

NATIONAL LAND USE AND LAND COVER MAPPING USING MULTI-TEMPORAL AWiFS DATA

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LAND USE / COVER MAPPING USING MULTI-TEMPORAL AWIFS DATA

Objective To provide information on sown area during kharif & rabi seasons and net sown area at the end of agricultural year along with land use/cover information on annual basis.

Deliverables Land use / land cover map of India on annual basis by August; Kharif sown area for entire India by January; Rabi sown area for entire India by May

Data Used AWiFS data of Resourcesat-1 and 2; ground truth; FSI forest cover map; 1:50K LULC

Start Date April-2004

End Date May-2019

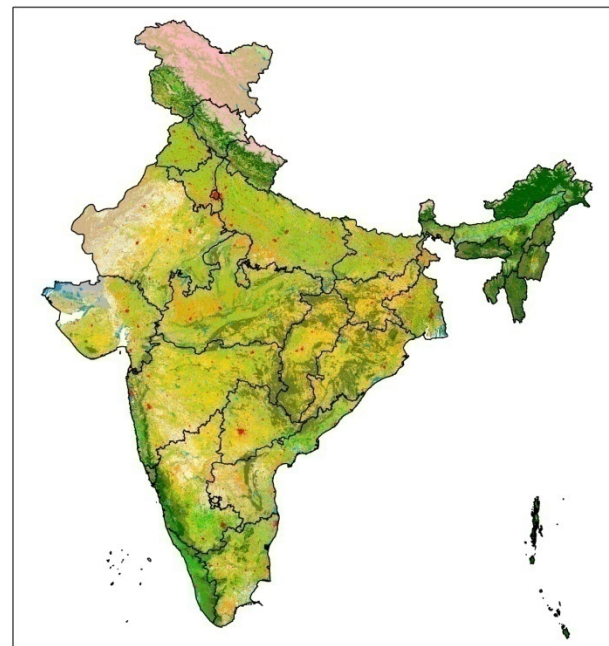
Approach Digital classification

Status 14 cycles completed



















Executed by Joint efforts of RSA, Regional Centres and NESAC

Utility of outputs 5km gridded products are used by NICES. Improved LULC products generated by replacing USGS global LULC data with AWiFS LULC are used in weather forecasting models. AWiFS LULC product found maximum users (445 requests) in the academic/research fraternity across globe. Regular users: CWET (Centre for Wind Energy Technology) & Environment Resource Foundation

