

HDFC ERGO working Methodology using GIS and Remote Sensing

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KULDEEP KUMAR



Technology-based yield estimation of Paddy crop at Gram Panchayat Level under Pradhan Mantri Fasal Bima Yojana



YES-TECH (Yield Estimation System using Technology)

Background

June 2022	September 2022	October 2022	November 2022	January 2023	February 2023	April 2023	June 2023
<ul style="list-style-type: none"> Working Group Meeting in New Delhi Five Approaches finalized 	<ul style="list-style-type: none"> 1-Day National Workshop on Technology based yield estimation in New Delhi 	<ul style="list-style-type: none"> 9th National Review Conference in Cochin YES-TECH Committee 	<ul style="list-style-type: none"> 6th National Level Monitoring Committee (NLMC) meeting in New Delhi 	<ul style="list-style-type: none"> 2-Day Workshop on YES-TECH & WINDS in New Delhi 	<ul style="list-style-type: none"> 3-Day Technical Training and Handholding on YES-TECH and WINDS at MANAGE, Hyderabad 	<ul style="list-style-type: none"> 9th National Review Conference in Raipur, Chhattisgarh 	<ul style="list-style-type: none"> YES-TECH & WINDS Roll-out Workshop at MANAGE Hyderabad YES-TECH Manual 2023

CMM-1: Models and Coverage

Models under CMM-1

- Semi-physical model
- AI/ML models
- Crop simulation models
- Ensemble models (AI/ Crop Simulation/ Semi-physical etc..)
- Parametric index of crop performance (Indirect approach)

Following states under CMM-1, from the ensuing Kharif season (2023).

- Andhra Pradesh – Paddy
- Assam – Paddy
- Haryana – Paddy and wheat
- Karnataka - Paddy
- Madhya Pradesh – Paddy and wheat
- Maharashtra – Paddy and Wheat
- Odisha – Paddy
- Rajasthan – Wheat
- Tamil Nadu - Paddy

