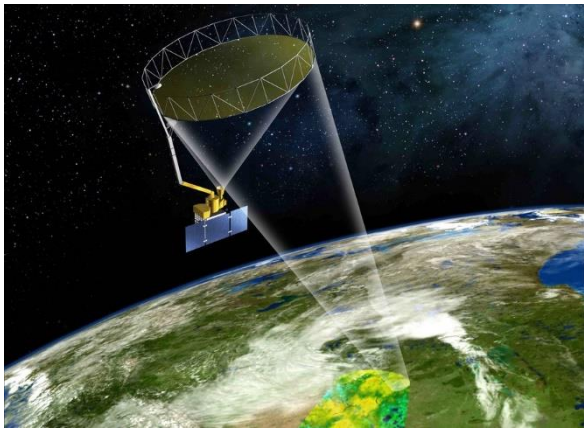
SATELLITE BASED AGRICULTURE INFORMATION SYSTEM: AN EFFICIENT APPLICATION OF ICT



Principal Investigator

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Crop Health
Crop Disease
Yield

➢ Vision

- Cost effective agriculture monitoring from macro to micro scale

➢ Problem

- Developing countries like India still uses traditional practices for agriculture monitoring
- Reduced productivity due to lack of efficient monitoring systems
- Pradhan Mantri Fasal Bima Yojana is a crop insurance scheme insists on usage of satellite based information for crop damage assessment
- Insurance agencies are usually located in urban and semi urban areas and still rely on manual inspections for crop insurance in remote locations

Objective(s) &Technology Involved

- To develop **agriculture information system** with satellite data as input
- To retrieve **real-time information** of crops like health, moisture content, disease etc. at district and tehsil level
- To provide **information to end user** through cloud service and to make them **cost effective and hassle free**
- To develop **web based and SMS based** service
- Emphasis on making use of low cost satellite data provided by operational satellites such as Terra/Aqua MODIS, TM, etc.

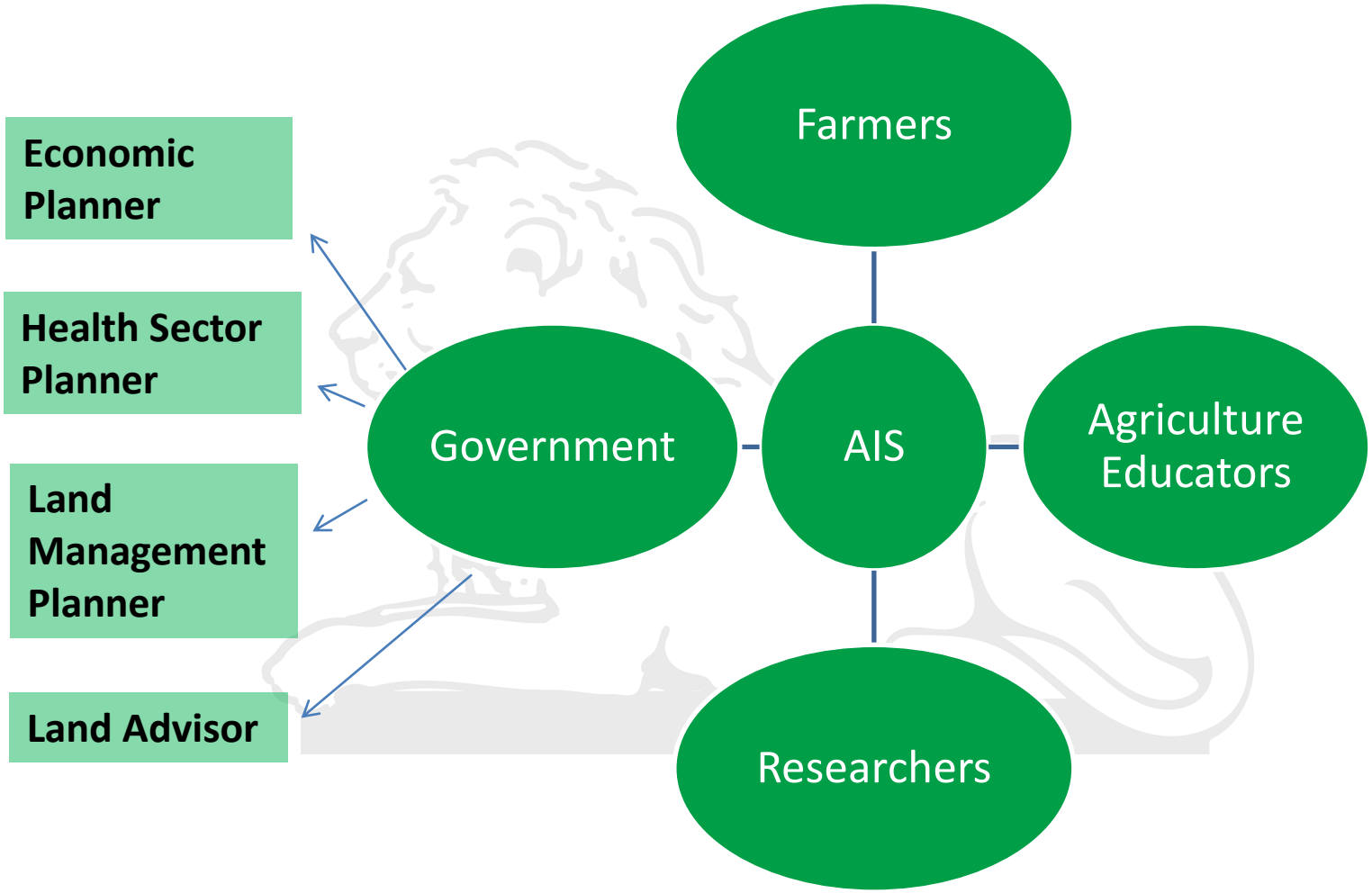
➢ **Data Used: Satellite Data (MODIS, Sentinel-2)**

Salient Features

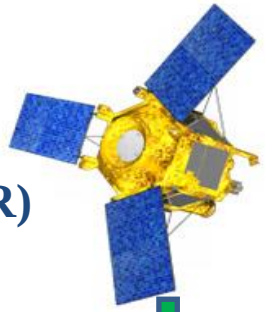
Satellite data based solution will be having following features:

- **Land Cover Monitoring**
- **Change Detection**
- **Crop Health/Agriculture Monitoring**
- **Soil Moisture Monitoring**
- **Real Time Assessment for Decision Making**
- **Development of Apps for Mobile**
- **Drought Monitoring**

Benefits of AIS for ICT



Working of AIS system

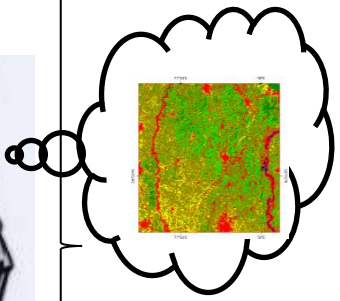


Satellites (Optical/SAR)