Land Use Land Cover map of India – 2017-18



Legend

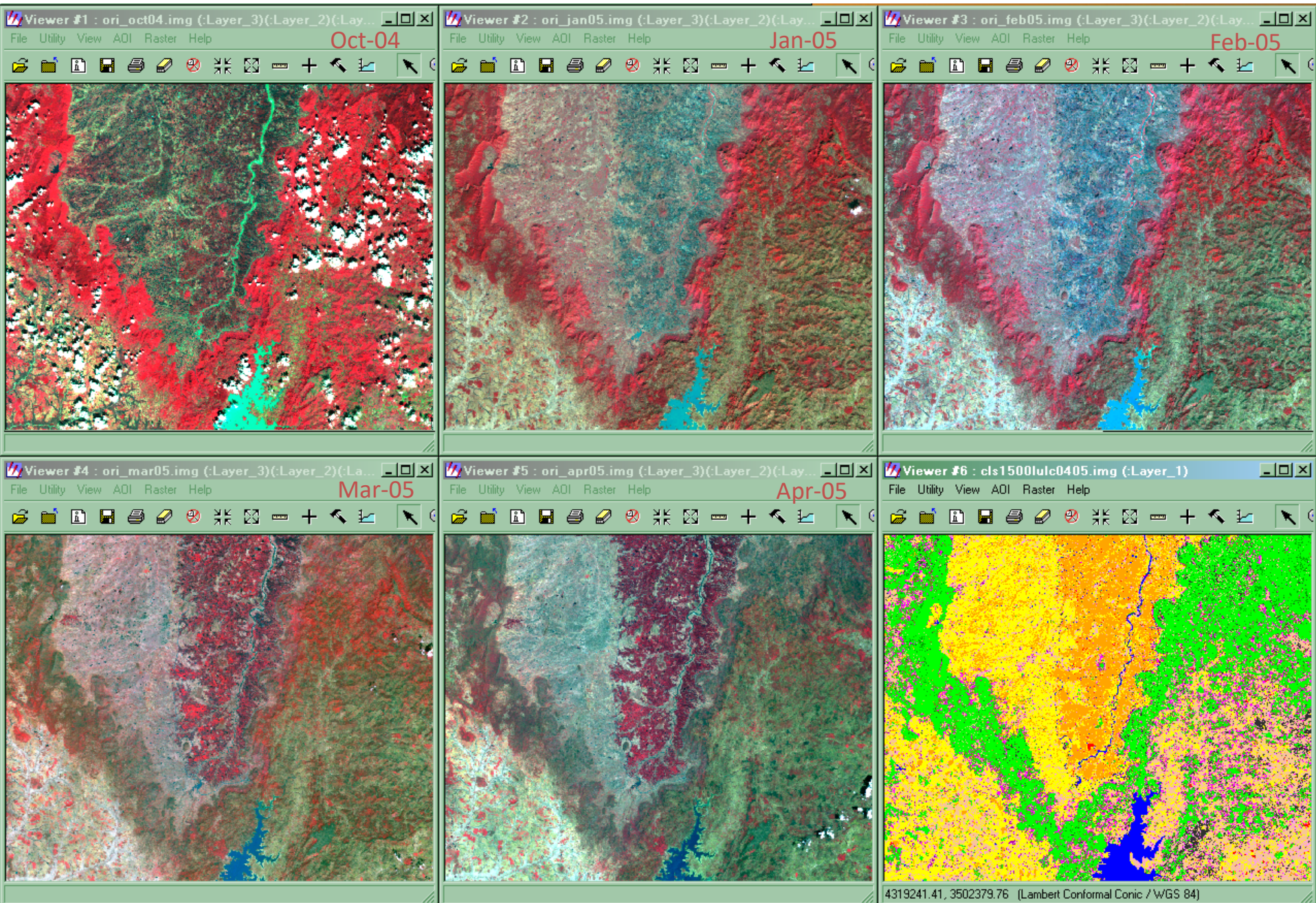
	Built-up		Degraded / scrub forest
	Kharif crop		Littoral swamp
	Rabi crop		Grassland
	Zaid crop		Shifting cultivation
	Double/triple crop		Wasteland
	Current fallow		Rann
	Plantation		Waterbodies max
	Evergreen forest		Waterbodies min
	Deciduous forest		Snow cover

S. No	LULC Class	Description
1	Built-up land	Residential areas, industries, airport and other impermeable surfaces generated by anthropogenic activity.
2	Kharif crop land	Seasonal Crop land with crops grown during June to November period of agricultural calendar year.
3	Rabi crop land	Seasonal Crop land with crops grown during November to April period of agricultural calendar year.
4	Zaid Crop land	Seasonal Crop land with crops grown during April to June period of agricultural calendar year.
5	Double/Triple/annual crop land	Land with crops grown in more than one season specified above. This will also include annual crops.
6	Current Fallow land	Agricultural area in which crop is grown during any part of the season of agricultural calendar year.
7	Plantation / Orchard	Trees which are artificially planted.
8	Evergreen / Semi-evergreen Forest	Comprises of trees(>2m tall), which are predominantly remain green throughout the year. It includes both coniferous and tropical broadleaved evergreen species. Semi- evergreen is a forest type that includes a combination of evergreen and deciduous species with the former dominating the canopy cover.
9	Deciduous Forest	These are the woodland types that are predominantly composed of tree (>2m tall) species, which shed their leaves once a year. It may also includes tree clad area with tree cover lying outside the notified forest boundary areas that are herbaceous with a woody appearance
10	Degraded Forest	Land covered with tree species (more than 2m tall) which are Evergreen / Deciduous in nature with relatively decreased density of trees.
11	Littoral/Swamp/Mangroves	Areas with seasonal or permanent water ponding (with or without vegetation) excluding the water bodies. These include ox-bow lakes, tidal flat/mud flat, mangrove, salt marsh/marsh vegetation and other hydrophytic vegetation.
12	Grassland Land	Areas with seasonal or perennial grasses occur naturally.
13	Shifting cultivation	These are the areas where woodlands are cleared and used for cultivation.
14	Waste lands	These are barren lands with nil or little vegetation cover and includes areas like rocky areas, scrub lands, mining dumps, gullied lands, sand dunes, etc.
15	Rann	These are the areas with very high concentrations of salts usually sourced from sea and occur near the sea coasts.
16	Water Bodies – maximum spread	This represents the maximum water spread in a water body like lakes, tanks, reservoirs, rivers, etc.
17	Water Bodies – minimum spread	This represents the least water spread in a water body like lakes, tanks, reservoirs, rivers, etc.
18	Snow / Glacial areas	Land under snow cover / ice, mostly permanent.