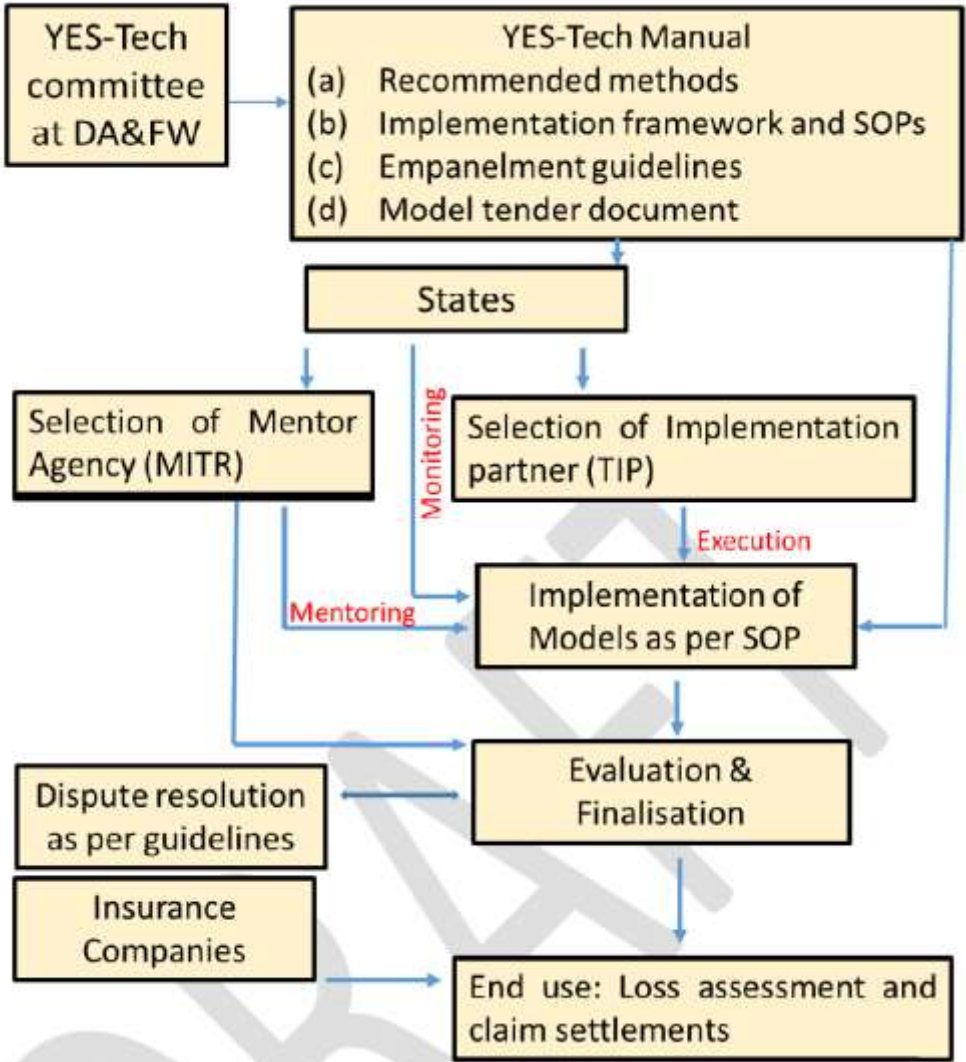
Action plan

- Five Recommended Approaches for Paddy and Wheat Crops
- Tech. Implementation Partner (TIP) and Mentor Institute for Technology Rollout (MITR) and to assist the States

Targeted Outcomes:

- Improve the quality of paddy and wheat yield estimates for crop insurance loss assessments.
- Gradually reduce dependence on manual system.
- Shift to 100% technology based Yield estimation by 2026 (next tender cycle)

YES-TECH Implementation Framework



Methodologies Adopted by Seven Agencies

Four Categories	Details
Category 1	Semi Physical, Remote Sensing and Weather based Approach
Category 2	Machine Learning approaches were used where input parameters were (RS + Weather + Crop data)
Category 3	Simulation model with RS parameters and advance gridded weather (TOP)
Category 4	Machine Learning, Satellite/Advance Drone, Crop Simulation methodology

Agencies	Name
A1	CROPIN
A2	AMNEX
A3	RMSI
A4	ICRISAT
A5	WRMS
A6	NIRUTHI
A7	AGROTECH

Categorization of Approaches for GP level yield estimation

Agencies	Approach categories	Technology used for Yield estimation	Data used for Yield estimation
A1	Machine Learning (RS + Weather + Crop data)	FAO yield Model	FAO yield model was used to generate reference ET coupled with LAI derived from remote sensing data. Combined layer of Normalized Polarization ratio (NPOL), Evapotranspiration (ETc, adj) and relative vegetation metric (NDVI) has been used to cluster the crop layer based on potential health/yield characteristics.
A3		Deep Machine Learning (Partial least square regression, Artificial Neural Network and Random Forest) and Crop Simulation model (DSSAT)	CCE Data, NDVI, EVI, CCCI,CSWI, Weather and Soil data
A2	Semi Physical Approach + RS +Weather	Semi physical model (Modified Monteith Model), Crop simulation, Picture based analysis	FAPAR, Insolation, LSWI, Temperature
A6		Light Use Efficiency model	LAI and fAPAR derived from MODIS, PAR, CCE observations, Satellite data for downscaling
A4	Simulation model with RS parameters and advance gridded weather (TOP) approach	DSSAT Model	Weather, Soil Data, Crop management data along with satellite derived LAI data assimilation
A5		Rice Grow model (ORYZA),	Weather data (25*25sq km), vegetation indices, MODIS LAI (500m), Water stress
A7	Machine Learning, Satellite/Advance Drone, Crop Simulation	Deep neural networks (LR, RF, Extra Trees, CatBoost, Kneighbours, DNN &Ensembling) ORYZA and WOFOST simulation models used in test mode.	Time series of weather parameters, Soil data vegetation indices and CCE data are the sources of data for statistical and structural models to assess the yield



