



# What is a rice fallow?

Rice fallows imply those low land kharif (rainy season - June to October) sown rice areas, which remains un-cropped during rabi (winter season - November to February)

## Reasons for fallows after rice

**Cultivation of long duration rice varieties**

**Lack of irrigation**

**Fast receding of residual moisture**

**Excessive soil moisture till late Nov. and early Dec.**

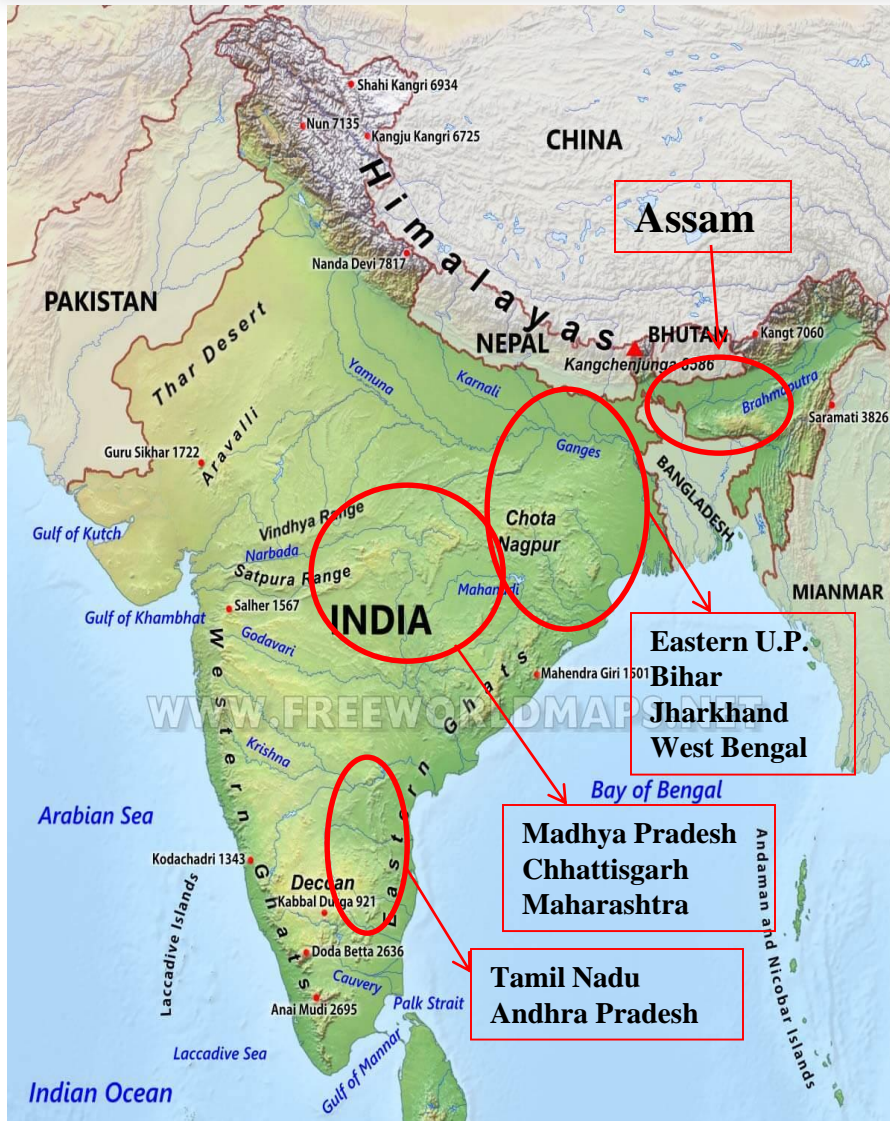
**Soil hardness and development of cracks**

**Lack of appropriate crop varieties for late planting**

**Inadequate and uncertain winter rains**

**Stray cattles/  
Wild animals**

# Region-wise Rice Fallows in India (11.65 million ha)



**Eastern Region : 4.27 m ha**  
Eastern U.P., Bihar, Jharkhand  
and West Bengal

**North-east Hill Region: 0.54 m ha**  
Assam

**Central Region : 5.01 m ha**  
Madhya Pradesh, Chhattisgarh,  
Maharashtra

**Coastal region: 1.52 m ha**  
Andhra Pradesh, Odisha, Tamil  
Nadu

## Estimated Area under Rice Fallows in India

State	Kharif rice area (m ha)	Rabi fallow (m ha)	Rice fallow as % of kharif rice areas
MP + Chhattisgarh	5.60	4.38	78.21
Bihar + Jharkhand	5.97	2.20	36.85
West Bengal	4.62	1.72	37.23
Odisha	3.88	1.22	31.44
Maharashtra	1.76	0.63	35.80
Assam	2.23	0.54	24.22
Uttar Pradesh	6.62	0.35	5.29
Andra Pradesh	2.66	0.31	11.65
Others	7.20	0.30	4.17
Total	40.18	11.65	29.00

Source: Anon. (2013), National Academy of Agricultural Sciences, Policy Paper 64 and Singh NP et al. (2016). Indian Journal of Genetics and Plant Breeding 76(4): 388-398.

# Potential Pulses Crops for Rice Fallows in different States

State	Pulses
Andhra Praesh	Green gram, Black gram, Cluster bean, Lablab bean
Assam	Lentil
Bihar	Lentil, Chickpea, Green gram, Grass pea (Lathyrus)
Chattisgarh	Lentil, Chickpea, Green gram, Grass pea (Lathyrus)
Jharkhand	Pea, Chickpea
Karnataka	Green gram, Black gram, Cluster bean, Lablab bean
Madhya Pradesh	Pea
Tamil Nadu	Green gram, Black gram, Cluster bean, Lablab bean
Eastern Uttar Pradesh	Lentil, Pea



# Potential Oilseeds Crops for Rice Fallows in Different States

State	Oilseeds
Assam	Groundnut
Bihar	Mustard, Groundnut
Chattisgarh	Sesame/Linseed
Jharkhand	Mustard, Sesame/Linseed, Groundnut
Karnataka	Mustard, Sesame/Linseed
Eastern Uttar Pradesh	Eastern Uttar Pradesh
West Bengal	West Bengal



# Popular Rice + Pulses cropping systems in India

Rice+lentil



Rice - chickpea



Rice + Urdbean



Rice - lentil

Rice+lathyrus



# Technological Interventions for rice fallows

- ✓ Suitable high yielding varieties of rice (110-120 days) and pulses.
- ✓ Rice stubble retention (20-30cm) for conserving soil moisture and higher productivity in rice + pulse relay cropping system.
- ✓ Sowing of pulses with Conservation tillage (zero tillage)
- ✓ Use of lime in rice (to bring normal *pH*) and P by chemical fertilizer (for increased P availability)
- ✓ Use of rhizobium, PSB, PGPR and Ammonium molybdate in acid soil of Ranchi.