AWIFS SENSOR DETAILS : RESOURCESAT-1 / 2

SPECIFICATIONS	AWIFS
No. of Bands	4
Spectral Bands (μ)	B2 0.52 – 0.59 B3 0.62 – 0.68 B4 0.77 – 0.86 B5 1.55 – 1.70
Resolution (m)	56
Swath (Km)	740
Revisit (days)	5
Data Rate (Mbs per stream)	105
Quantisation	12-bit

Land use / cover map of part of Orissa using C-5 classifier



PROCESS DETAILS

Satellite Data:

- RS-2 AWiFS

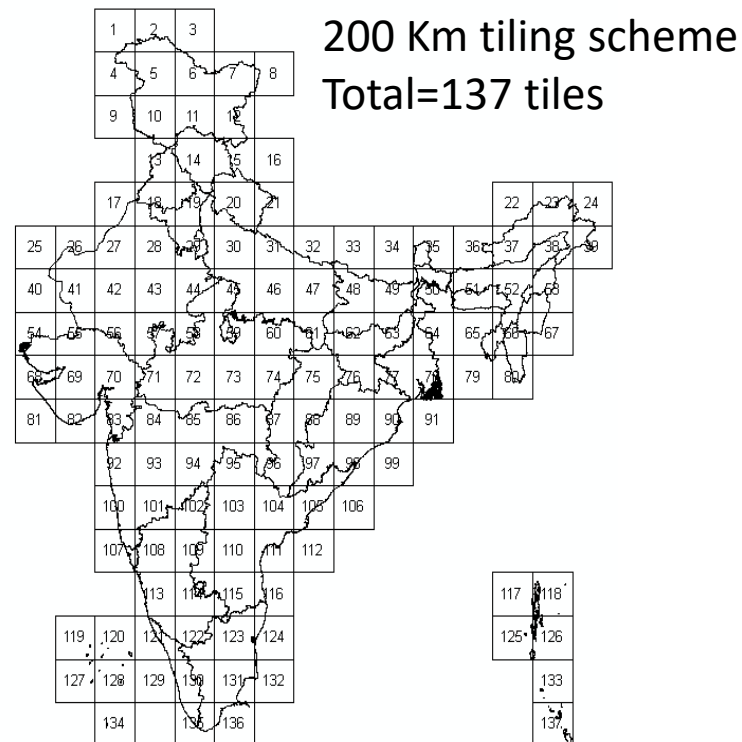
Projection: Albers Equal Area / WGS-84

Data Products:

- Ortho-rectified data through automated process -fortnightly
- Analysis unit: 200x200 km tiles

No. of data sets:

- All AWiFS data acquired by R-1/ R-2 : though subscription service.



PROCESSING STATUS

Automation achieved :

Ortho-rectification, TOA generation, cloud detection & compositing NDVI generation and time compositing, sown area extraction, crop under persistent cloud.

Automation partially achieved:

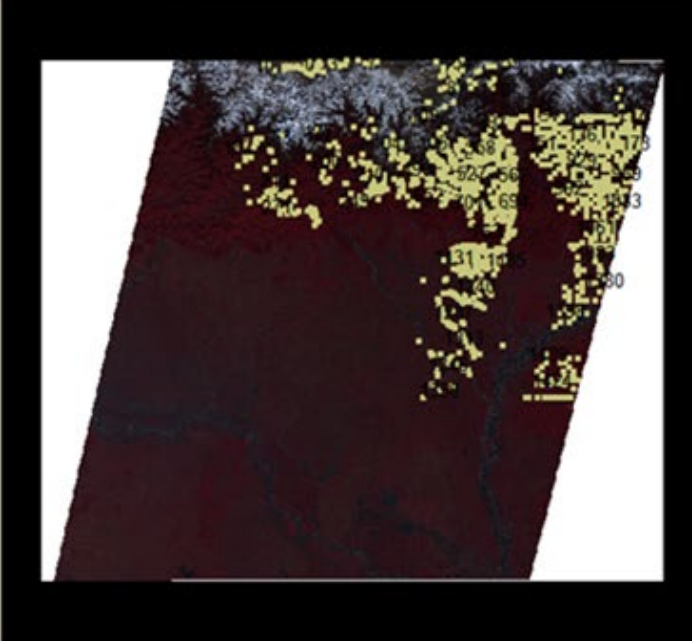
Surface water spread, built-up area extraction, shifting cultivation, forest changes


ORTHO-CORRECTION PACKAGE DEVELOPED BY ASD & CIG

NRSC - CORRELATION - Automatic Image Registration Module for AWIFS Data

G:\georthokitproducts_sikkim\143338781\AWFS_19-NOV-2013_109_052.tif Master Image Loaded From Library...