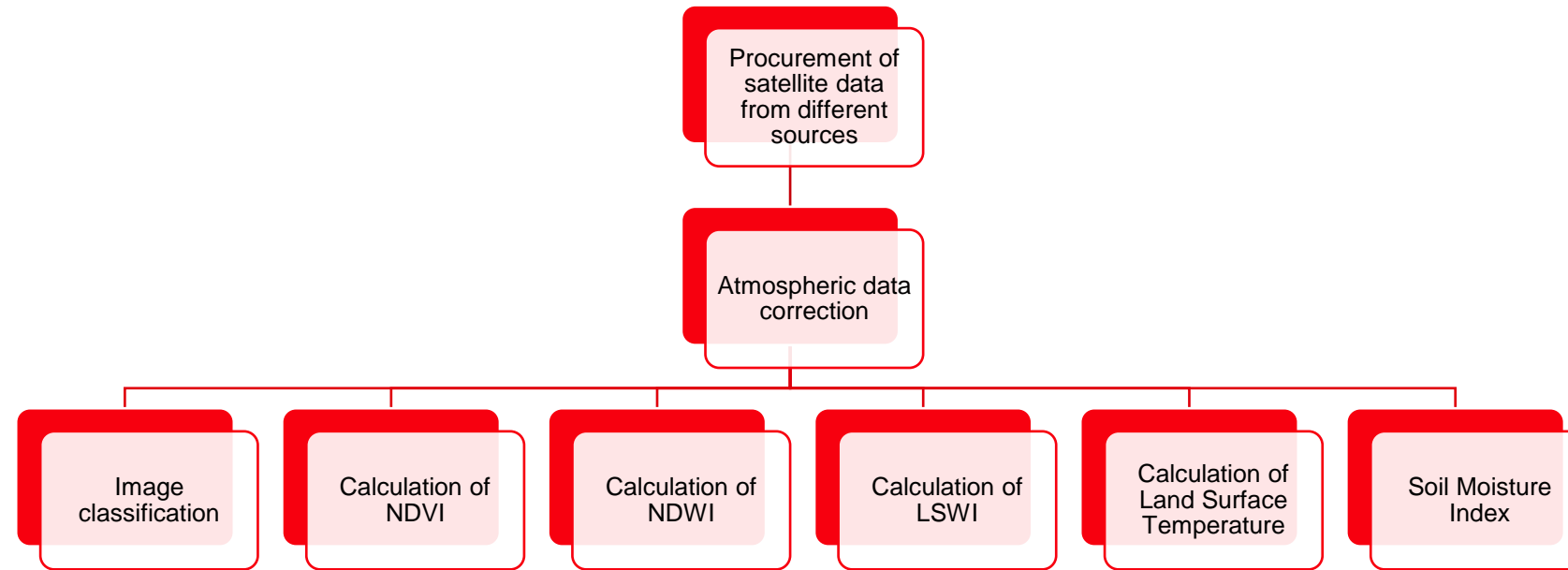
YES-TECH - Reports



- TIPs shall submit the following technical reports (cluster-crop-wise) at pre-defined intervals, conforming with the **Seasonality Discipline** and the YES-TECH Manual 2023, for review by the State, MITRs and Insurance Companies:
 1. Inception Report (IR)
 2. Mid-Season Report (MSR)
 3. End of Season Report (ESR)
 4. Special Reports (SR)
- The State/UT or the MITR may ask for granular reports as and when required.
- TIPs will submit the yield estimation reports for evaluation by MITR, States/UTs and ICs at pre-defined intervals, both in Offline and Online modes. Email will be accepted as mode of delivery and the date and time of the email will be construed as the date and time of the submission of the report.
- These reports and datasets will not be shared publicly by any of the concerned stakeholders., without prior approval/consent from MNCFC, till the finalization and publishing of data and information sharing protocols and guidelines.