Satellite Workstation

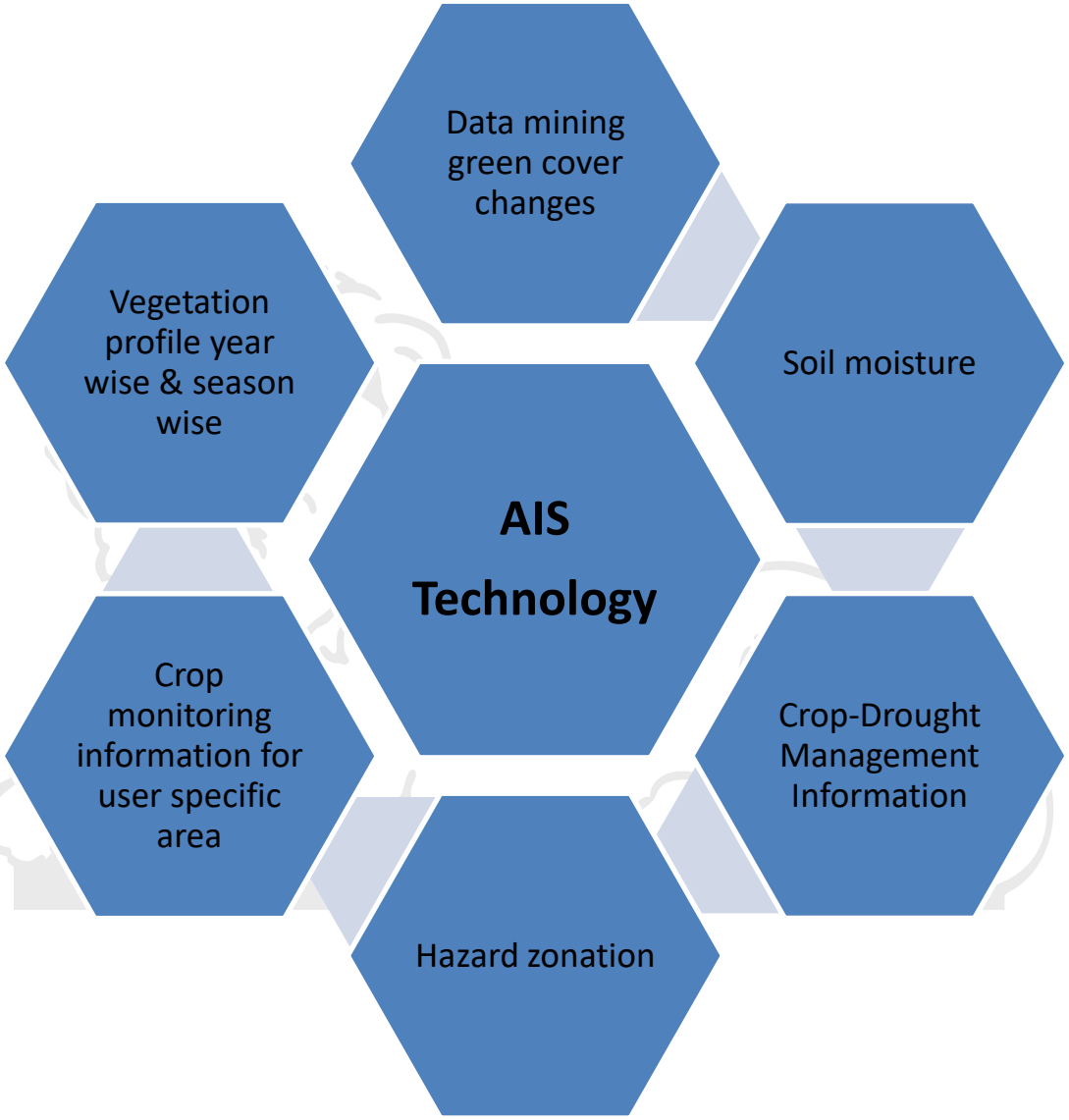
Data Analyst/ System Developer

AIS for ICT

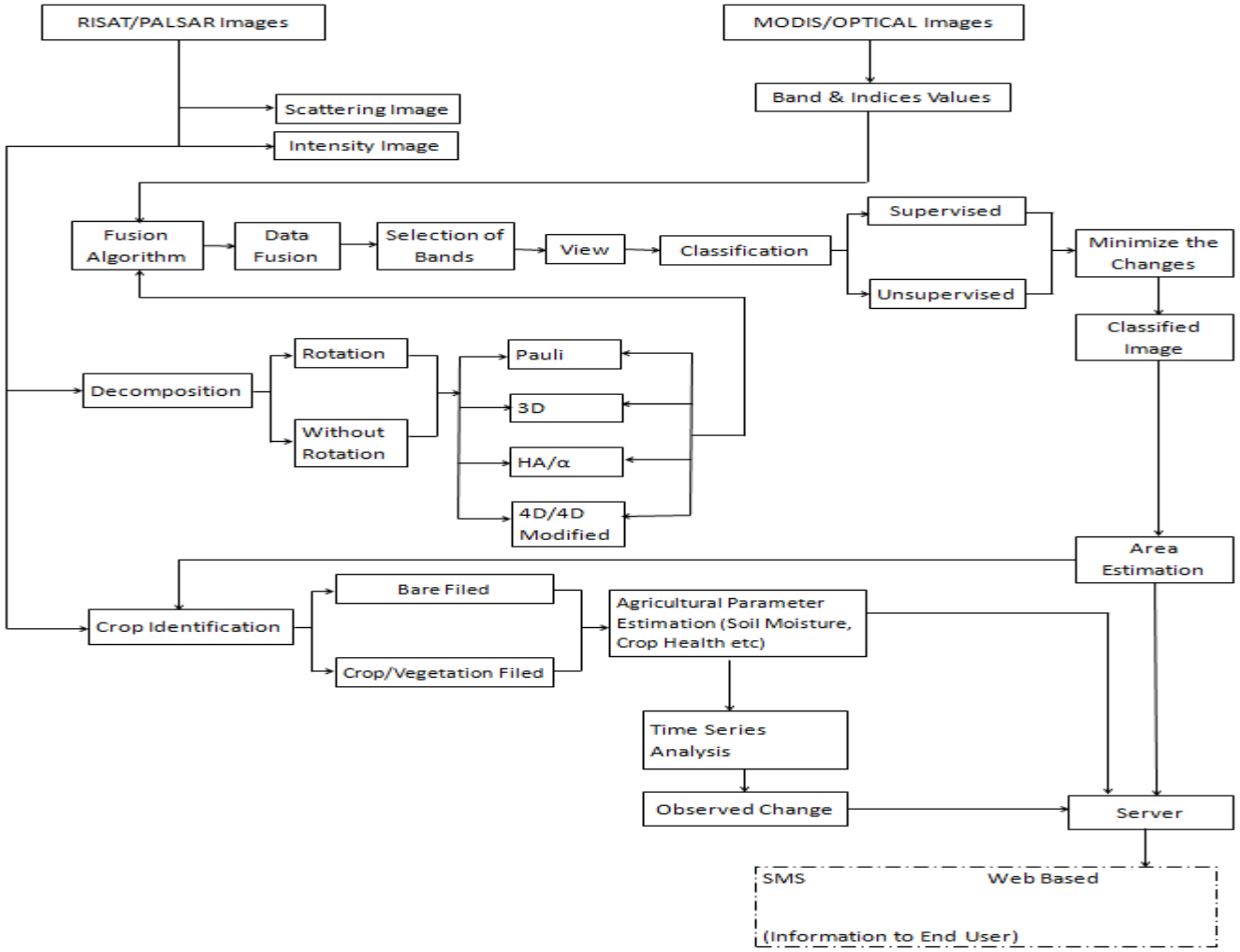


Consumers from different locations and aspects

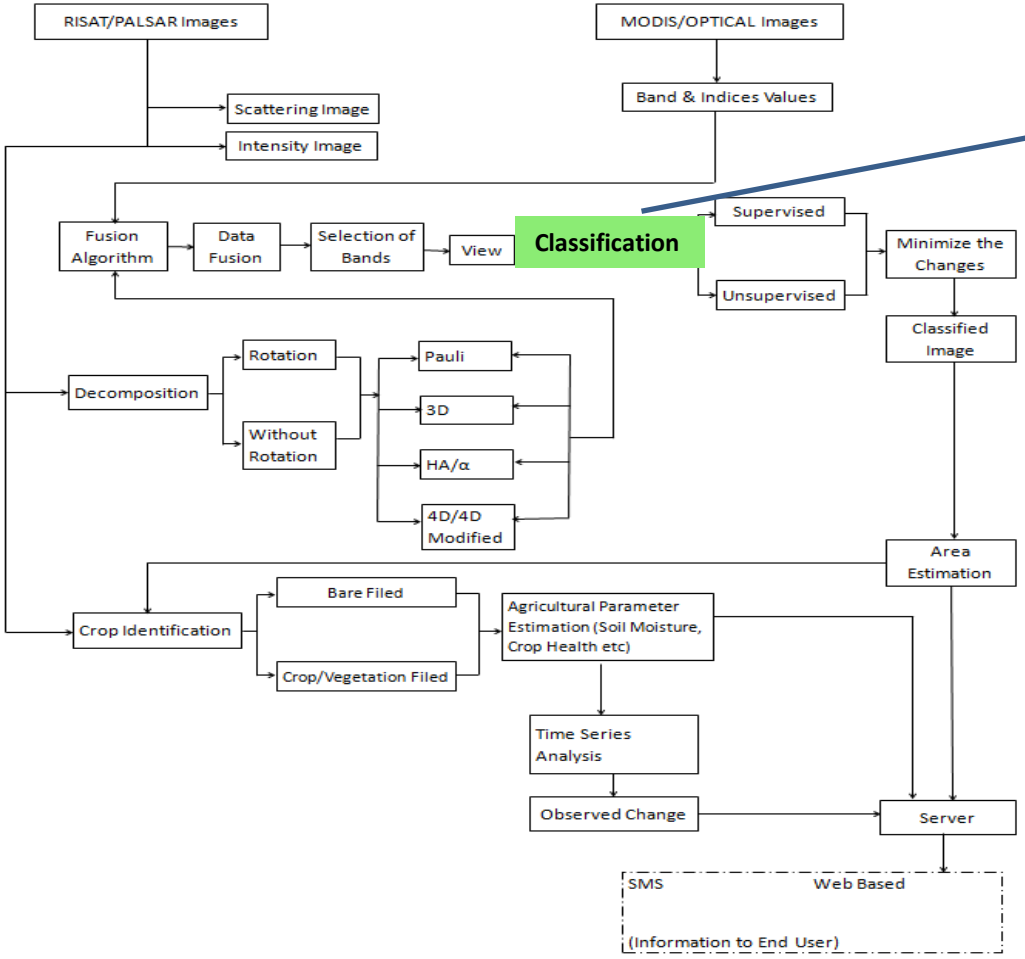
Technology

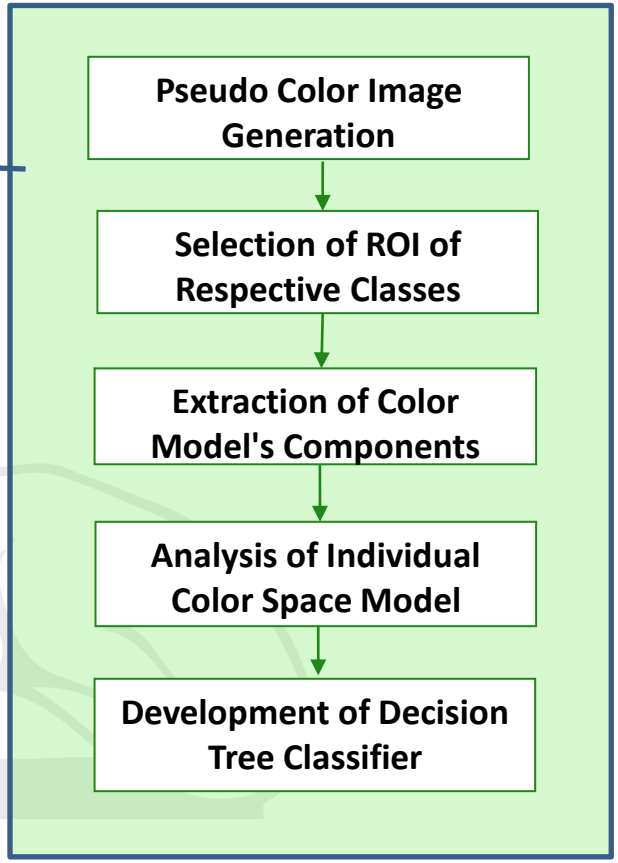

Data mining green cover changes
Vegetation profile year wise & season wise
Soil moisture
AIS Technology
Crop monitoring information for user specific area
Crop-Drought Management Information
Hazard zonation