# Technological Interventions for rice fallows

- ✓ **Seed treatment by Vesicular Arbuscular Mycorrhizal (VAM) in acid soil for enhancing P availability and increased pulses yield and Water Use Efficiency.**
- ✓ **Compact block cultivation of chickpea and lathyrus after rice in whole village saves the crop from stray cattle's**
- ✓ **Paired rows planting of chickpea for higher yield.**
- ✓ **Foliar spray of 2% urea / DAP (T.N.) at flowering for enhancing seed yield under rice fallow.**



# Government of India Initiatives to cover Rice Fallow Areas

## **Scheme: Targeting Rice Fallow Areas in Eastern India (TRFA)**

**Objective:** Bring 4.5 million hectare area of rice fallow under Pulses & Oilseeds cultivation in next 3 years

**Additional production Target of: 3.20 mt by 2020** (2.50 million tonnes Pulses & 0.70 million tonnes of Oilseeds)

**Target for 2017-18: 1.1 million tonnes**

**Target for 2018-19: 1.5 million tonnes**

**Monitoring of Scheme:** Committee under the Chairmanship of Agriculture Commissioner

**Project Outlay: Rs. 203.642 crore** (US \$ 31.56 million) in 2017-18

**Project Outlay: Rs. 250.00 crore** (US \$ 35.71 million) in 2018-19

# Implementation of Targeting Rice Fallow Areas in Eastern India 2016-17 & 2017-18

S.No	State	No. of Districts		Target (lakh ha)		Fund Allocation (Rs. in Crore)	
		2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
1	Assam	3	8	0.15	2.3	15.00	40.71
2	Bihar	2	5	0.00	0.3	10.00	25.48
3	Chhattisgarh	3	5	8.71	3.5	15.00	25.48
4	Jharkhand	2	4	0.09	0.3	10.00	20.44
5	Odisha	3	9	0.69	4.3	15.00	45.76
6	West Bengal	2	9	1.05	4.3	10.00	45.76
	<b>Total</b>	<b>15</b>	<b>40</b>	<b>10.69</b>	<b>15.00</b>	<b>75.00</b>	<b>203.63 (US \$ 31.56 million)</b>

- In addition 2.00 lakh minikits of pulses and oilseeds were distributed
- 22,500 Farmers will be trained
- Farmers are provided assistance for Cluster demonstrations, seeds, micro-nutrients, farm implements, water saving devices, trainings and extension activities
- The Scheme is implemented in **4000 Villages** of **40 Districts** in **6 Staes**

# State-wise Area & Production Targets of Pulses & Oilseeds during 2017-18

State	Targets of Area (lakh ha)			Production target (lakh tonnes)		
	Pulses	Oilseeds	Total	Pulses	Oilseeds	Total
Assam	1.84	0.46	2.30	1.25	0.30	1.55
Bihar	0.24	0.06	0.30	0.23	0.07	0.30
Chhattisgarh	2.80	0.70	3.50	1.86	0.42	2.28
Jharkhand	0.24	0.06	0.30	0.23	0.04	0.27
Odisha	3.44	0.86	4.30	1.76	0.59	2.35
West Bengal	3.44	0.86	4.30	3.14	1.01	4.15
<b>Total</b>	<b>12.00</b>	<b>3.00</b>	<b>15.00</b>	<b>8.47</b>	<b>2.43</b>	<b>10.90</b>



# National Level Workshops on Rice Fallows

- The Targeting Rice Fallow Area is being monitored at Highest Level i.e, Cabinet Secretariat/ PMO
- **2 National Level Workshop** were conducted under the Chairmanship of Secretary (AC&FW)



**1<sup>st</sup> National Workshop was held at Bhubaneswar, Odisha on 7<sup>th</sup> October, 2016**



# 2<sup>nd</sup> National Workshop was held at Ranchi, Jharkhand on 23<sup>rd</sup> September, 2017



# Outcome of National Level Workshop

- Mapping of potential districts for cultivation of oilseeds and pulses by **Mahalanobis National Crop Forecast Centre, New Delhi**
- Creation of water harvesting structure, supply of sprinklers for live saving irrigation, water carrying pipes
- **Seed hubs** were created **at ICAR-KVKs** for utilization of latest certified varieties of pulses
- Strong Technical Support by **Indian Institute of Pulses Reserach, (IIPR), Khanpur , Indian Institute of Oilseeds Research (IIOR) & Indian Institute of Rice Research (IIRR), Hyderabad** and respective **State Agriculture Universities (SAUs)**
- Coordination and collaboration with International organizations like **International Center for Agricultural Research in the Dry Areas (ICARDA) & International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)** for developing varieties/technologies.

# Success stories of TRFA

- Launches in 2016-17 with 15 districts increased to 50 districts covering 5000 villages in 2018-19 with cluster approach & focused attention.
- Per year 1.0 million ha were brought under pulses & oilseeds in TRFA states during 2016-17 & 2017-18. During 2017-18 an additional production of around 1.00 million tonnes pulses & oilseeds were produced.
- During 2018-19 it has been targeted to cover 1.8 million ha with 1.3 million production.
- New states will be included under TRFA considering its success in Eastern states.
- International /National Institutions are involved in technology generation & dissemination
- Providing support both in technical and financial terms for climate resilient agriculture and remunerative agriculture.

