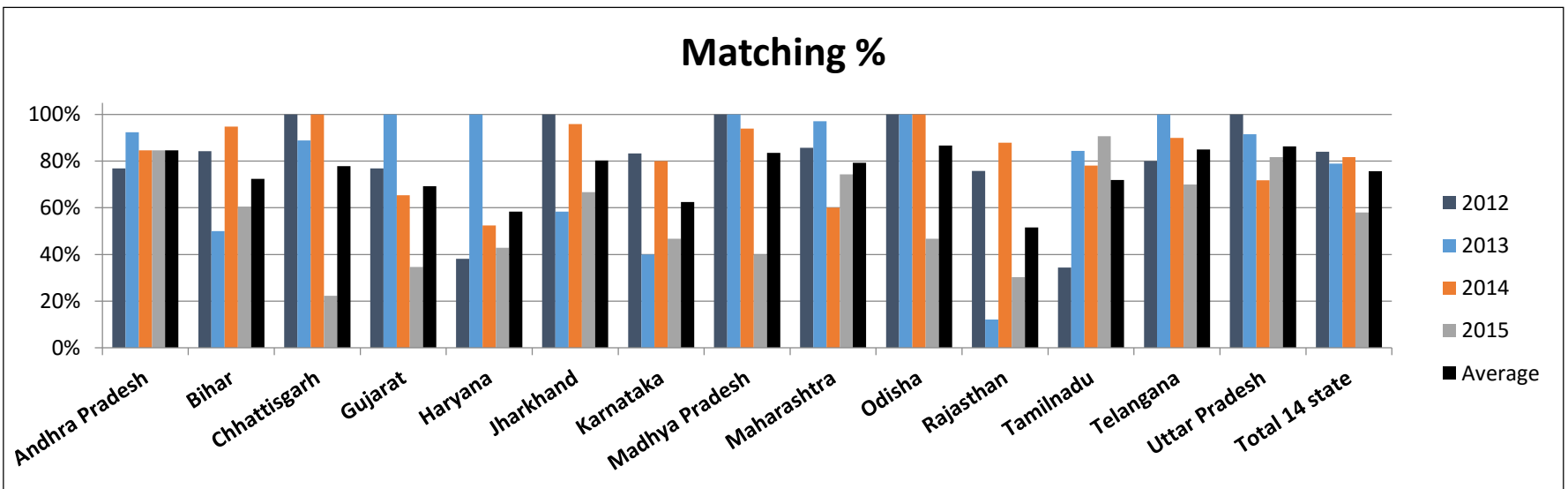
Matching between State Declarations band NADAMS Assessments



State	2012	2013	2014	2015	Average
Andhra Pradesh	77%	92%	85%	85%	85%
Bihar	84%	50%	95%	61%	72%
Chhattisgarh	100%	89%	100%	22%	78%
Gujarat	77%	100%	65%	35%	69%
Haryana	38%	100%	52%	43%	58%
Jharkhand	100%	58%	96%	67%	80%
Karnataka	83%	40%	80%	47%	63%
Madhya Pradesh	100%	100%	94%	40%	84%
Maharashtra	86%	97%	60%	74%	79%
Odisha	100%	100%	100%	47%	87%
Rajasthan	76%	12%	88%	30%	52%
Tamilnadu	34%	84%	78%	91%	72%
Telangana	80%	100%	90%	70%	85%
Uttar Pradesh	100%	92%	72%	82%	86%
Total 14 state	84%	79%	82%	58%	76%

Matching %	No. of Cases
< 50 %	11 (19.6%)
50 % -60 %	4 (7%)
60 % -70 %	4 (7%)
70 %- 80 %	7 (12.5%)
80 % -90 %	11 (19.6%)
90 % -100 %	19 (33.9%)
Total	56