Usage of Technological intervention

Pre Bid analysis and Portfolio Monitoring based on Remote Sensing Technology & Rainfall pattern



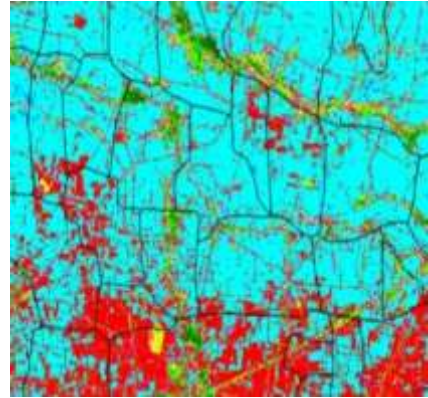
- Procurement/Download Satellite data from NASA and ESA which are freely available
- Working in 9 States and more than 55 Districts of India
- Collection of more than 10000 GPS based Crop signature of different crops to classify, and monitoring of Crop health
- Classification of satellite image for extract the actual area of major crops with the help of ENVI and Arc GIS software
- Process the different indices like, NDVI, NDWI, LSWI and Soil Moisture Index for crop health and dry spell, drought, flood etc.
- Calculation of crop acreage to maximize crop area coverage for premium collection
- Germination Kawach Project using NDVI
- Yield Estimation forecast using YES-TECH implementation model-Semi-Physical

NDVI: Normalized Differential Vegetative INDEX
NDWI- Normalized Differential Water Index
LSWI-Land Surface Water Index

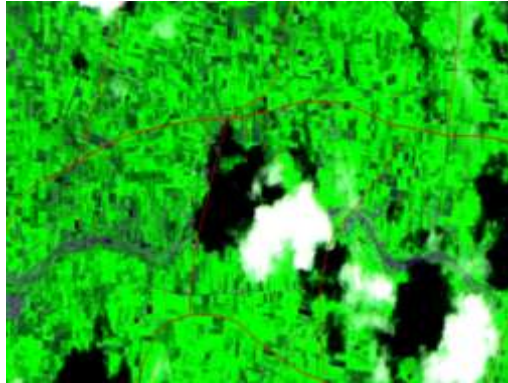
GIS and Remote Sensing Based Case Studies 2022