# Pradhan Mantri Annadata Aay Sanrakshan Abhiyan - PM AASHA

## **Approved Umbrella Scheme of PM- AASHA on 13.09.2018:**

- Price Support Scheme (PSS)- Pulses, Oil Seeds & Copra
  - Price Deficiency Payment System (PDPS)- Oil Seed
  - Pilot of Private Procurement and Stockiest Scheme (PPSS)- in Selected Districts/APMC - Oil Seeds.
  - Existing Scheme of DFPD and Ministry of Textile for other commodities
- Empowered Committee of Secretaries of Gol and State Governments to oversee implementation.
- High Level Committee of Finance Minister, Minister of Agriculture and Minister of Food for deciding policy matters and issues.
- Food Corporation of India to take up PSS operations in selected states as mandated by Empowered Committee

# Integration of Pulses into Governmental Nutritional Security Programmes

1. Pulses are procured at Minimum Support price by Federal and Provincial Governments in Coordinated manner
2. Pulses stored and distributed through special Nutritional Programmes;
  - Mid-Day Meal Scheme for school children
  - Public Distribution System for Families below Poverty line
  - Child Care Centres (Anganwadi) for Children below 6 Years, Pregnant and Lactating Mothers

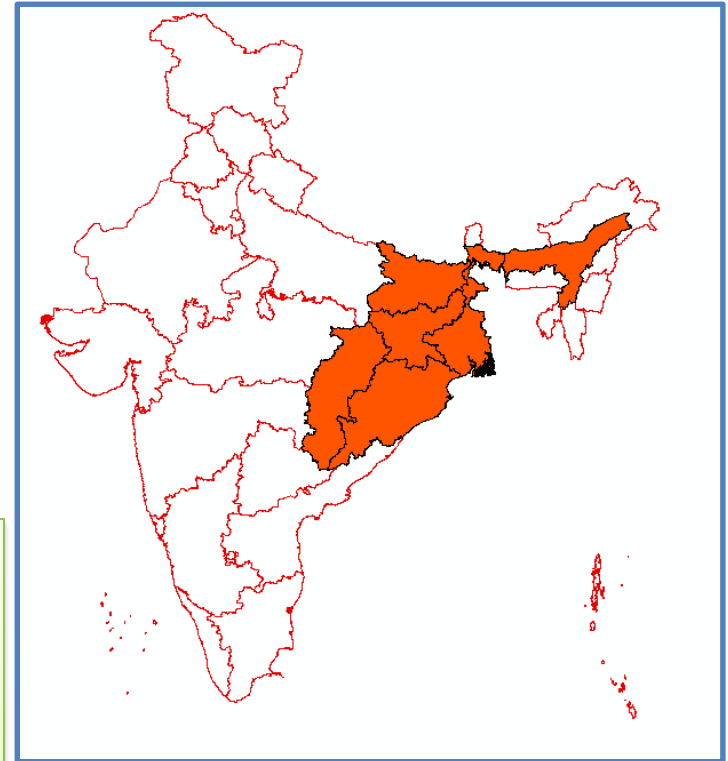
# Satellite Mapping - Summary of the Study

## Study Area

- Assam
- Bihar
- Chhattisgarh
- Jharkhand
- Odisha
- West Bengal

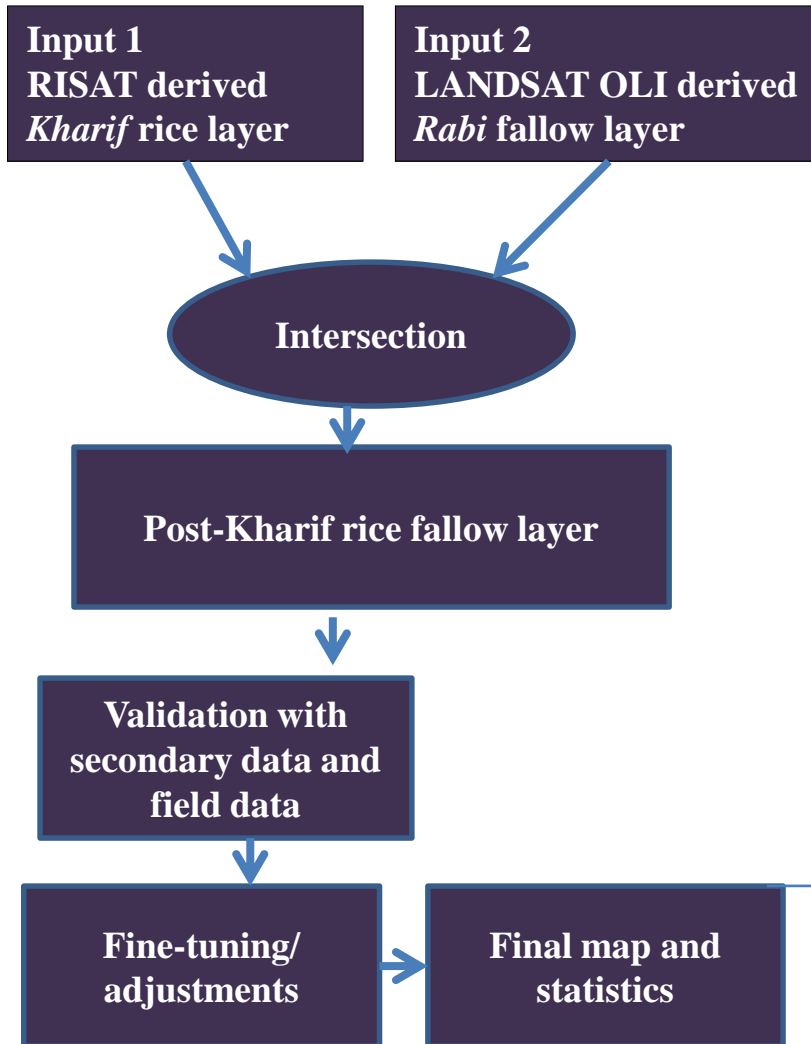
## Objective

- Delineation of post-kharif rice fallow lands using satellite data.
- Characterizing the post-kharif rice fallow lands for crop suitability in rabi season.
- Generation of multi-criteria based information products/advisorics on crop-growing suitability