Total 14 States , 4 years = 56 Cases





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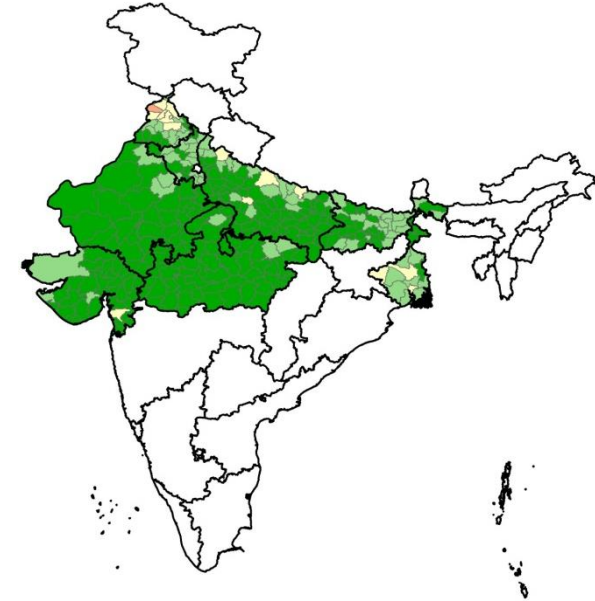
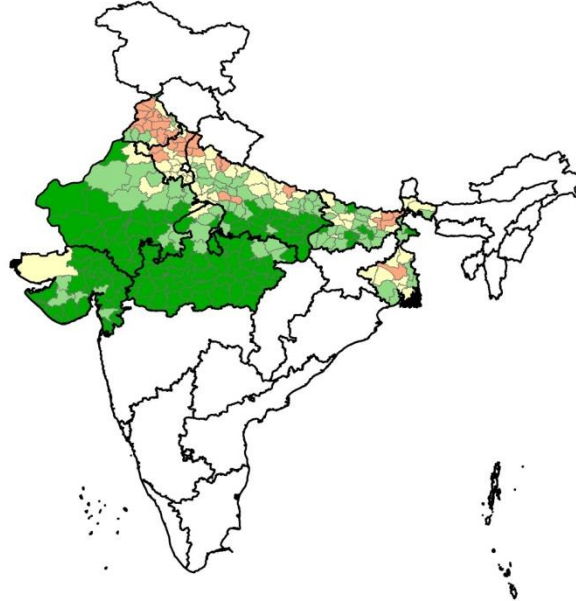
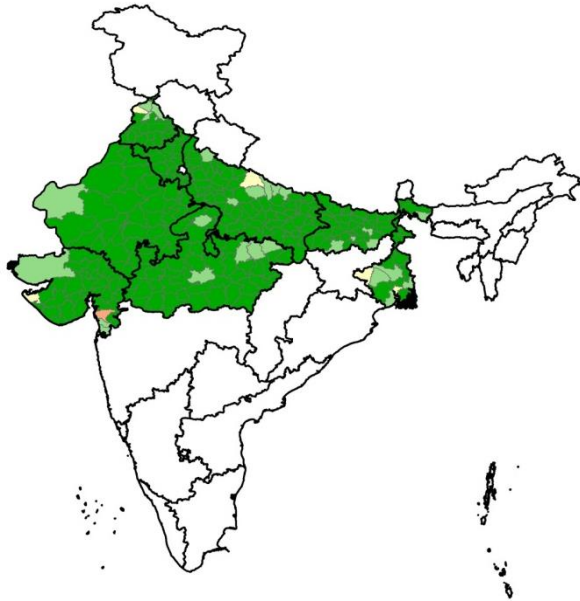
Agricultural Condition Assessment in Rabi Season (upto 16th Jan, 2017)



Vegetation Condition Index

Temperature Condition Index

Vegetation Health Index (VHI)



$$VHI = 0.5 * VCI + 0.5 * TCI$$

Legend

- High > 60 %
- Average > 40% and < 60 %
- Low > 20% and < 40 %
- Very Low < 20 %

Though the vegetation condition is very good in Northern and central states, there is temperature stress, thereby affecting overall vegetation health.



Future Needs



- Monitoring at dis-aggregated level (Block/GP)
- Early Warning of Droughts
- Composite Indicator: *Integrated, Implementable, Acceptable*
- Vulnerability Assessment – *towards drought mitigation*
- Rabi season drought assessment
- Development of products (long-term, calibrated and real-time) for drought monitoring
- Assessment Climate Change Impacts vis-à-vis drought vulnerability