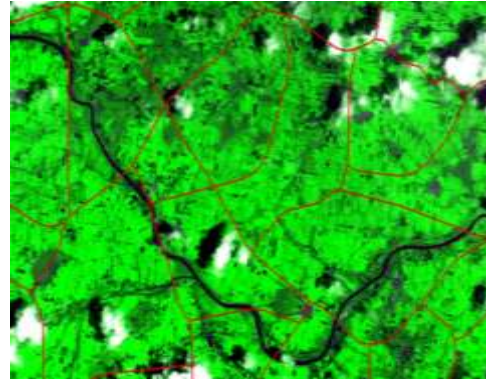
Akola , Flood Mapping



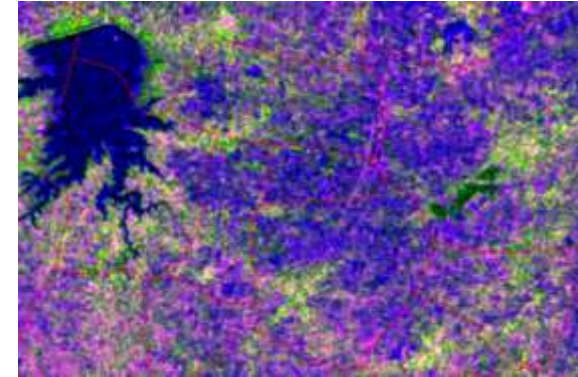
Aurangabad , Crop Health Monitoring



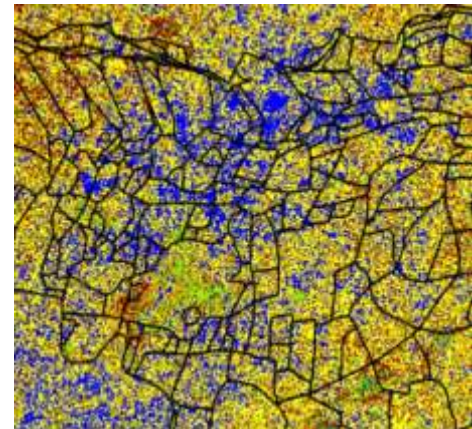
Hingoli .Crop Health Monitoring



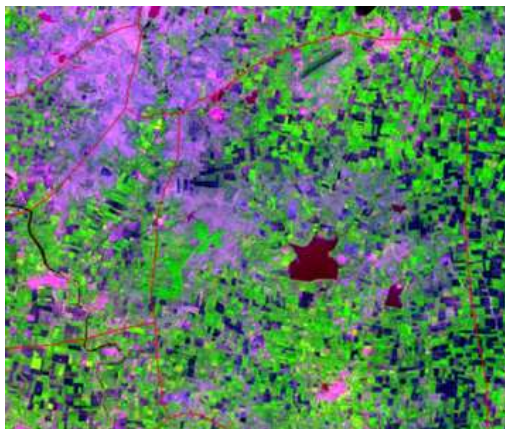
Lalitpur , SAR data based Flood Mapping



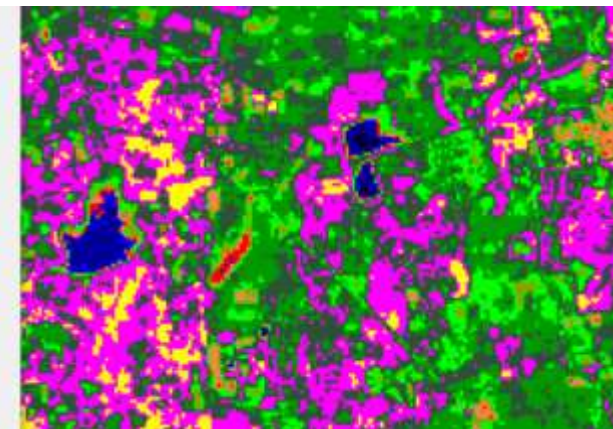
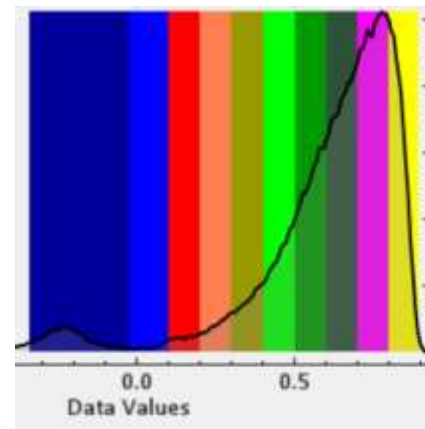
Tonk , SAR data based Flood Mapping