➢ Methodology



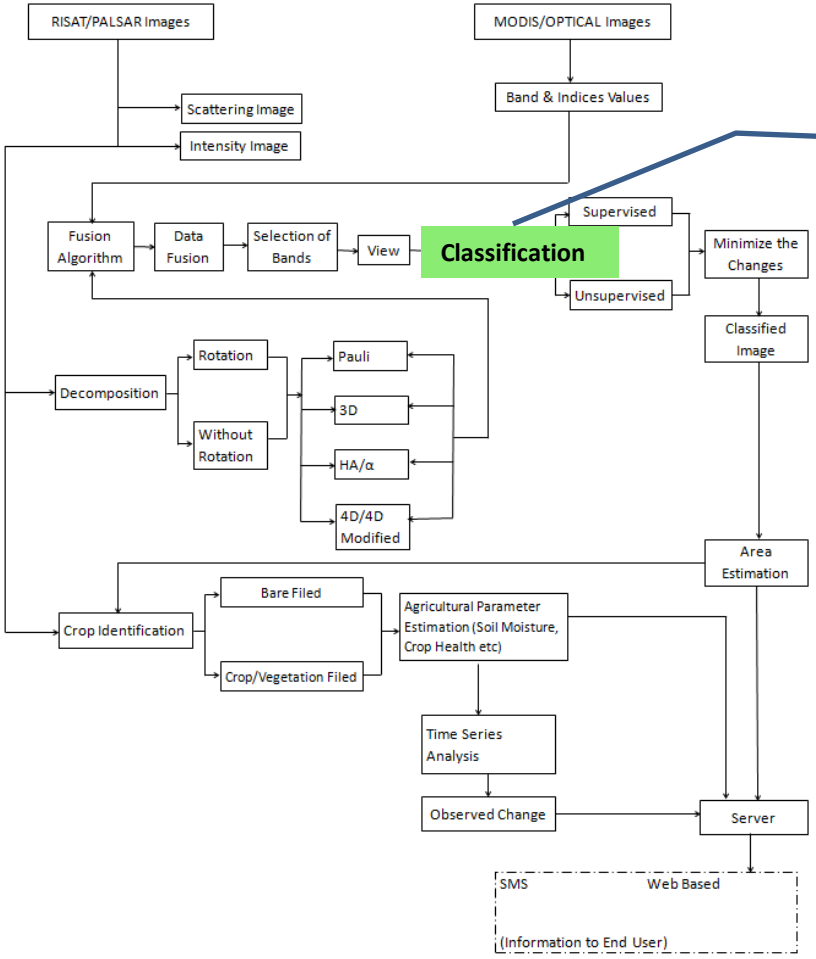
Methodology contd……

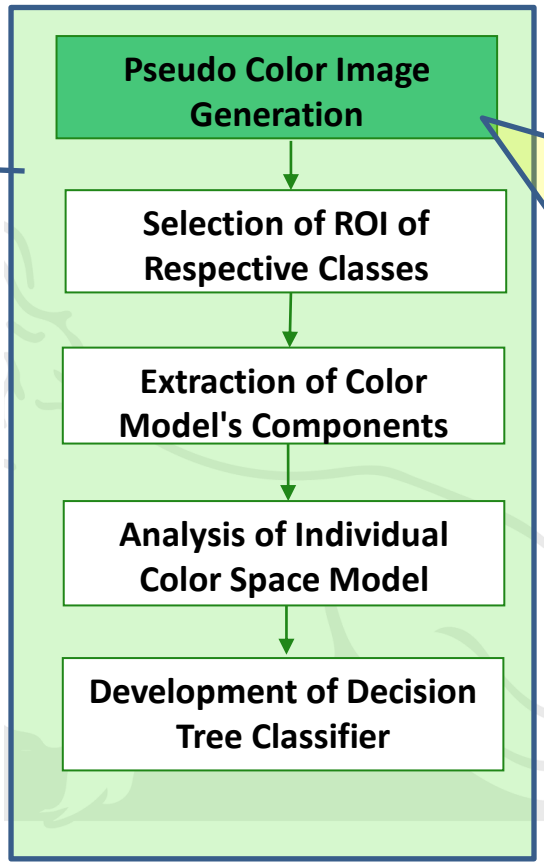


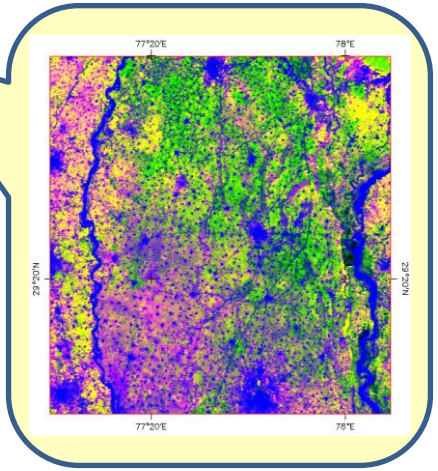


Land Cover Classification Algorithm

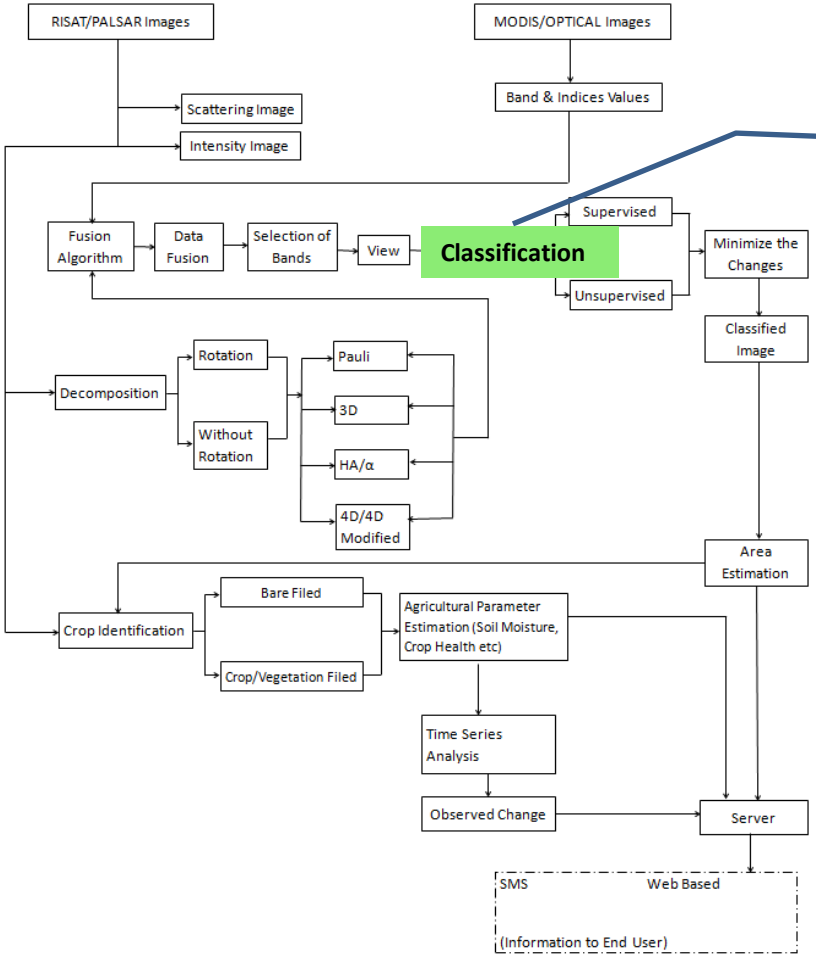
Methodology contd……

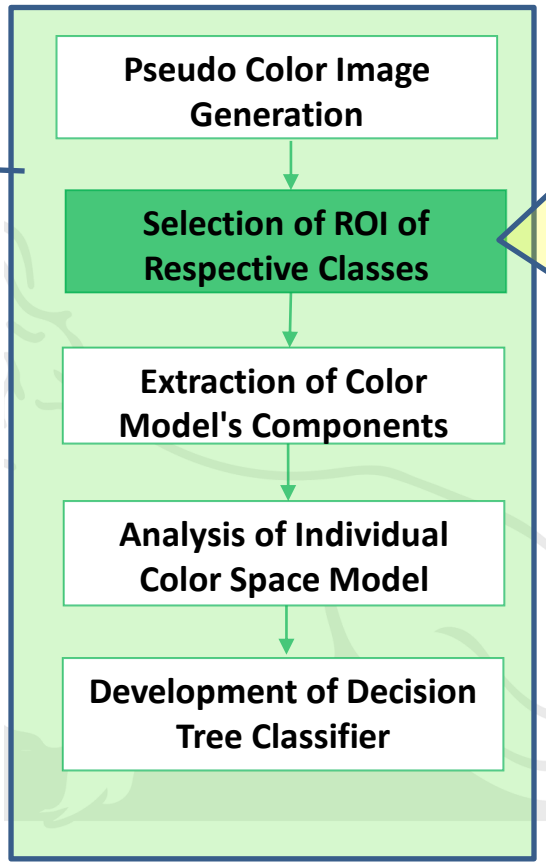






Methodology contd……

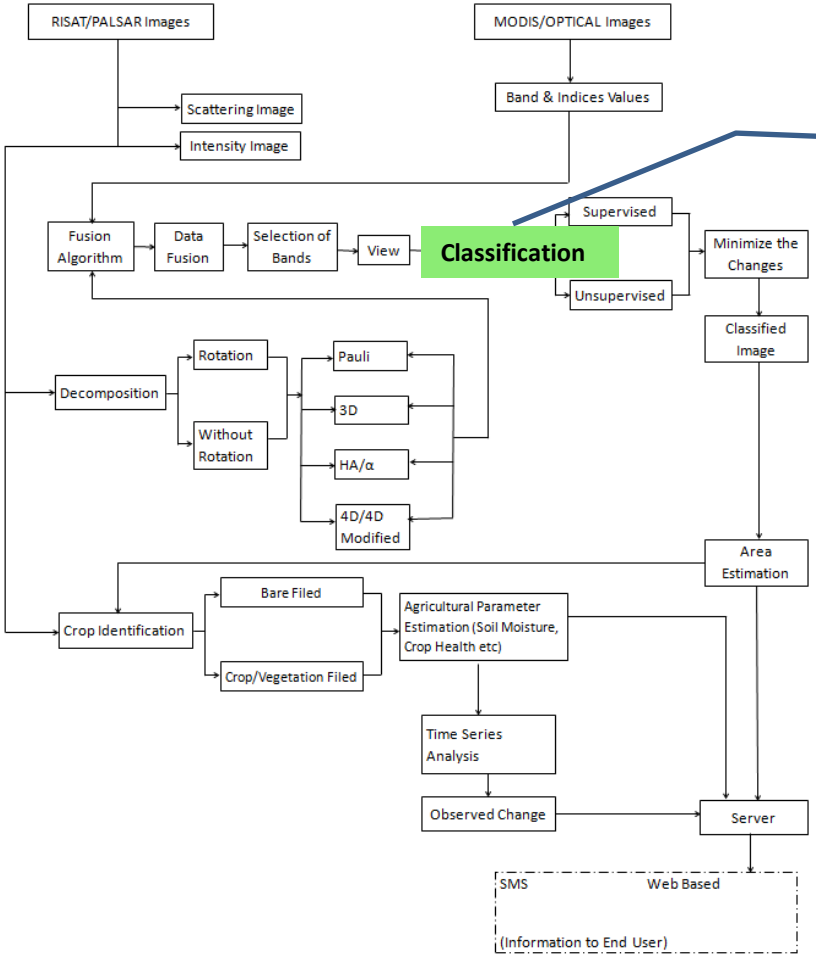


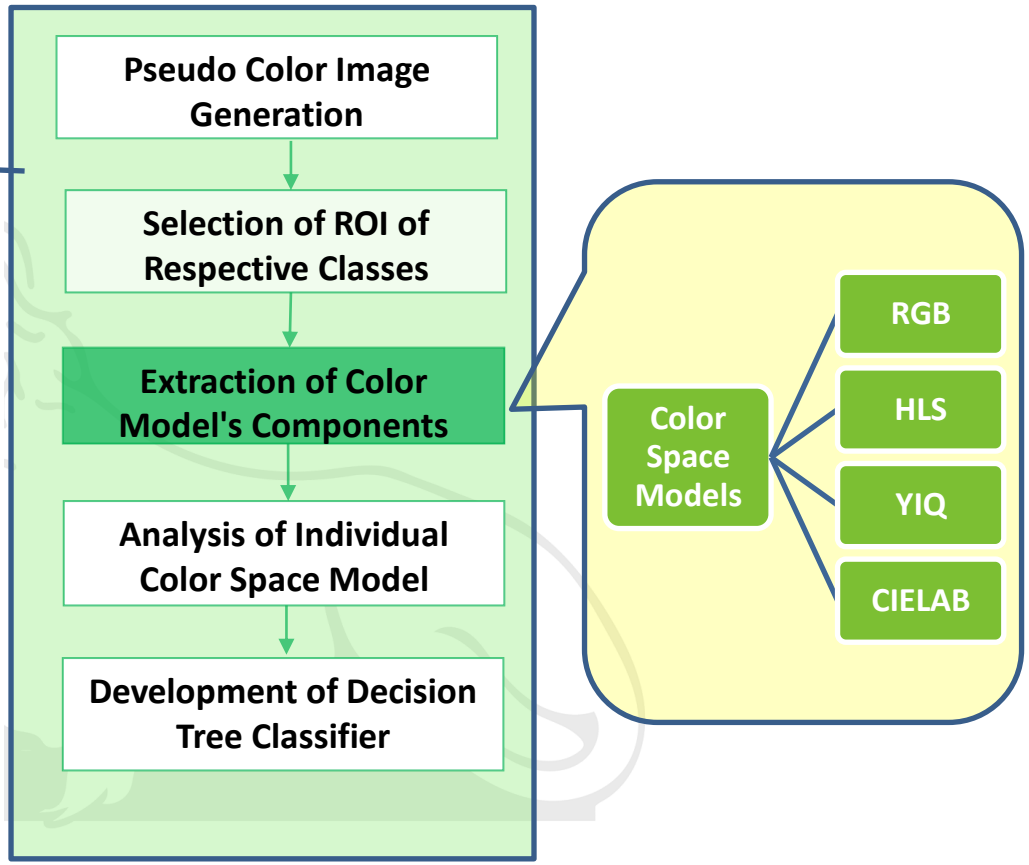


Class	ROI Points
Water	200
Urban	200
Normal Vegetation	200
Dense Vegetation	200
Bare Soil	200