Lat 26.3645034557: Lon 90.4823930199 File X, Y -1, -1





Correlation For Imagery

RUN Batch Input Batch Run

Correlation For Thematic

RUN Batch Input Batch Run

RS2 Import Validate

Show India Layer
 Show State Boundary Layer
 Show District Boundary Layer

Editing Tools

Settings

GCP_ID.	REF_GCP_X	REF_GCP_Y	Image X	Image Y
0	88.26579834230...	28.16590889742...	3929.968034664...	40.60497583955...
1	88.34418910851...	28.16859351270...	4076.435655659...	35.58896142191...
2	88.43009679750...	28.17127812798...	4234.941711257...	30.57294700425...
3	88.45479525809...	28.16698274353...	4282.092246783...	38.59657007249...
4	88.44244602779...	28.16644582048...	4259.018580462...	39.60177295603...
5	88.55788448488...	28.17772120466...	4475.710403304...	18.53451240188...
6	88.64218140470...	28.17718428160...	4631.206850251...	19.53771528541...
7	88.75976755401...	28.17342582021...	4852.914687512...	26.56013547013...


Chip 6 Points-> 2 (00:00:19)
Chip 7 Points-> 523 --> 522 --> 269 (00:00:21)
Chip 8 Points-> 222 --> 221 --> 88 (00:00:27)
Correlation Completed Successfully
Time Taken for Completing Correlation :: 00:4:41
Total Points Accumulated From Correlation Process :: 1448
Attempting To Create Output.... 5%.... 25%.... 50%.... 65%.... 75%..
Output Image Saved at
G:\georthokitproducts_sikkim\143338781\project_landuse_autoreg_AWFS_19-NOV-2013_109_052.tif
Proceed For Validation..

Current Status - Ready Sub Process - NULL

FIELD DATA COLLECTION THROUGH MOBILE APP

← → ↻ 🏠 🔍 Search

🌟 Most Visited 📄 NRSC Web Client Sign... 🗺️ DIKSTRA (Dashboard ... 🌐 Welcome to the PCRa... 📄 WhiteboxTools | Tutor... 🌐 Predictive Soil Mappin... 📄 Python Programming ... 📄 SDG Indicator 15.3.1 ... 📄 Getting Started 🏠 Home 📄 Google Hindi input fu

 **Indian Earth Observation Visualisation**

Integrated Field Data Viewer

Welcome kandrika [Logout](#)

Project Details

Select Project: LULC250K

Select Profile: All

Select State: All

Date Mode: Day Period

Start Date: [Select Date](#)