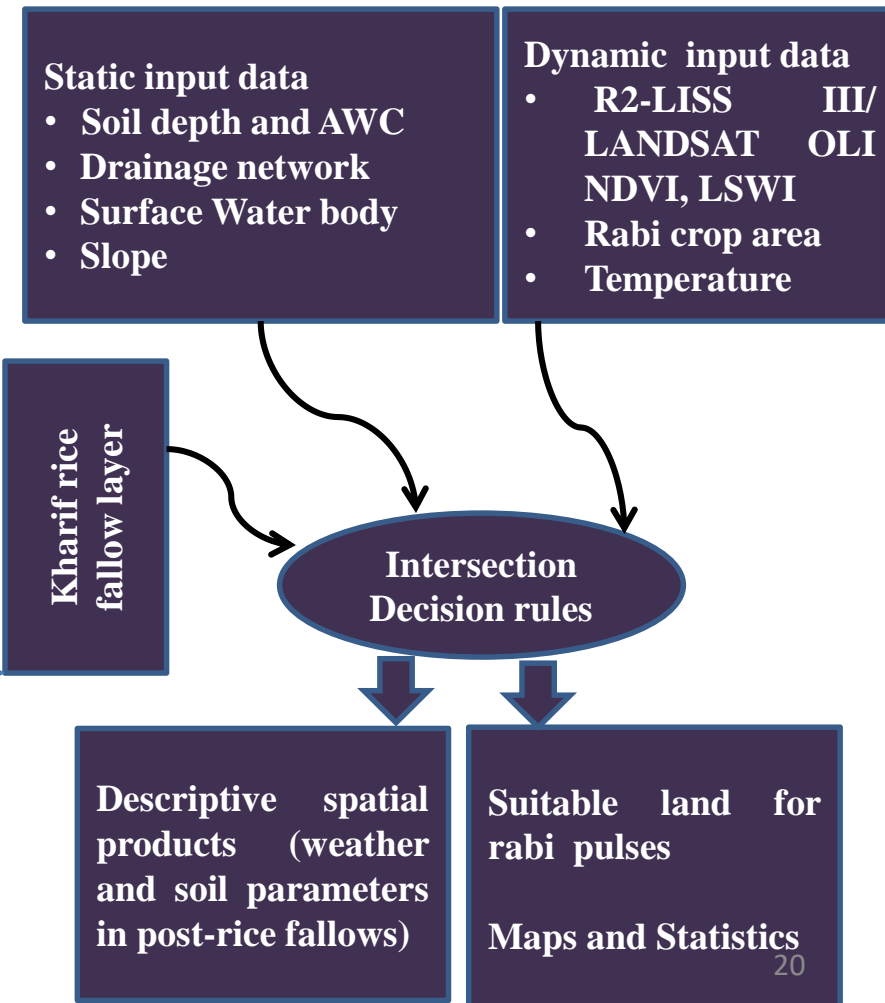


# Approach for Suitability Analysis

## Delineation of Post *Kharif*-rice fallow lands

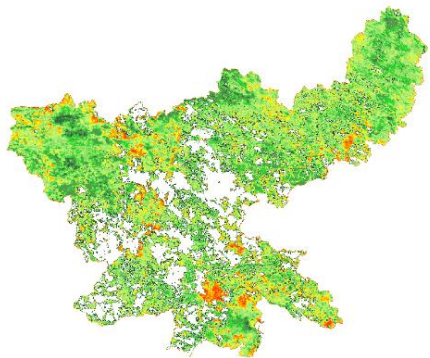


## Suitability analysis for *Rabi* pulses cultivation in post *kharif*-rice fallow lands

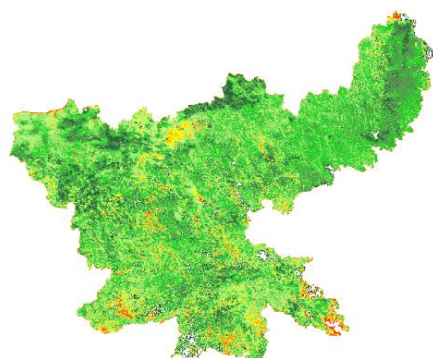


# Multi-Date Satellite Data Showing Crop Growing

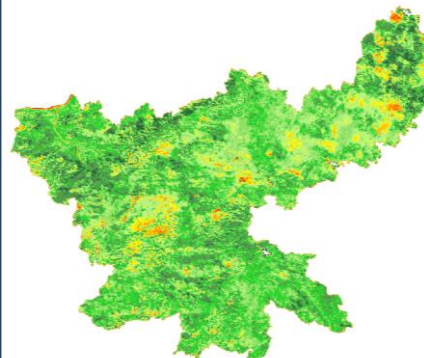
Resourcesat 2 AWiFS NDVI Data 2016-17



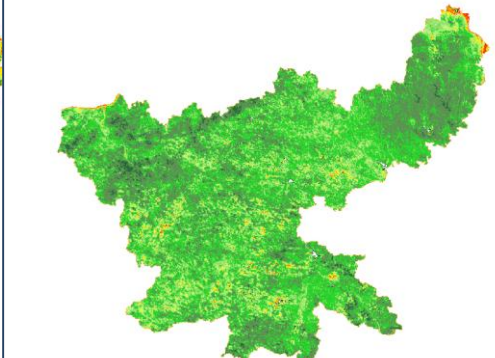
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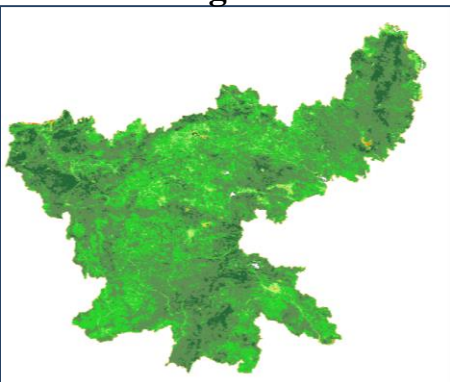
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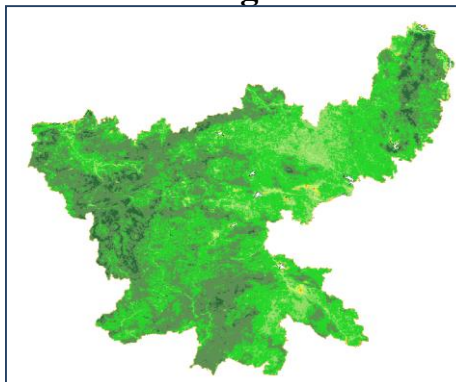
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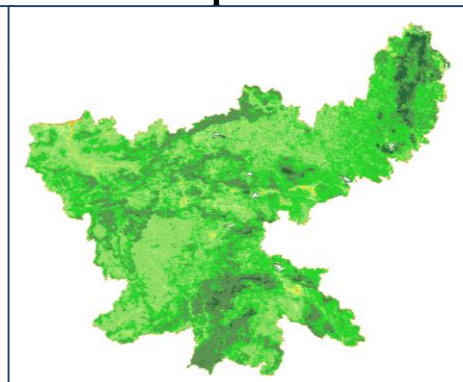
16-30 Sept 2016