Land Cover Classification Algorithm

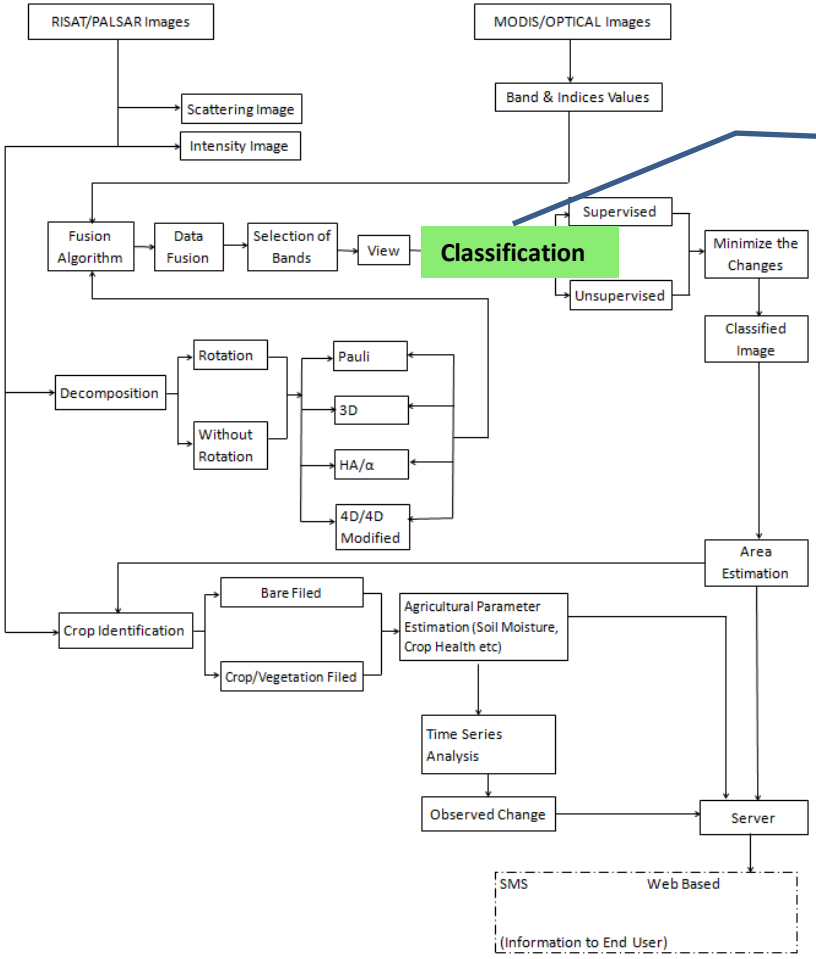
Methodology contd……

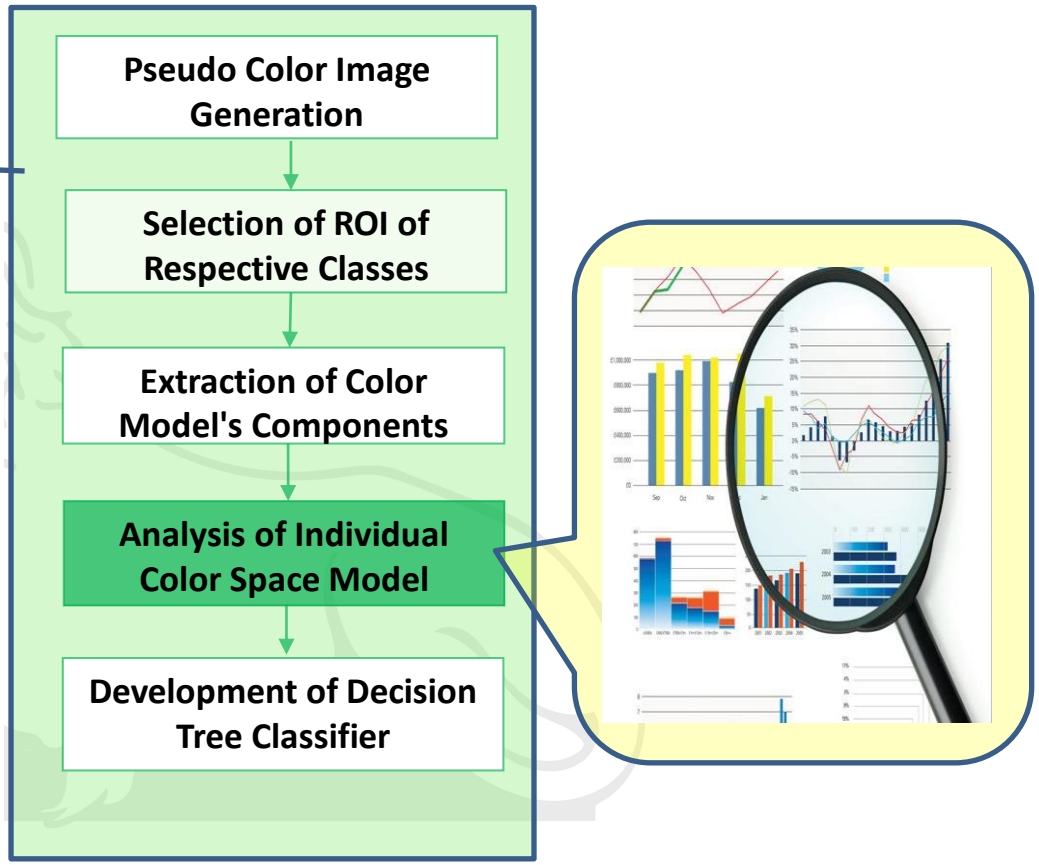




Land Cover Classification Algorithm

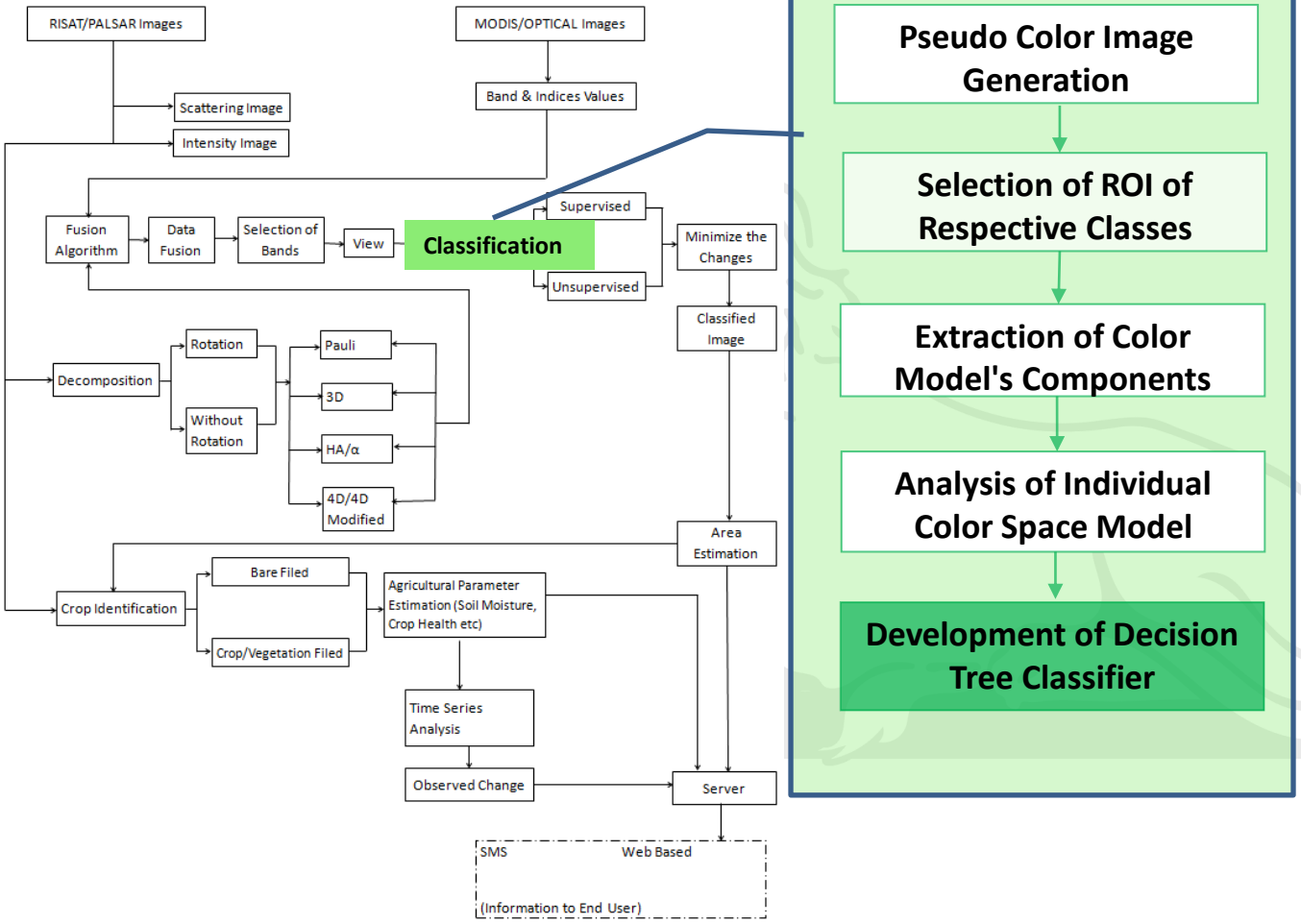
Methodology contd……



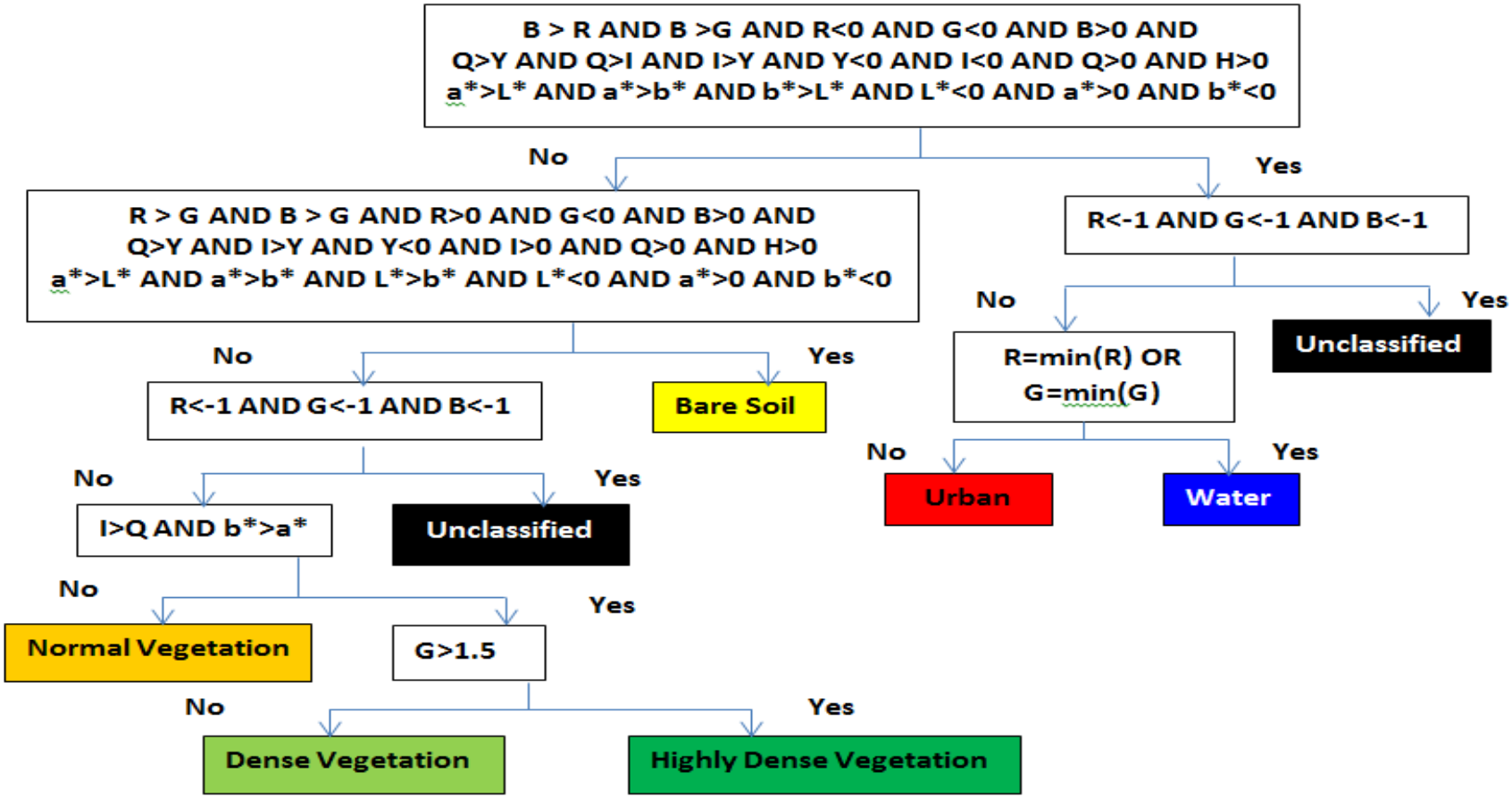


Land Cover Classification Algorithm

Methodology contd……



Decision Tree Classifier



➢ Deployment on Cloud for Web Based Solution

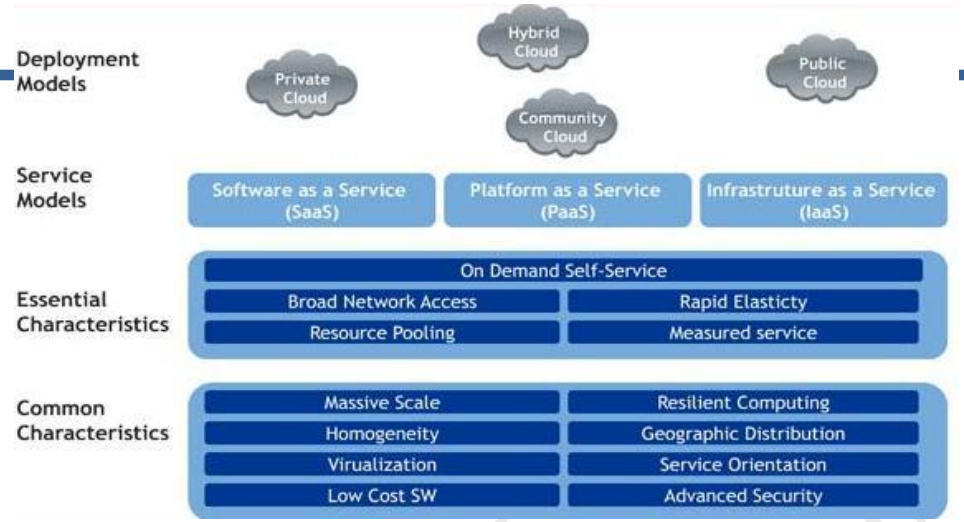


Fig.: Cloud Computing Architecture

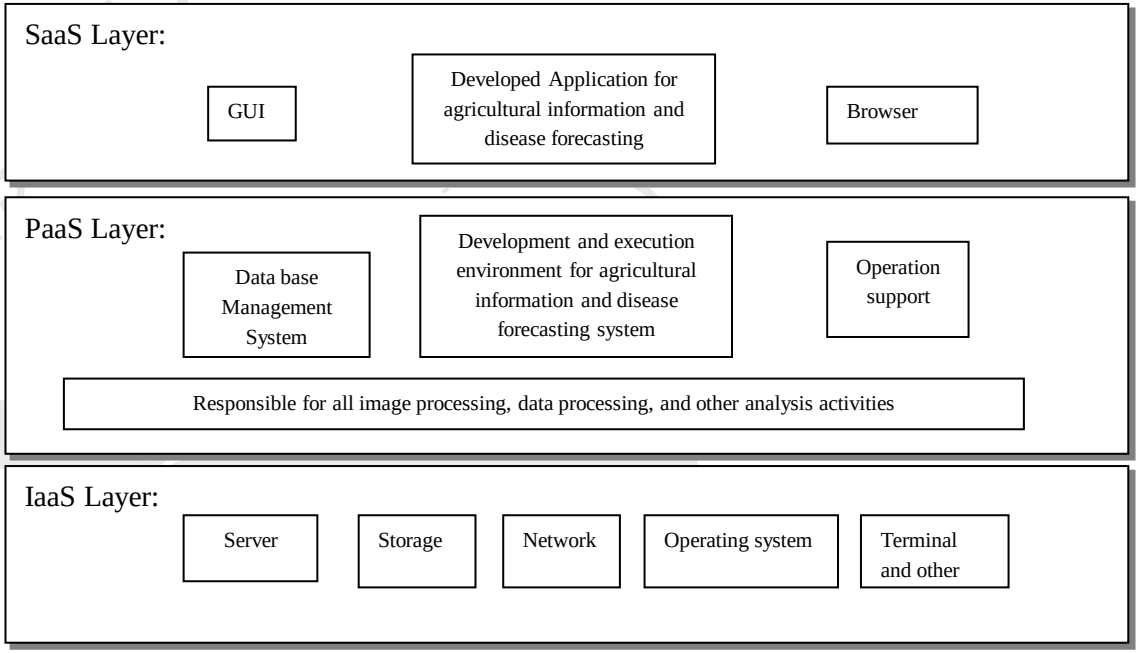


Fig. : Proposed Layered Structure

➢ Product

First Phase
- Uttarakhand
- U.P
- Kerla
- Tamilnadu
- Punjab

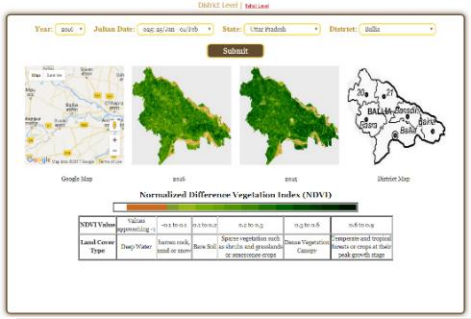
Name of the product : **Agriculture information system**

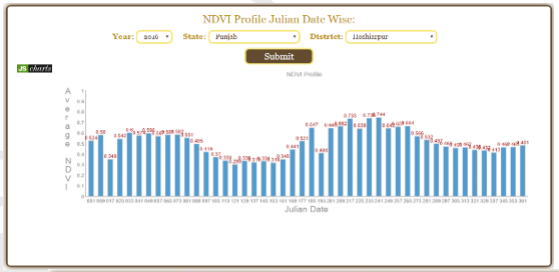
Web address: www.aisiitr.in\modis\

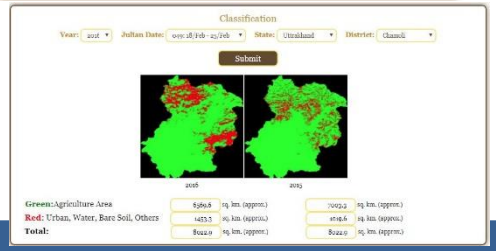
Android app available in google play store

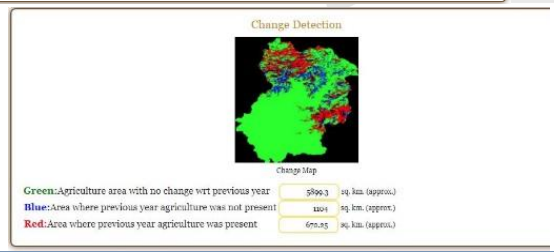
Large scale application

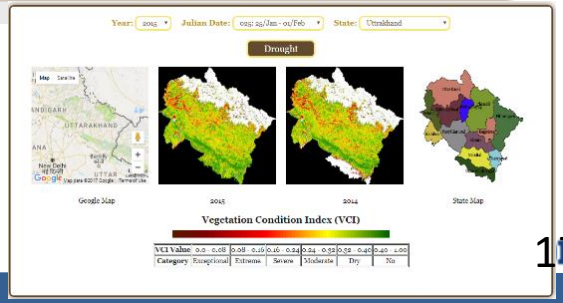
- Vegetation map (District / Tehsil / Village wise)
- Vegetation profile (District / Tehsil / Village wise)
  - Year wise / Crop cycle wise
- Agriculture area identification and its changes (District wise)
- Drought maps (State wise)