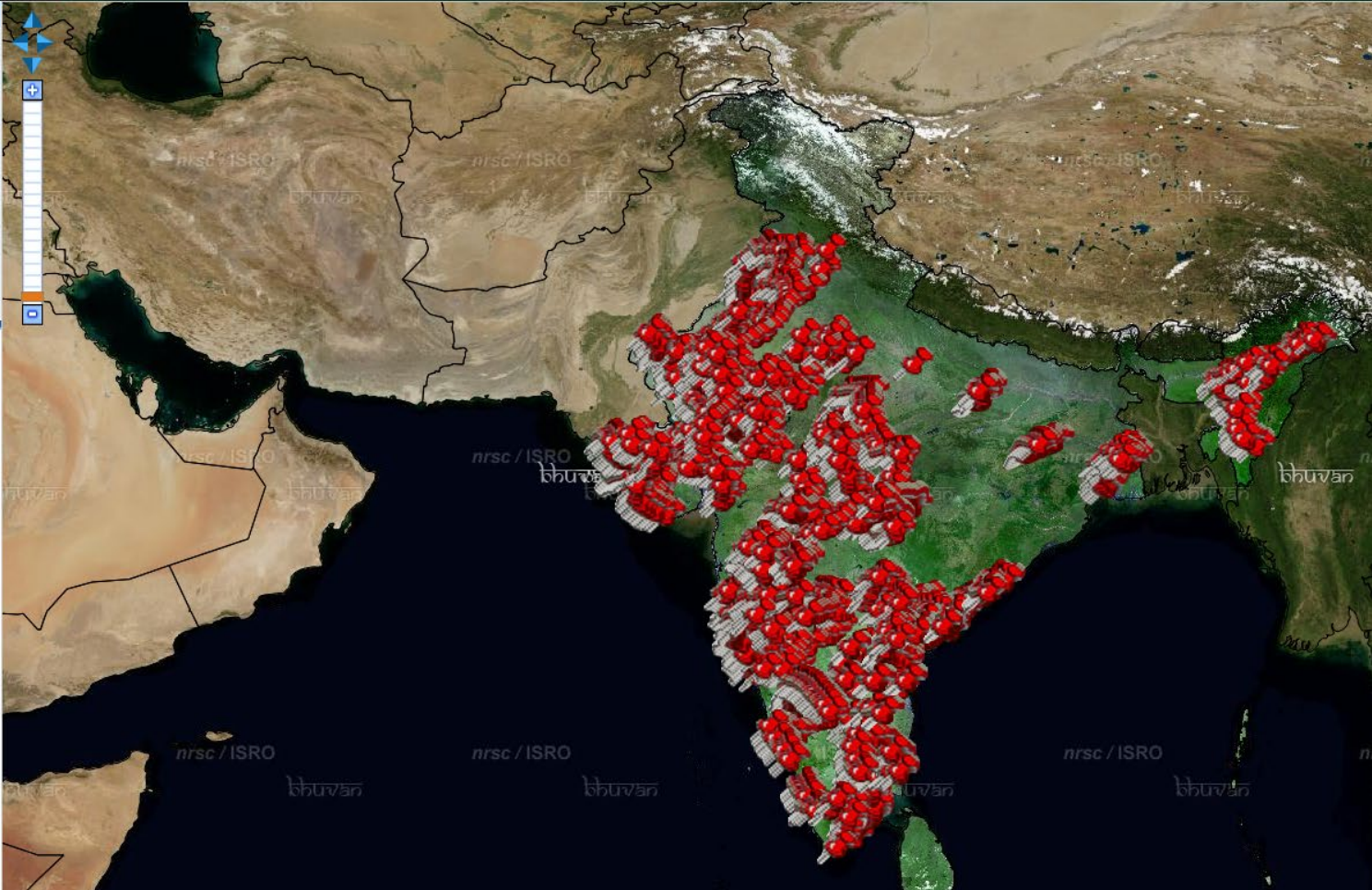
End Date: [Select Date](#)

Download Format: KML Shape

[View](#) [Download](#)