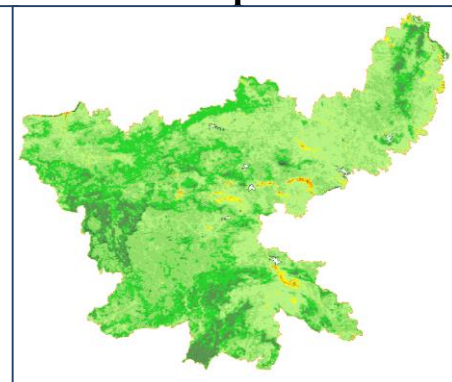
1-15 Oct 2016



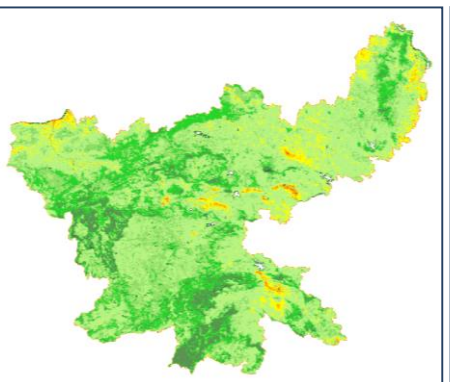
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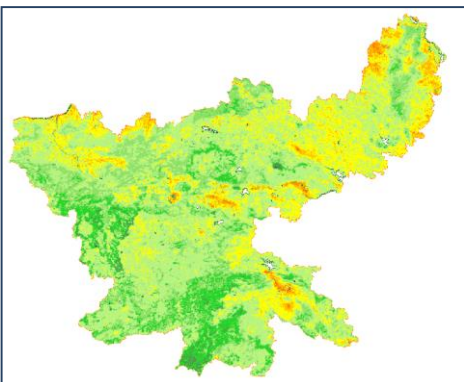
Nov 1-15 2016



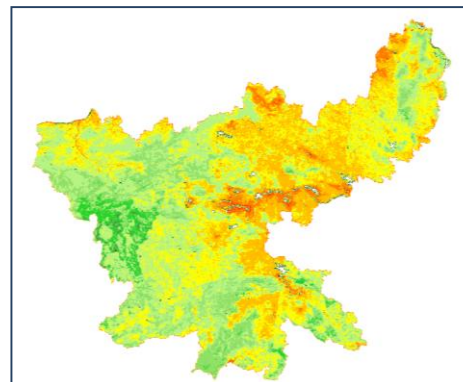
16-30 Nov 2016



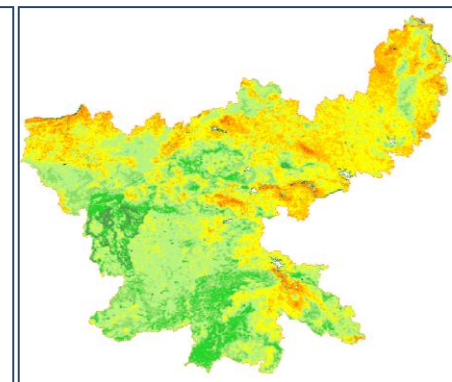
Dec 1-15 2016



Dec 11-20 2017



Dec 20-30 2017

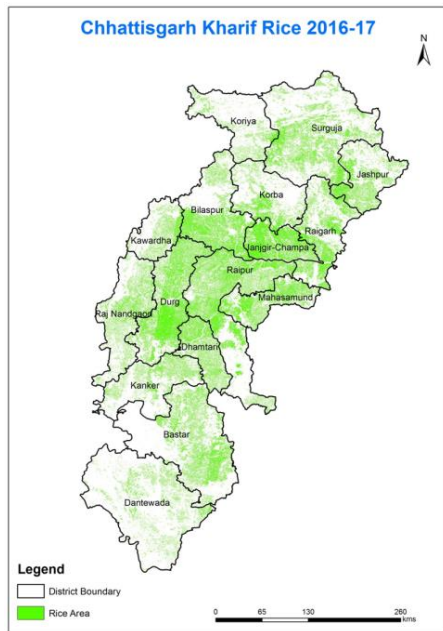


Jan 1-10 2017

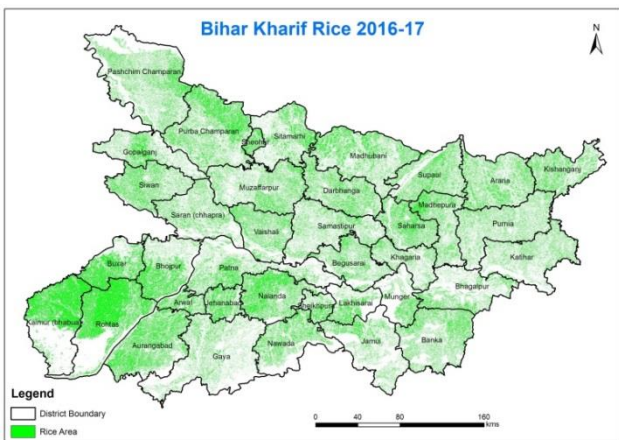
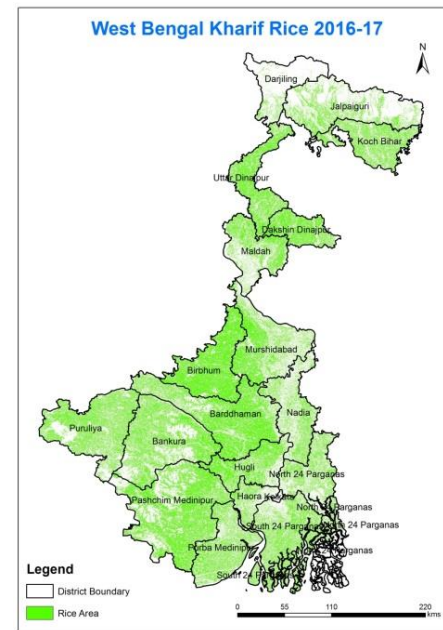
# Kharif Rice maps