Vegetation Map

District Level | Tehsil Level

Year: 2016 Julian Date: 025: 25/Jan - 01/Feb State: Uttrakhand District: Haridwar

Submit

Google Map

2016

2015

District Map

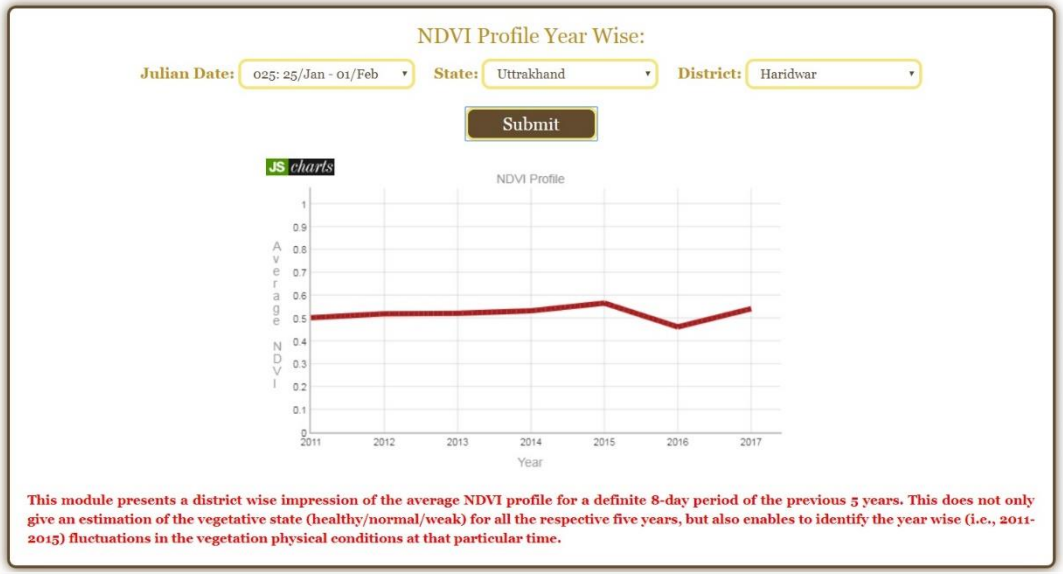
Normalized Difference Vegetation Index (NDVI)

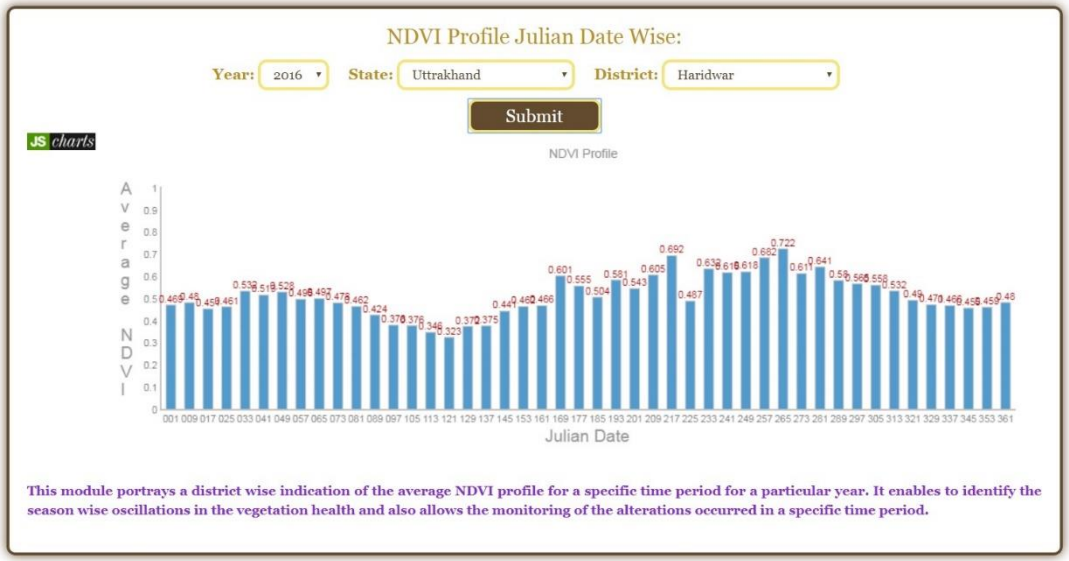
NDVI Value	Values approaching -1	-0.1 to 0.1	0.1 to 0.2	0.2 to 0.3	0.3 to 0.6	0.6 to 0.9
Land Cover Type	Deep Water	barren rock, sand or snow	Bare Soil	Sparse vegetation such as shrubs and grasslands or senescence crops	Dense Vegetation Canopy	Temperate and tropical forests or crops at their peak growth stage

The Normalized Difference Vegetation Index (NDVI) is a measure of plant/crop "greenness" based on the photosynthetic process or chlorophyll content. This module gives a district wise overview of the vegetation health in the form of NDVI for a 8-day (week) period of a particular year. The lively/healthy vegetation, shows more NDVI value in comparison to dead vegetation as healthy vegetation soaks the majority of the red light that strikes it while reflecting a large amount of the near infrared light.

http://www.aisiitr.in/modis/

Vegetation profile



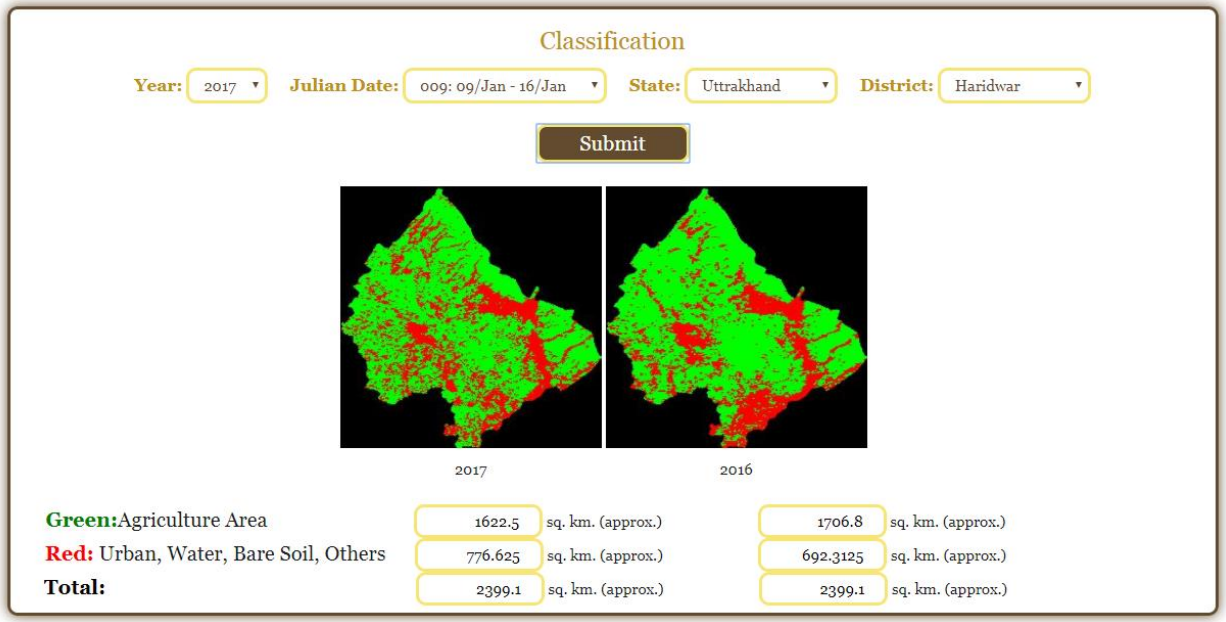


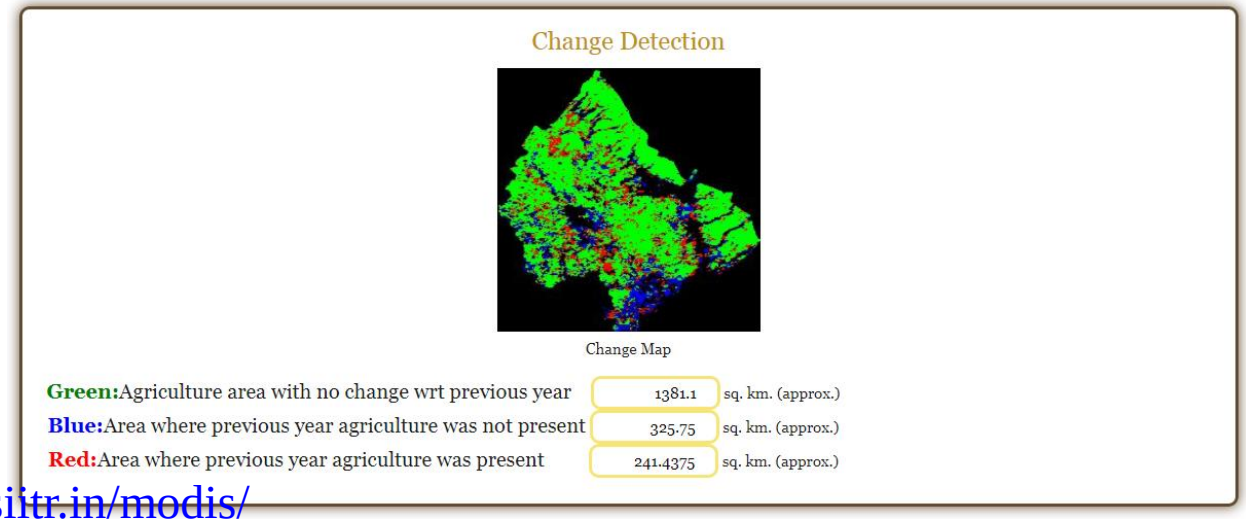
Previous 5 year vegetation profile for the selected date

Vegetation profile for the selected year

http://www.aisiitr.in/modis/

Classification & Change Detection

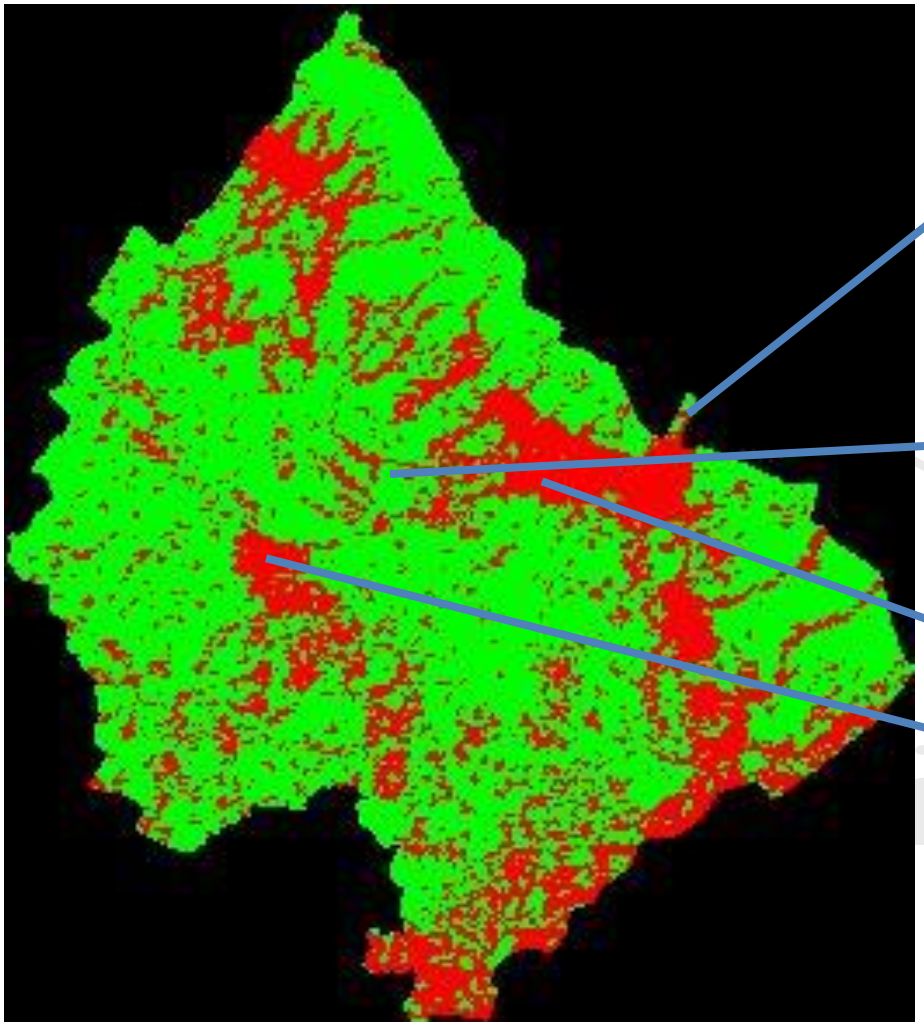




http://www.aisiitr.in/modis/

Validation

09 Jan 2017



Haridwar

Roorkee

Vegetation

Other class (water, urban, bare land)

Field Survey – Ground truth data

Date of field visit	Parameters measured
17-02-2017	crop type, crop height, crop density, multispectral data, soil moisture, leaf area index etc.
24-02-2017	crop type, crop height, crop density, multispectral data, soil moisture, leaf area index etc.