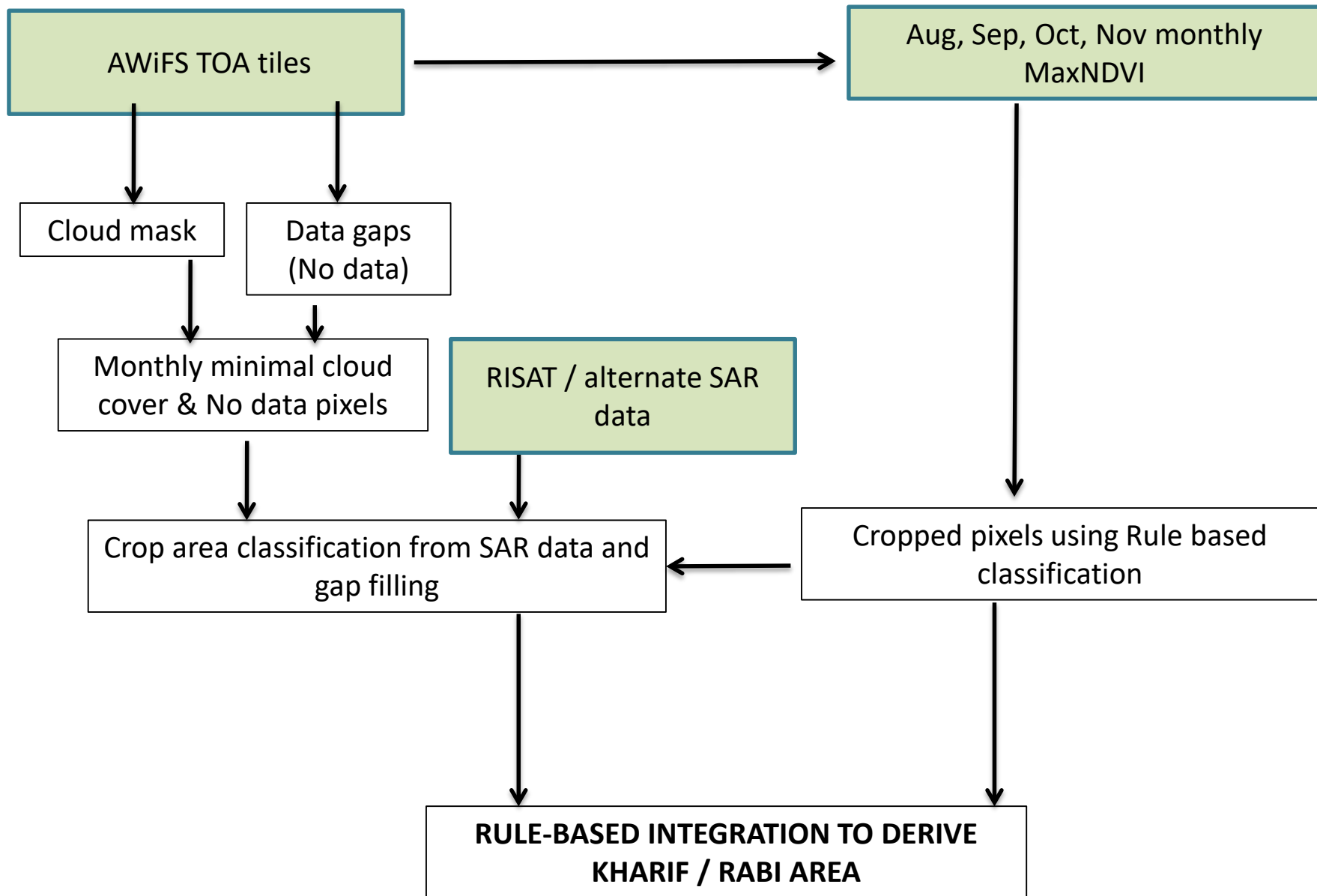
Total No of Points Found: 7454

[Contact Us](#) [Disclaimer](#) [Feedback](#)