(Derived from RISAT-1 Data)

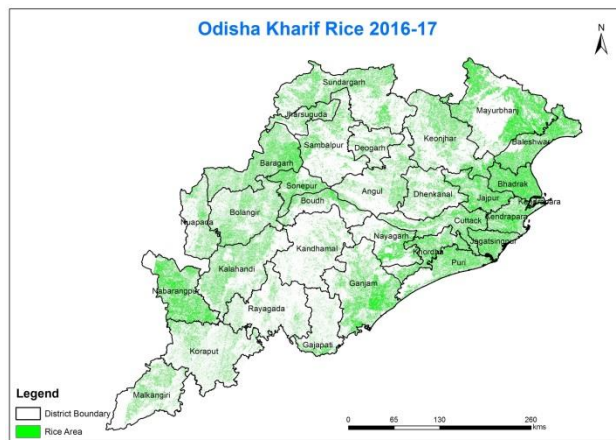
**Chhattisgarh**  
(32.70 Lakh Ha)



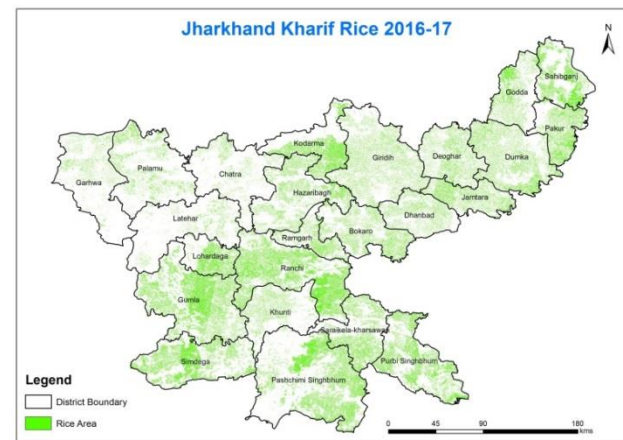
**West Bengal**  
(36.69 Lakh Ha)