Crop detail
Lat 29.93146 N
Lon 77.96592 E

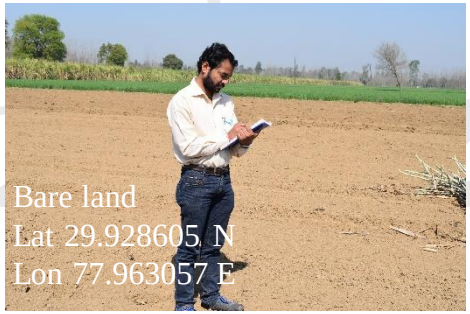

Wheat soil moisture measurement
Lat 29.93127 N
Lon 77.96578 E


Bare land
Lat 29.937532 N
Lon 77.932522 E


Mustard
Lat 29.86072 N
Lon 77.78505 E


Wheat
Lat 29.937453 N
Lon 77.933245 E

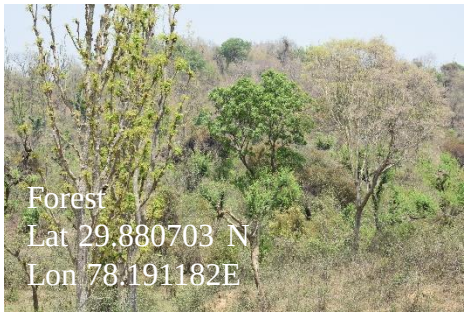

Sugarcane Planting
Lat 29.928758 N
Lon 77.962942 E

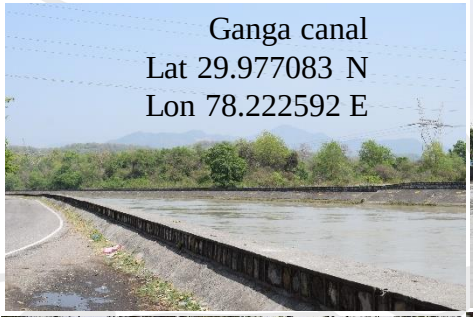

Bare land
Lat 29.928605 N
Lon 77.963057 E

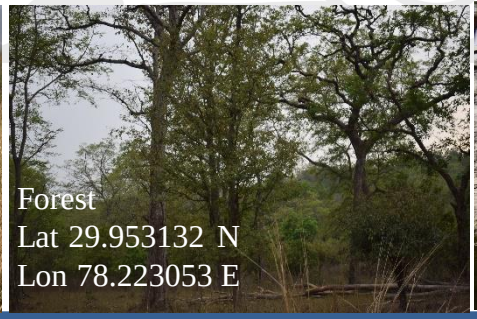

Multispectral scanner
Lat 29.930392 N
Lon 77.964965 E

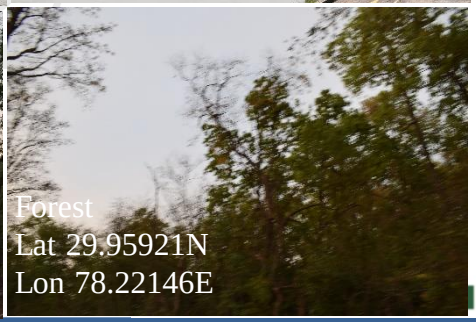
Field Survey – Ground truth data

Date of field visit	Parameters measured
22-04-2017	Identification of new sites and collection of geographical information for forest, water (Cheela dam), grassland etc.







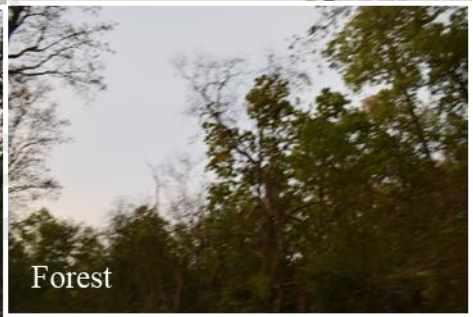


Field Survey – Ground truth data

Date of field visit	Parameters measured
09-06-2017	crop type, crop height, crop density, multispectral data, soil moisture, leaf area index etc.
30-06-2017	New site identification, crop type, crop height, crop density, multispectral data, soil moisture, leaf area index etc.

Field Survey – Ground truth data

Field Survey - Ground truth data



Validation

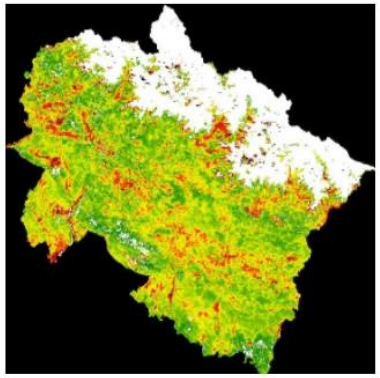
Date	Vegetation index from AIS	Ground truth vegetation index
10 Feb 2017	0.664	0.618
24 Feb 2017	0.634	0.771
09 Jun 2017	0.464	0.528
05 Jan 2018	0.408	0.537

Drought Monitoring

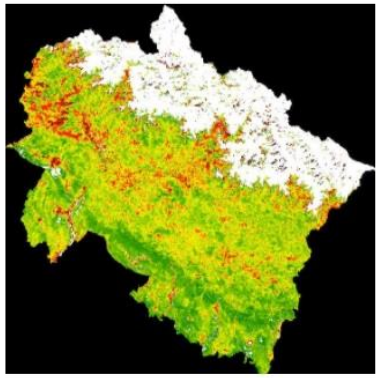
Year: 2016 Julian Date: 025: 25/Jan - 01/Feb State: Uttrakhand

Drought

Google Map



2016



2015

State Map

Vegetation Condition Index (VCI)

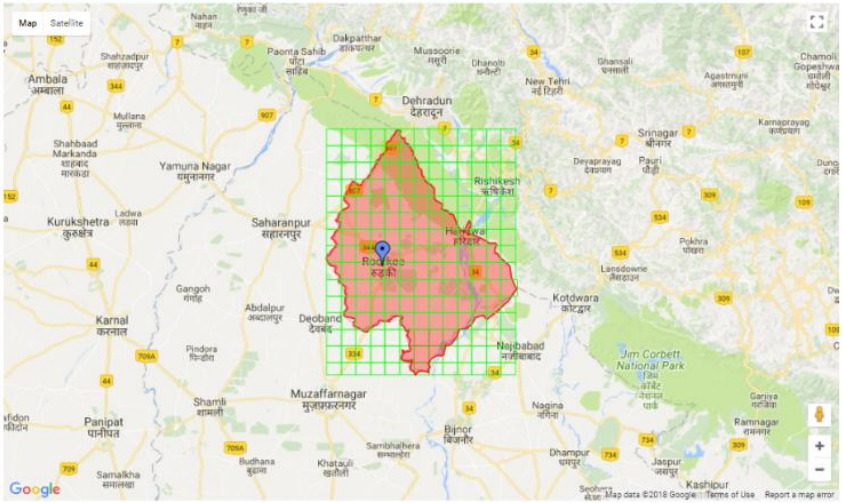
VCI Value	0.0 - 0.08	0.08 - 0.16	0.16 - 0.24	0.24 - 0.32	0.32 - 0.40	0.40 - 1.00
Category	Exceptional	Extreme	Severe	Moderate	Dry	No

http://www.aisiitr.in/modis/

Village level NDVI profile (ongoing)

Village Level NDVI Profile of HARIDWAR District

zoom in the map to go on a deeper level



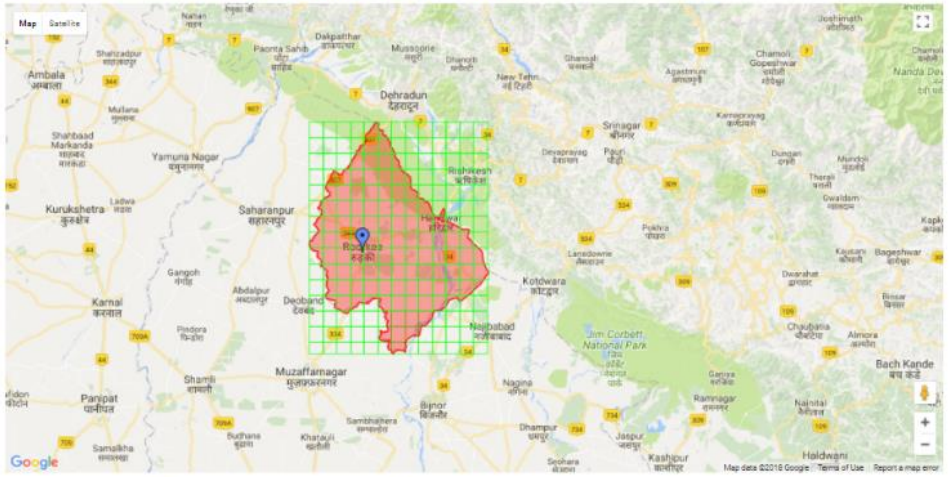
Latitude: 29.85430 Longitude: 77.88800

Julian Date: 001: 01/Jan - 08/Jan Submit

NOTE: Scale opt is of 5 km around the chosen point

Village Level NDVI Profile of HARIDWAR District

zoom in the map to go on a deeper level



Latitude: 29.85430 Longitude: 77.88800

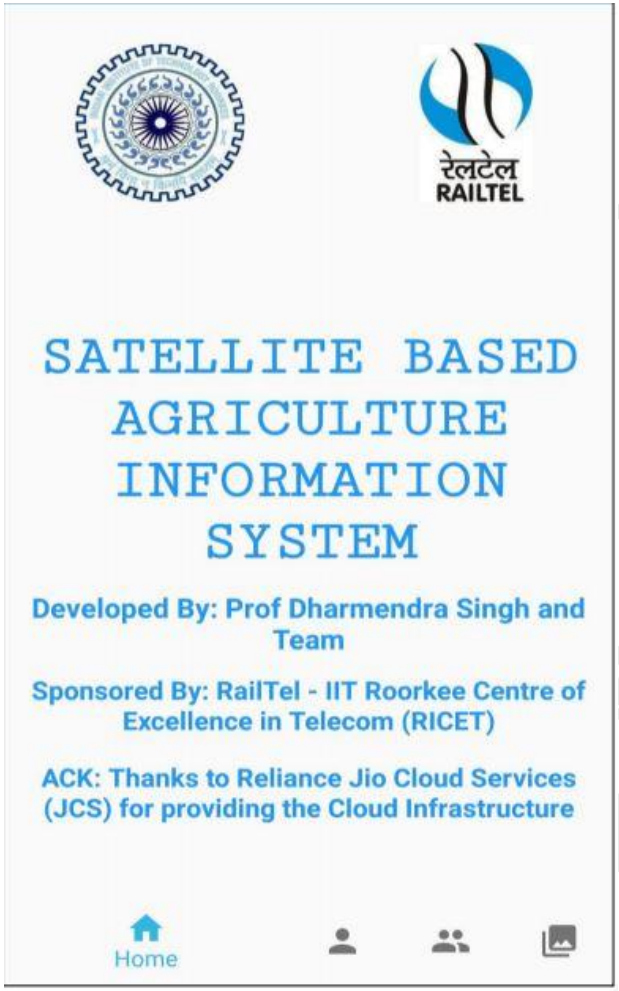
Julian Date: 049: 18/Feb - 25/Feb Submit