Silod Tehsil, Aurangabad Dist CCE Monitoring



NDVI/RST Based Crop Cutting Experiment in Bargarh ,Odisha

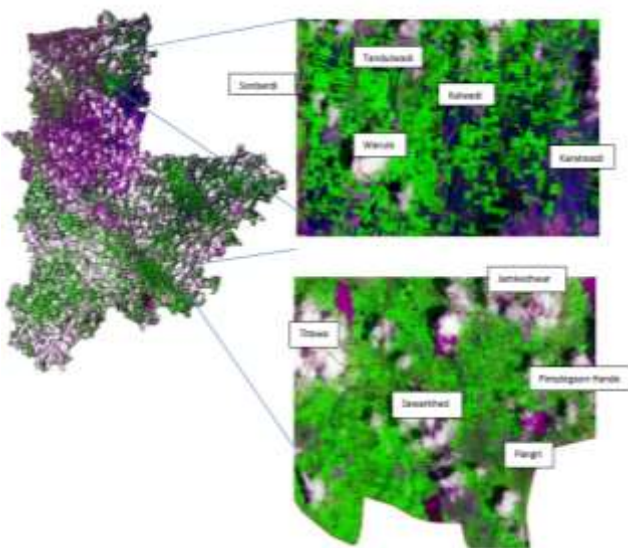


- Remote Sensing based report publishing on every 15 days for all allotted states
- Publishing daily weather report to state team
- Real time geo-tagged crop signatures collection from all our working states

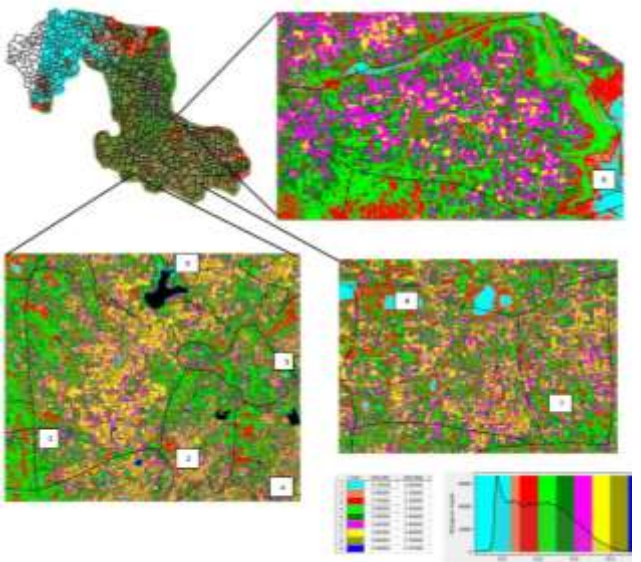
GIS and Remote Sensing Based Case Studies in Khariff 23