**Bihar**  
(24.05 Lakh Ha)

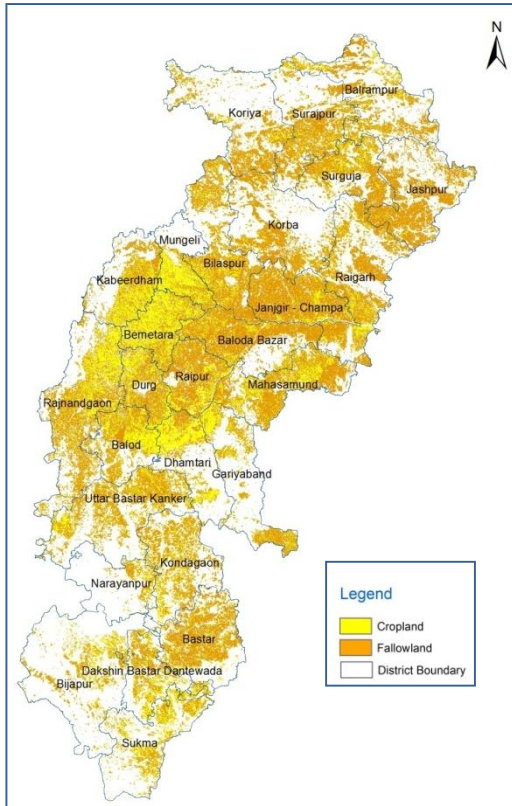


**Odisha**  
(32.37 Lakh Ha)

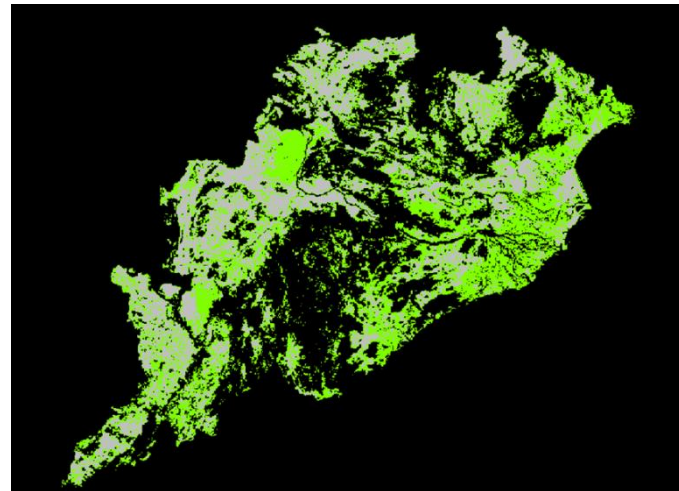


**Jharkhand**  
(12.76 Lakh Ha)

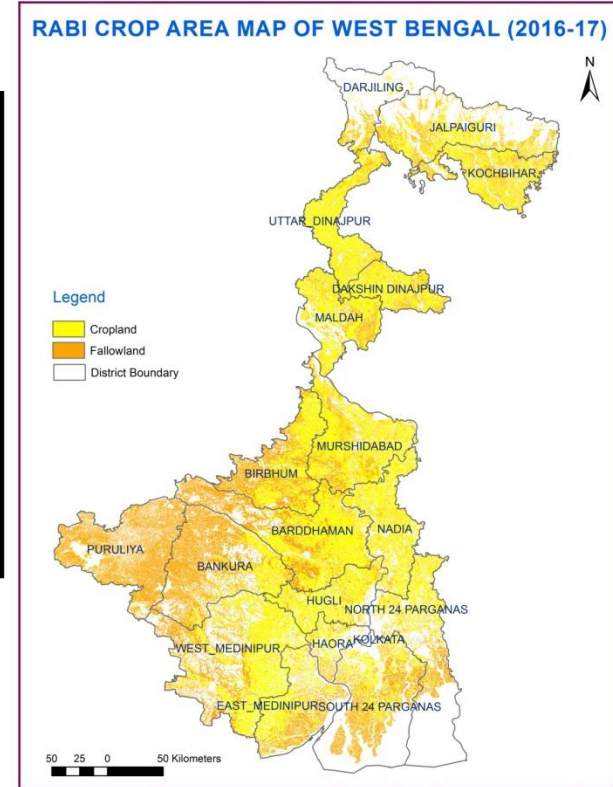
# Rabi Cropped Area Mapping using Satellite Data



**RCA: 16.1 lakh ha**



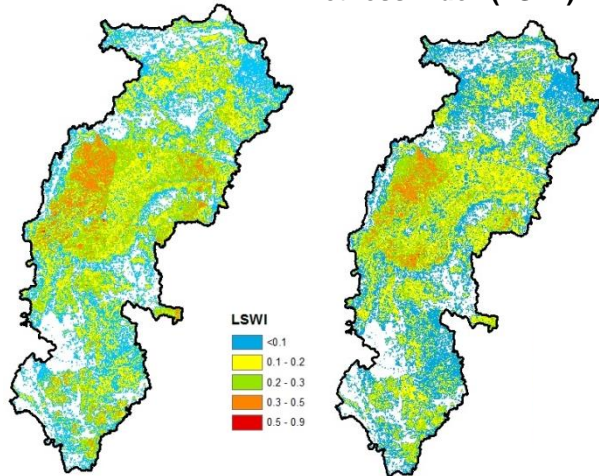
**RCA: 22.36 lakh ha**



**RCA: 26.9 lakh ha**

# Input Parameters for Suitability Analysis

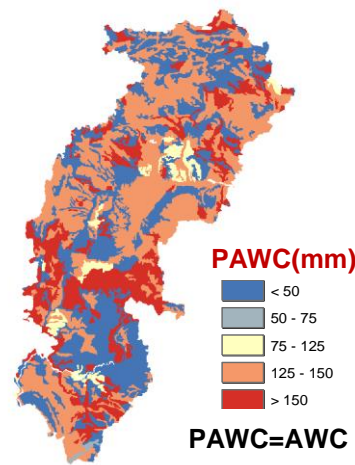
Land Surface Wetness Index (LSWI)



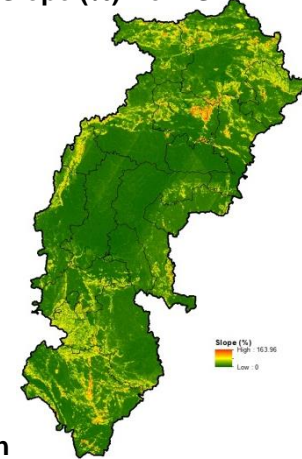
2<sup>nd</sup> Feb Dec 2015

1<sup>st</sup> Feb Jan 2016

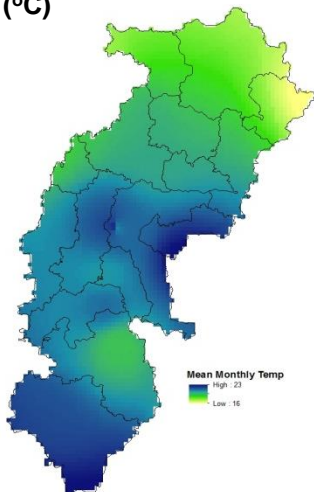
Plant Available water capacity (PAWC)



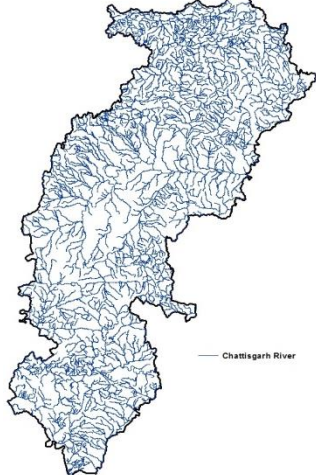
Slope (%) from SRTM DEM



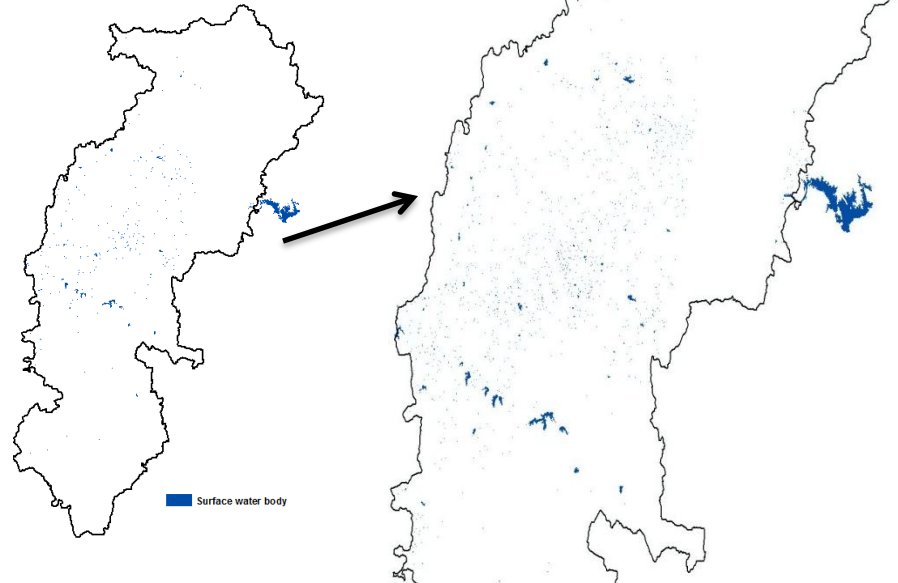
Mean Monthly Air Temperature (°C)