NOTE: Scale opt is of 5 km around the chosen point

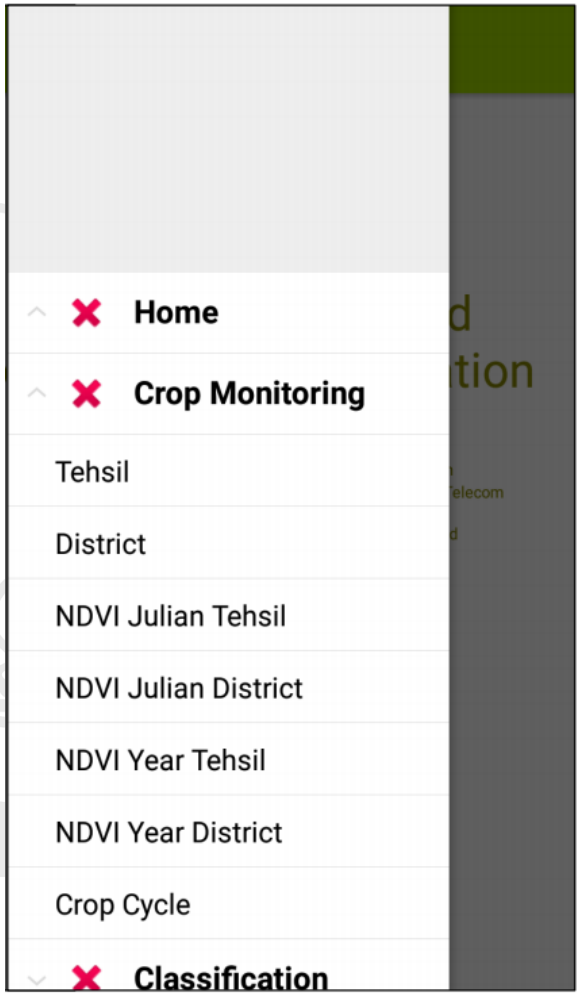
AIS Android Application

AIS_IITR

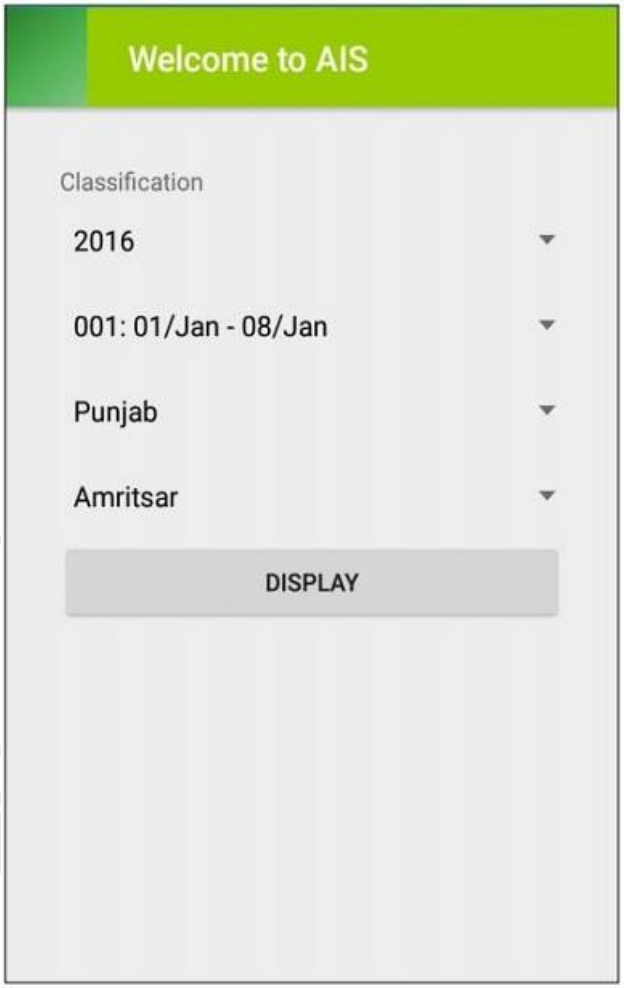
GET IT ON Google Play



Launch Screen



Menu

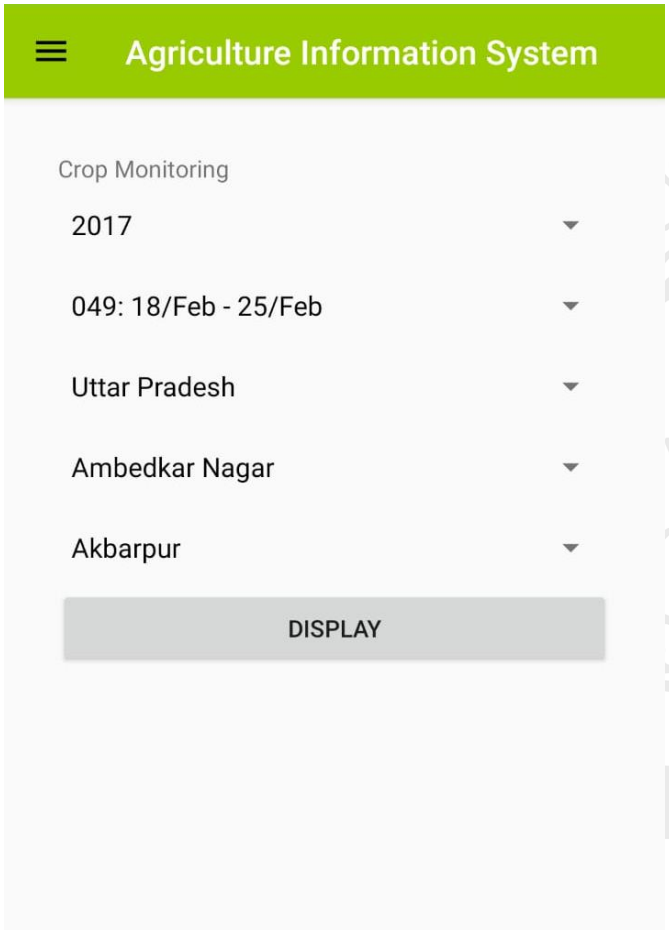


District wise Classification

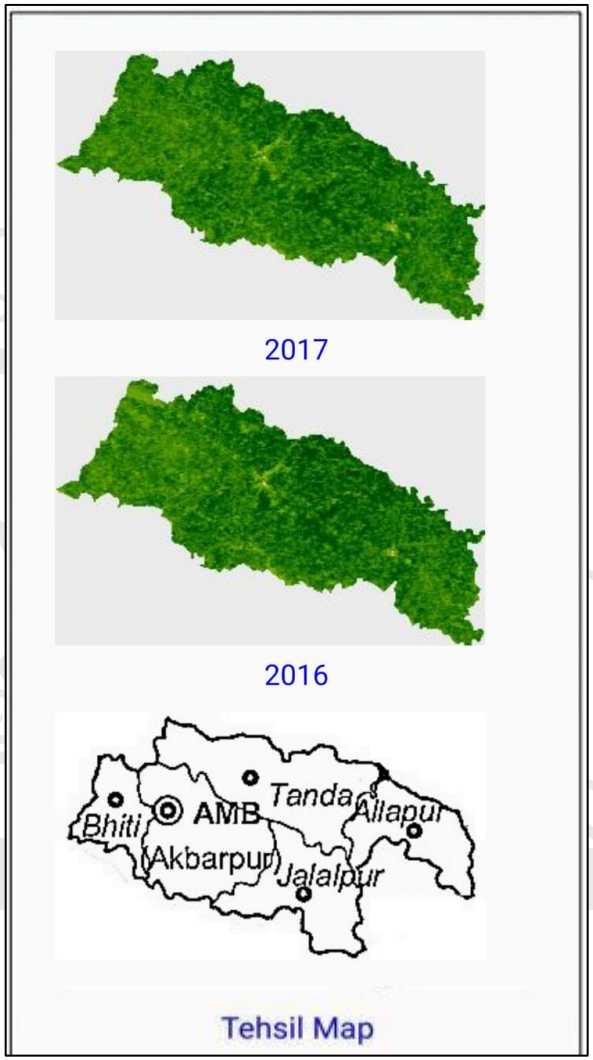
AIS Android Application

AIS_IITR

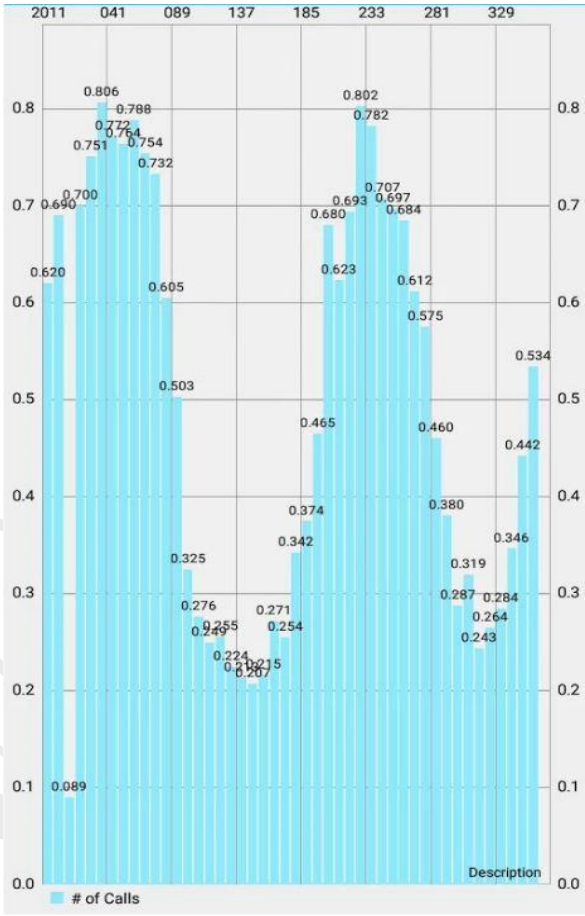
GET IT ON Google Play



Tehsil wise Crop Monitoring

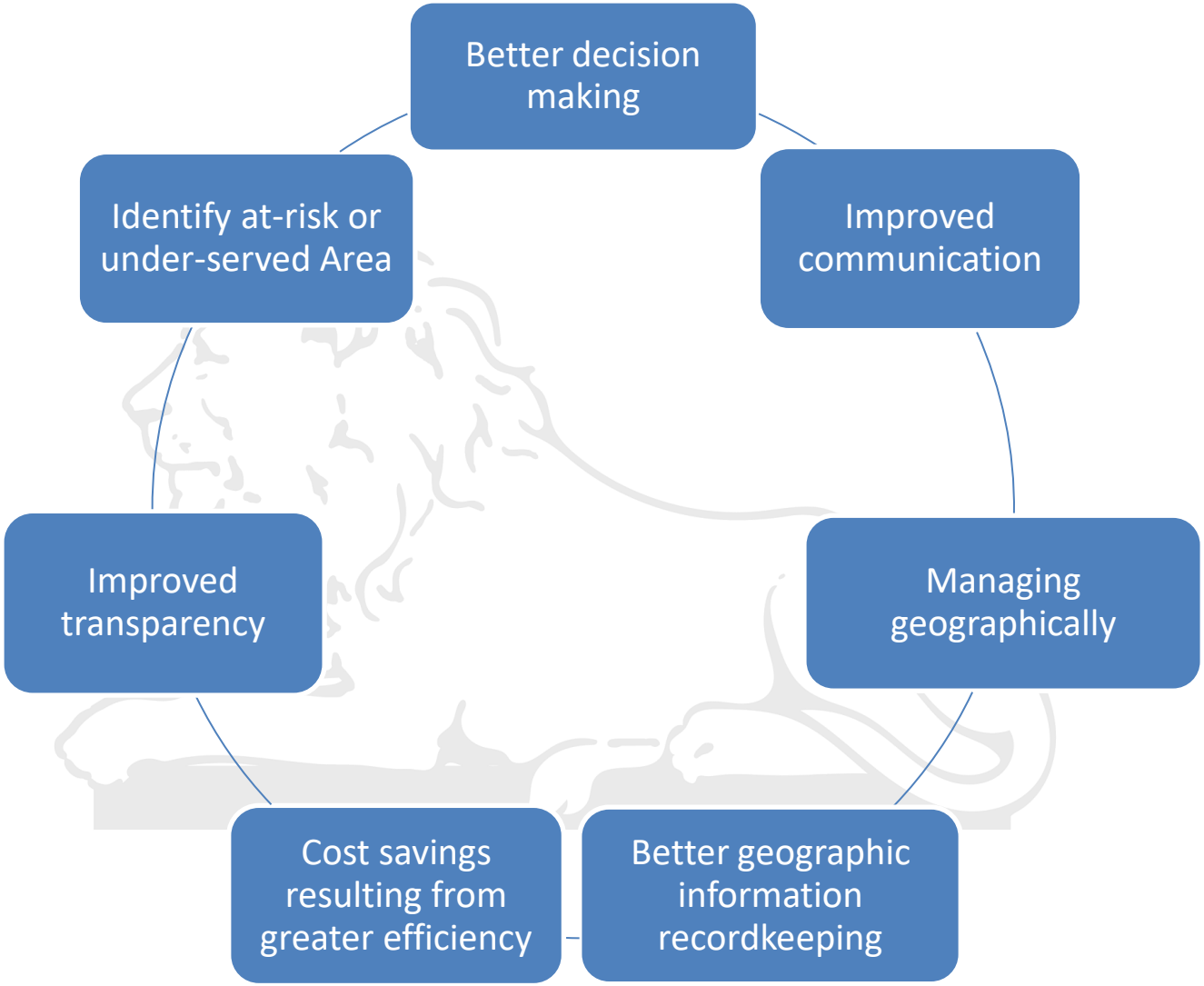


Tehsil NDVI map



NDVI profile

Benefits of AIS



➢ Competition

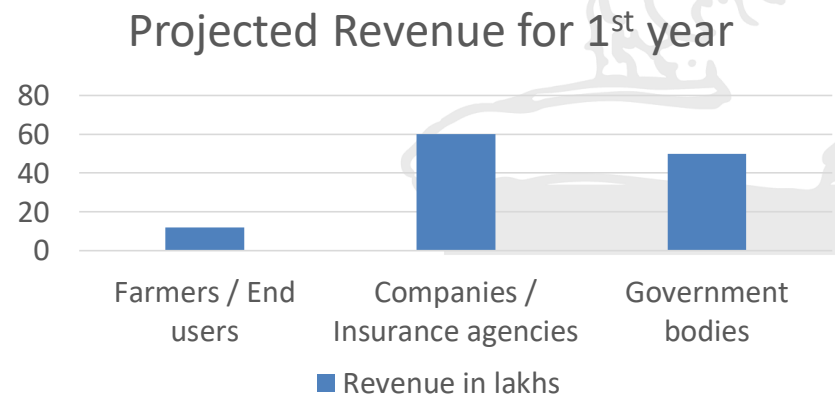
- Traditional practices like in situ sampling and investigation






Business Model

- Launched and available online for registered users
- Initial free trial for 1 month
- @ ₹ 10/pm (for one location per user)
  - Target of approx. 10000 users in 1st year - ₹ 12 lakhs
- @ ₹ 10000/pm for one district (negotiable)
  - Target of at least 5 companies / insurance agencies in 1st year and minimum of 10 districts - ₹ 60 lakhs
- State wise contracts for 1 year – ₹ 20 to 30 lakhs (negotiable)



Projected revenue for 1st year ₹ 1.12 crore

Agriculture Information System (AIS) & Pradhan Mantri Fasal Bima Yojana (PMFBY)