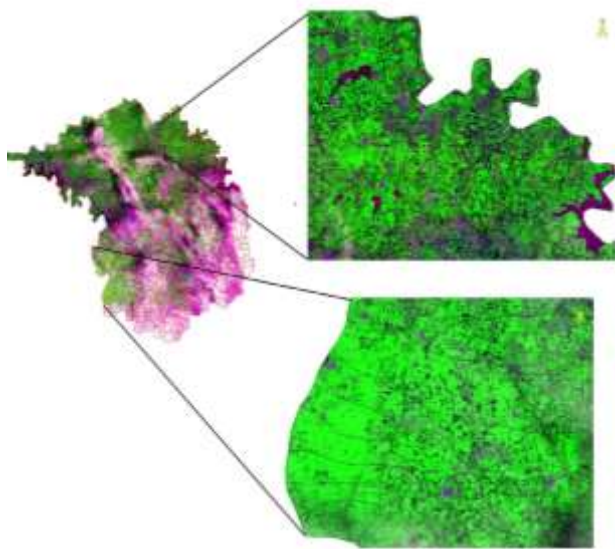
Akola Crop Health Monitoring



Osmanabad Crop NDVI



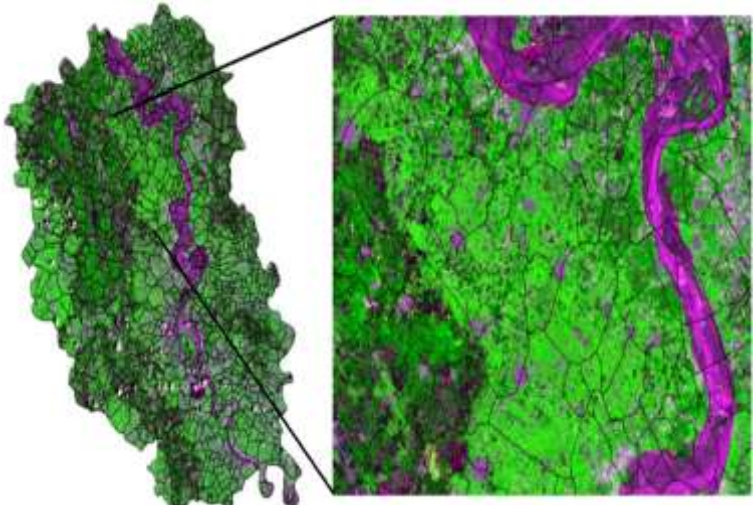
Hingoli Crop Health Monitoring



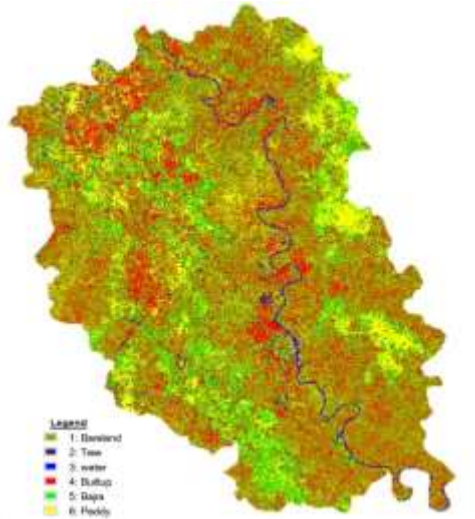
Hingoli Drone Image of 4th Nov 23



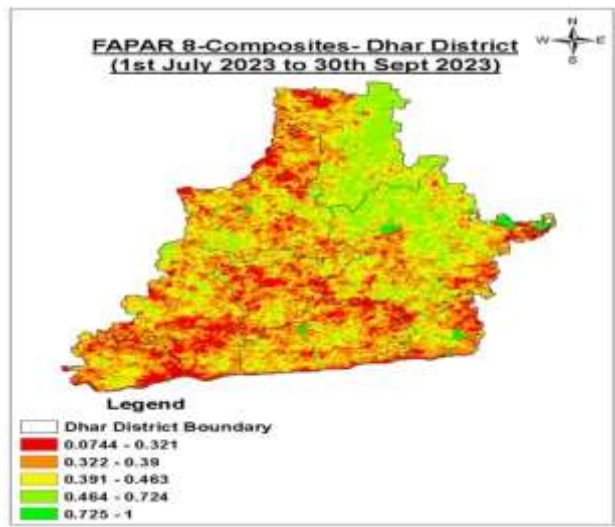
Mathura CHM



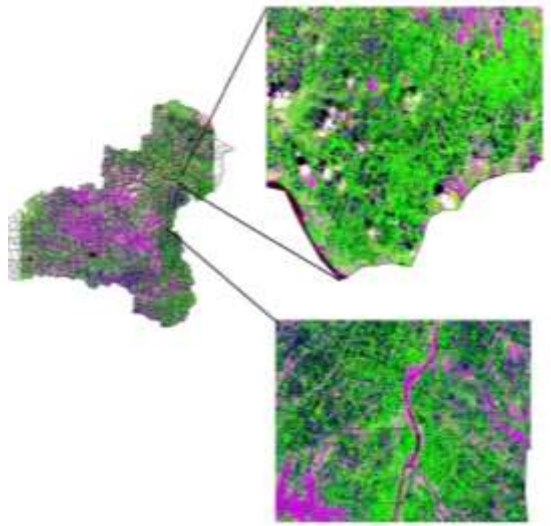
Mathura Classification Map



Dhār FAPAR Map



Dhule Crop Health Monitoring



Awards for uses of GIS and GIS remote sensing technology in PMFBY :



- 1st Insurance company to be awarded by ESRI India in 2019 ESRI Conference
- 1st Insurance company to be awarded Geo-Smart India Excellence Award by Geo-Spatial World Forum in 2022

Thanking You