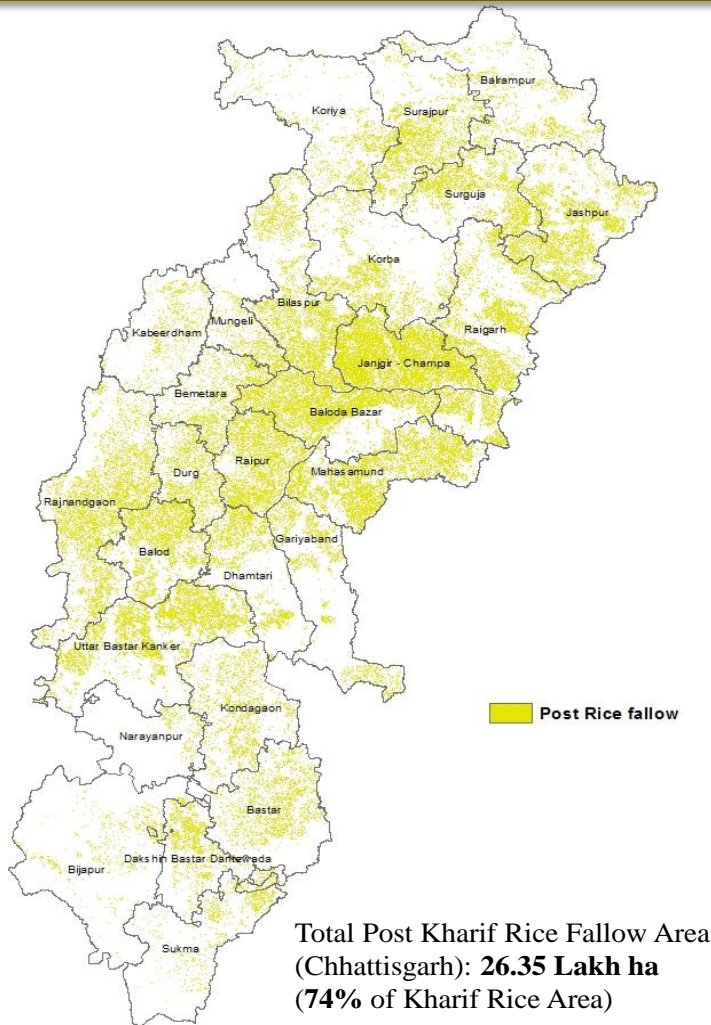
Drainage Network



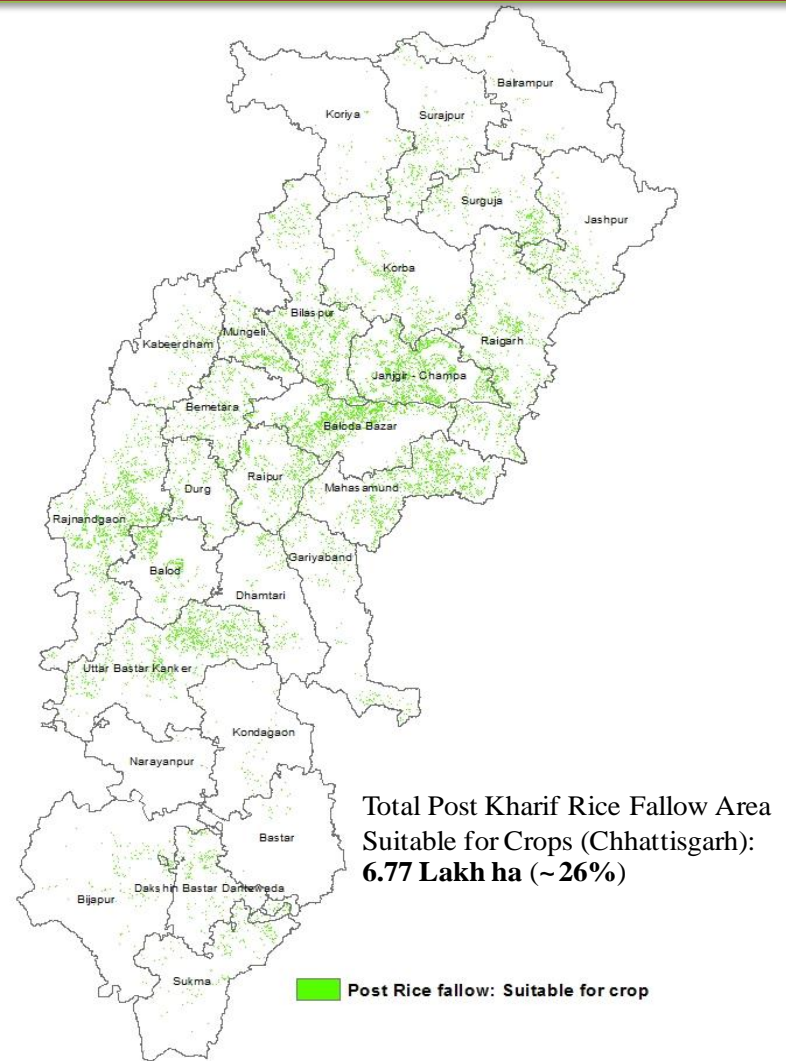
Surface water body



# Suitability Analysis for growing Crops in Rabi Season



**Post Kharif Rice Fallow Map**



**Suitability map showing area favorable for rabi crop growing on Post-kharif Rice-Fallow**

# Conclusions and Way Forward

- ❖ Mapping of potential zone through remote sensing
- ❖ Enabling policy- integrating market, MSP, buffer stock, warehousing.
- ❖ Cropping system approach including intercropping
- ❖ Community water reservoirs
- ❖ Promotion of Farm implements/tools.
- ❖ Ensuring timely availability of critical inputs
- ❖ Strong seed production chain
- ❖ Facilitating Rural credit
- ❖ Protection from stray cattle/wild animals
- ❖ Consolidation of R&D activities for future roadmap
- ❖ Capacity building and awareness to the farmers
- ❖ Promotion of new short duration varieties through minikits

# THANK YOU