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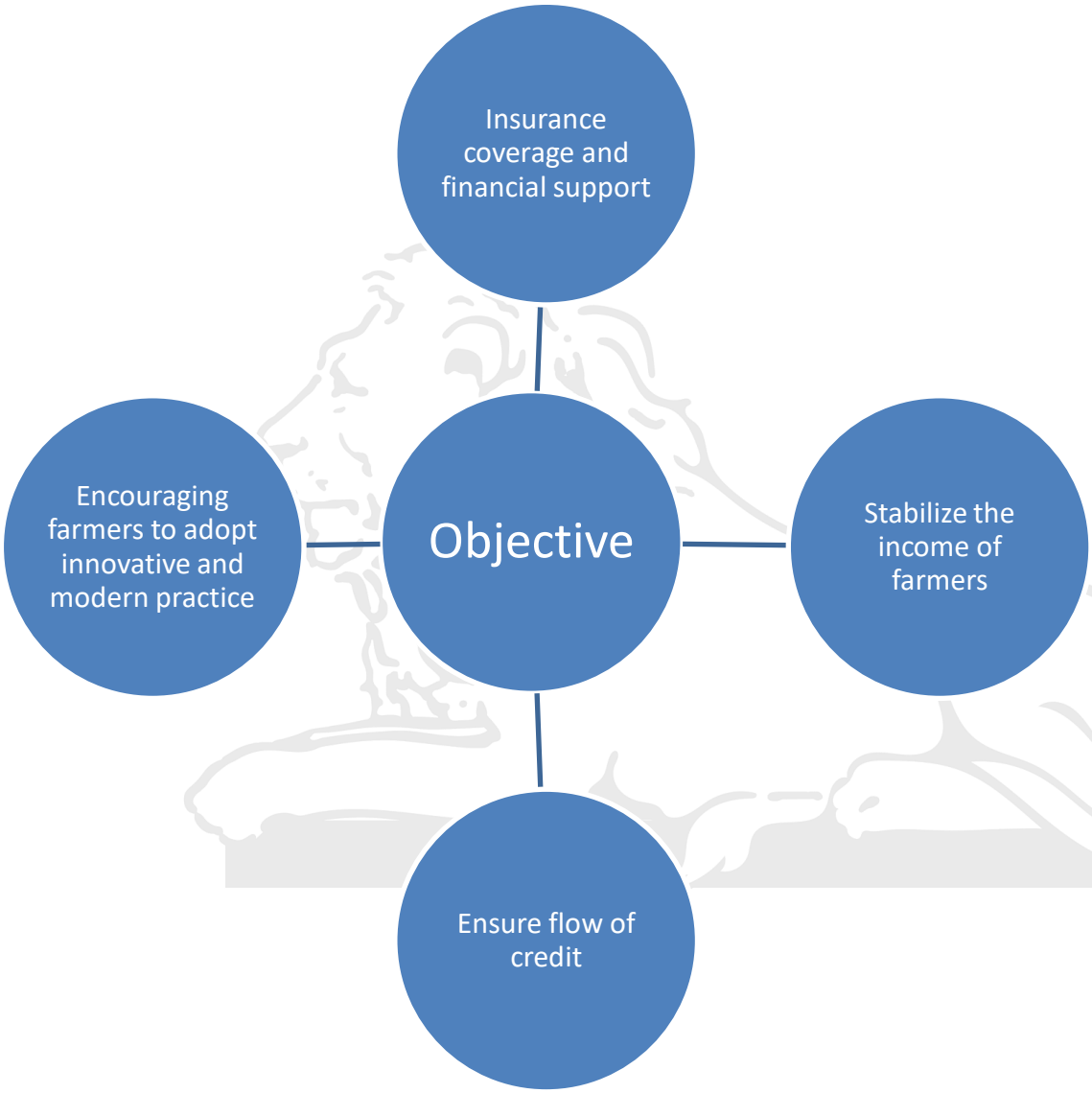
PMFBY Introduction

- Pradhan Mantri Fasal Bima Yojana is a **crop insurance scheme** launched by Prime Minister Narendra Modi Led NDA Government. The scheme has been launched to cater the financial needs of the farmers in the events of crops destroyed by heavy rain, other natural calamities, pests or diseases.
- The scheme is aimed to provide insurance cover and financial support to the farmers in difficult times. In the new scheme, the shortcomings of previous crop insurance schemes have been taken care of very well. Along with this scheme, several other initiatives have been started by the central government of the welfare of the farmers.

Objective of PMFBY



Risks to be Covered

Yield losses (standing crops, on notified area basis): Comprehensive risk insurance is provided to cover yield losses due to non-preventable risks, such as

- **Natural Fire and Lightning**
- **Storm, Hailstorm, Cyclone, Typhoon, Tempest, Hurricane, Tornado etc.**
- **Flood, Inundation and Landslide**
- **Drought, Dry spells**
- **Pests/ Diseases etc**

PMFBY & AIS

PMFBY		AIS
Past Data	→	Provide both Year wise and season wise
Data Classification	→	Crop classification module
Verification of Land and crop	→	Easily Done by this technology
Drought related info	→	Drought module available
Condition of Crop and soil	→	Crop Monitoring Module

PMFBY highlights where AIS can contribute

1. To give information which area in a district/State needed more focus under this scheme i.e. identification of area which are having any kind of crop and agriculture land issue in past few years to change policy for specific area and particular crop.
2. AIS can remove burden from : -
   - The executive of the insurance company. who will visit the crop fields for collecting data by using smart phones with internet and GPS connectivity to capture several data related of land and the crop growth via AIS Technology.
   - The farmers will be guided about the soil health of the land. Experts from the Department of agriculture will visit the farms regularly to collect the soil sample and test them in the laboratories and the test reports will be given to the farmers.
3. Easy Verification of land and crop which is mentioned by farmer in application for insurance.
4. We can provide past data related to
   - Natural Fire and Lightning
   - Storm, Hailstorm, Cyclone, Typhoon, Tempest, Hurricane, Tornado etc.
   - Flood, Inundation and Landslide
   - Drought, Dry spells
   - Pests/ Diseases etc

   Which help Insurance company to formulate their various policies for farmers.

Apart from that by the help of AIS you can access data related to crops and soil such as

- Most sown Crop
- Condition of Crop
- Condition of soil
- Past environmental condition

Publicity

अब सेटेलाइट से होगी फसलों की देखरेख

सिस्टम से लैस होने वाला उत्तराखंड होगा पहला राज्य

विनोद कुमार सिंह

रुड़की। उत्तराखंड में फसलों की मॉनिटरिंग अब सेटेलाइट से संभव हो सकेगी। इसके लिए आईआईटी रुड़की ने सेटेलाइट बेस्ट एग्रीकल्चर इनफार्मेशन सिस्टम डेवलप किया है, जिसके माध्यम से हम उत्तराखंड में जिले और तहसील स्तर पर फसलों की सेहत पर नजर रख सकेंगे। खास्सबात यह है कि उत्तराखंड पहला ऐसा राज्य होगा जहां सेटेलाइट से फसलों की देखरेख हो सकेगी। इसके लिए माड्यूल तैयार कर लिया गया है। उत्तराखंड के बाद पंजाब और यूपी का माड्यूल तैयार किया जा रहा है। इसके बाद इसमें देश के सभी राज्यों को शामिल करने का प्रयास किया जाएगा।

- आईआईटी रुड़की ने बनाया एग्रीकल्चर इनफार्मेशन सिस्टम
- यूपी और पंजाब के लिए भी बनाया जा रहा है माड्यूल

यह कहते हैं वैज्ञानिक

आईआईटी के प्रोफेसर धर्मेंद्र सिंह के अनुसार उत्तराखंड का माड्यूल तैयार होने के बाद करीब 800 यूजर इसकी टेस्टिंग कर रहे हैं। अब इसे बड़े स्तर पर लॉच करने की तैयारी की जा रही है। जल्द ही लोगों को इसका लाभ मिल सकेगा।

उत्तराखंड में पिछले साल किसी जिले या तहसील में किस फसल की पैदावार कितनी थी और इस बार उसकी क्या संभावना है। पिछले साल जनवरी के दूसरे सप्ताह में गेहूं या गन्ने की फसल की क्या स्थिति थी और इस बार क्या है, यह सब जानकारी आपको घर बैठे ही मिल सकती है। यही नहीं तहसील और जिले स्तर पर फसलों के संबंध में साप्ताहिक जानकारी भी मिलती रहेगी।

साथ ही दो साल पहले या फिर दो साल बाद फसलों की हेल्थ और शोध कैसी होगी, इसकी भी जानकारी मिल सकेगी। यह सब संभव होगा सेटेलाइट बेस्ड एग्रीकल्चर सिस्टम से, जिसका इस्तेमाल अभी तक विदेशों में ही किया जा रहा है। अब आईआईटी रुड़की के प्रयास से यह उत्तराखंड में भी संभव हो सकेगा। आईआईटी रुड़की के प्रोफेसर धर्मेंद्र सिंह के अनुसार सेटेलाइट बेस्ड एग्रीकल्चर इनफार्मेशन सिस्टम डेवलप करने के बाद इसका परीक्षण किया जा चुका है और इसे आमजन के लिए लॉच करने की चल रही है। उन्होंने बताया कि सेटे बेस्ट एग्रीकल्चर इनफार्मेशन सिस्ट लिए रिलायंस जीओ ने अपना क स्टोरेज और प्रोसेसिंग की सुविधा प्रद है, जबकि इसकी फंडिंग रेलटेल कंप और से की गई है।

क्या और कैसे मिलेगी सुविधा

सेटेलाइट बेस्ट एग्रीकल्चर इनफार्मेशन सिस्टम का लाभ नेट के माध्यम से मिल सकेगा। इसके लिए यूजर को आइडी और पासवर्ड दिया जाएगा, जिससे वह क्षेत्र की फसलों के संबंध में आसानी से जानकारी ले सकेगा।

मोबाइल ऐप भी हो रहा तैयार

सेटेलाइट बेस्ड एग्रीकल्चर इनफार्मेशन सिस्टम डेवलप करने के बाद मोबाइल ऐप भी तैयार किया जाएगा, जिसे डाउनलोड करने के बाद लोगों को मोबाइल पर ही फसलों की सेहत और उत्पादन के संबंध में घर बैठे जानकारी उपलब्ध हो सकेगी।

IIT-Roorkee develops online crop monitoring system, app

Tapan.Susheel | TNN

Roorkee: The Indian Institute of Technology Roorkee (IIT-R) claims to have developed a satellite-based online information system and mobile app for crop monitoring at district level in Uttarakhand.

The electronics and communication engineering department of the institute, which developed the system, says that they may be able to extend the online platform country-wide in a year or more after uploading data from other states.

"The online information system is called 'satellite-based agriculture information system' (SBAIS). The website will soon be in the public domain for general users," Dharmendra Singh, professor of microwave imaging & space technology and the principal investigator (PI) of the project, told TOI. The institute has also developed an app for mobile users to access the online information system.

The state agriculture authorities have expressed satisfaction over the development of the online information system as it can allow them to inspect land for settlement of crop insurance claims. "To settle-cases of crop insurance of farmers, we have to gather data from our personnel time to time but if entire in-

State agriculture authorities said that the online information system can also allow them to inspect land for settlement of crop insurance claims

formation of vegetation in every district is available online, the actual damage can be assessed sooner," said JP Tiwari, chief district agriculture officer, Haridwar.

RailTel, a Miniratna enterprise of Government of India, has reportedly provided a funding of around Rs 80 lakh to the institute for the project.

The institute has been working on the project for two years and has collected data on various agricultural factors for the period beginning from 2011 and including all 13 districts of the state.

The salient features of the project, under two main modules, are monitoring crop health district- and tehsil-wise, and image classification of vegetation of a particular area.

The online information system is called 'satellite-based agriculture information system' (SBAIS) and has reportedly received a funding of Rs 80 lakh from RailTel

NEWS / CITY NEWS / DEHRADUN NEWS / IIT-R DEVELOPS SATELLITE-BASED CROP MONITORING SYSTEM, APP

IIT-R develops satellite-based crop monitoring system, app

A- A+

Tapan Susheel | TNN | Jan 19, 2016, 22:37 IST

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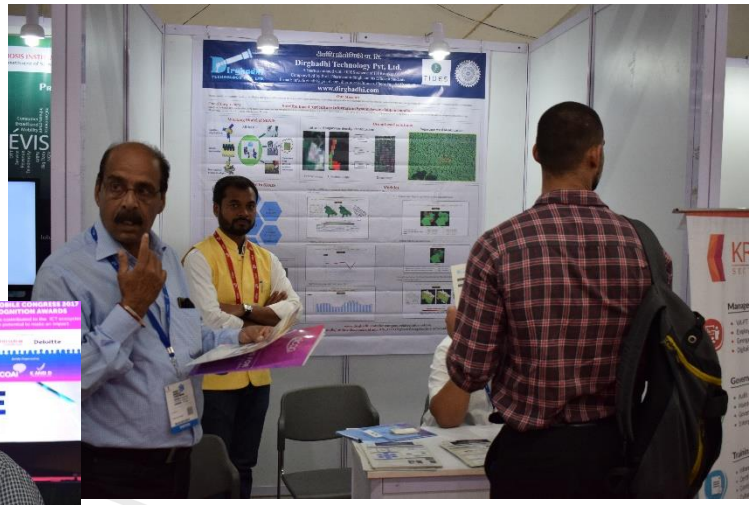
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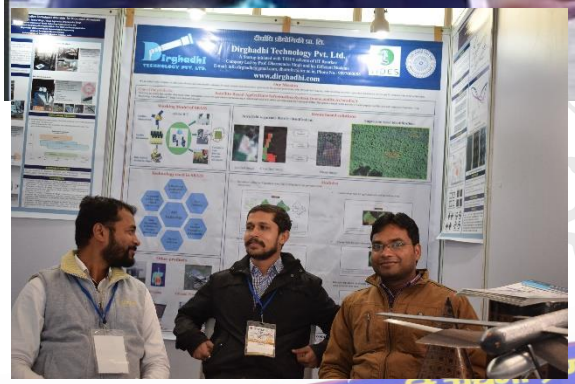
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Thanks for Patient