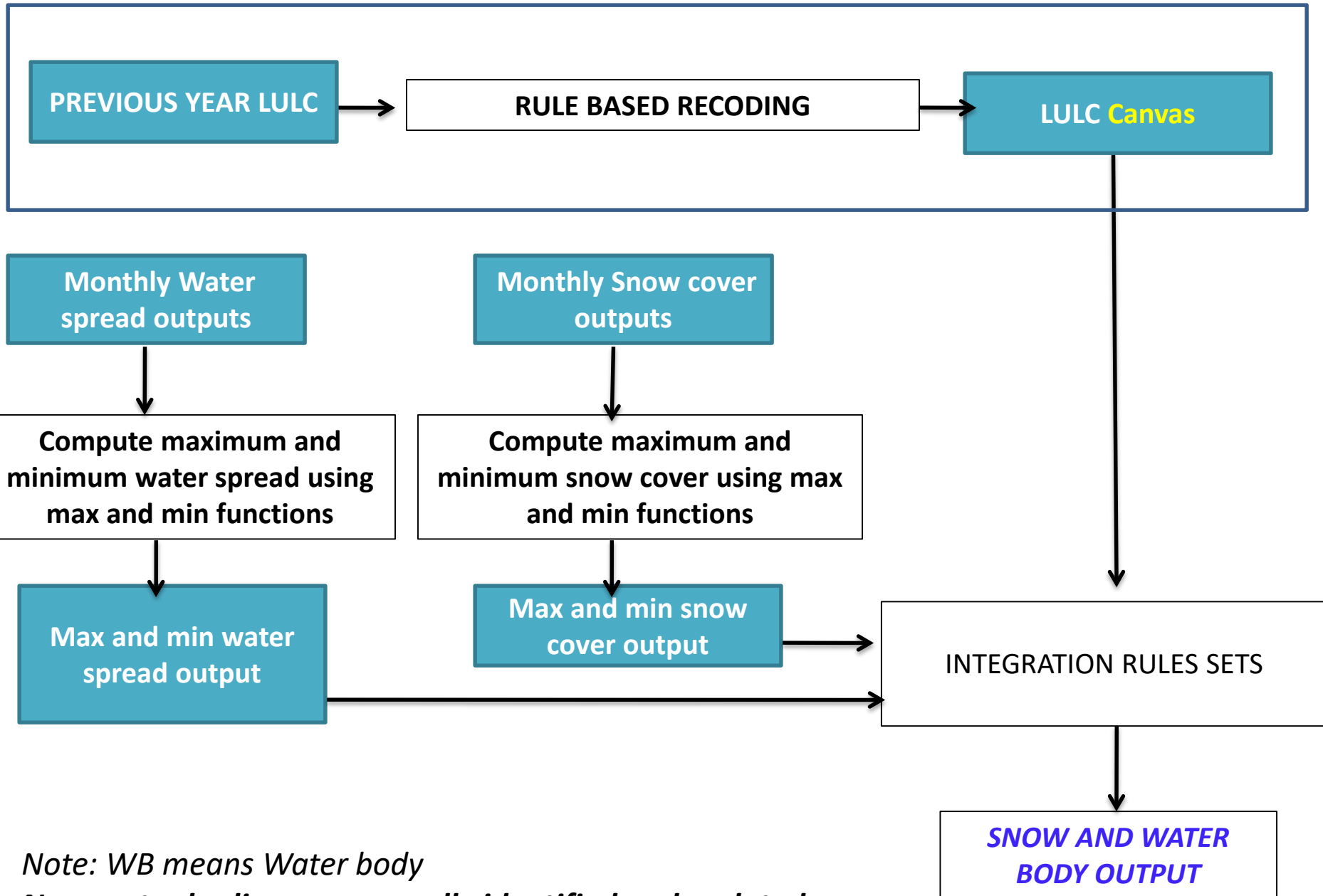


AUTOMATION OF NET SOWN AREA ESTIMATION USING AWIFS

APPROACH



WATER SPREAD AND SNOW COVER INPUTS

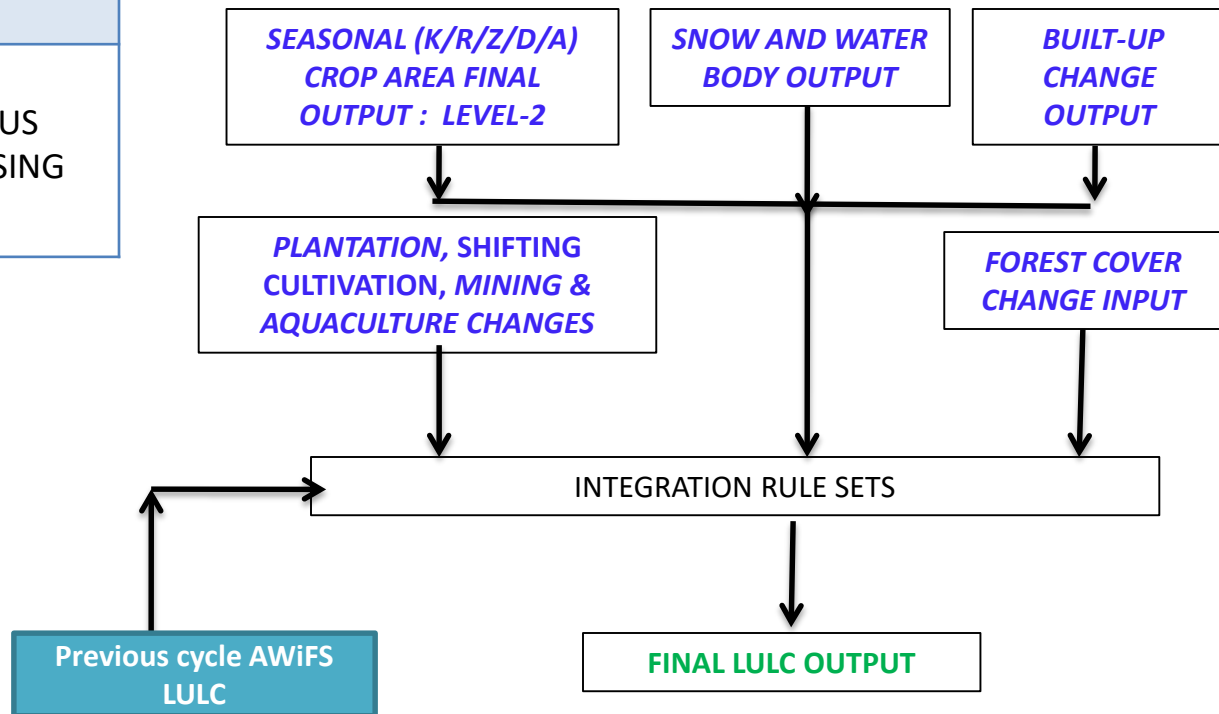


Note: WB means Water body

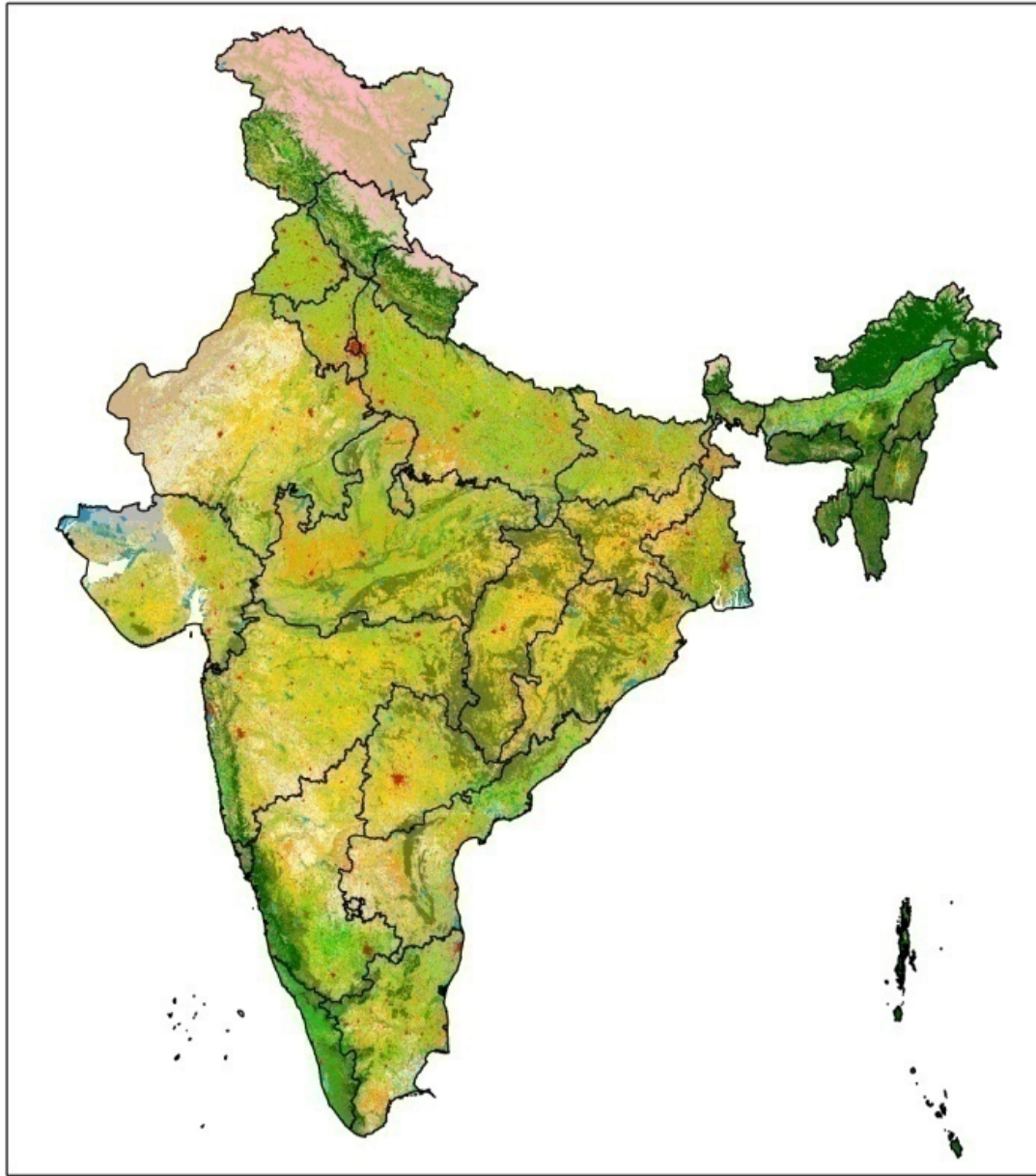
New water bodies are manually identified and updated

FOREST, PLANTATION, SHIFTING CULTIVATION CHANGES AND INTEGRATION

PLANTATION	RULE BASED ON TEMPORAL MONTHLY NDVI
SHIFTING CULTIVATION	SEASONAL NDVI DIFFERENCE AND TEMPORAL VARIATION IN NDVI, REGION-SPECIFIC RULES
BUILT-UP	NEIGHBORHOOD AREA ANALYSIS WITH PREVIOUS YEAR BUILT-UP AREA USING NORMALIZED INDICES.



LAND COVER MAP : 2017-18

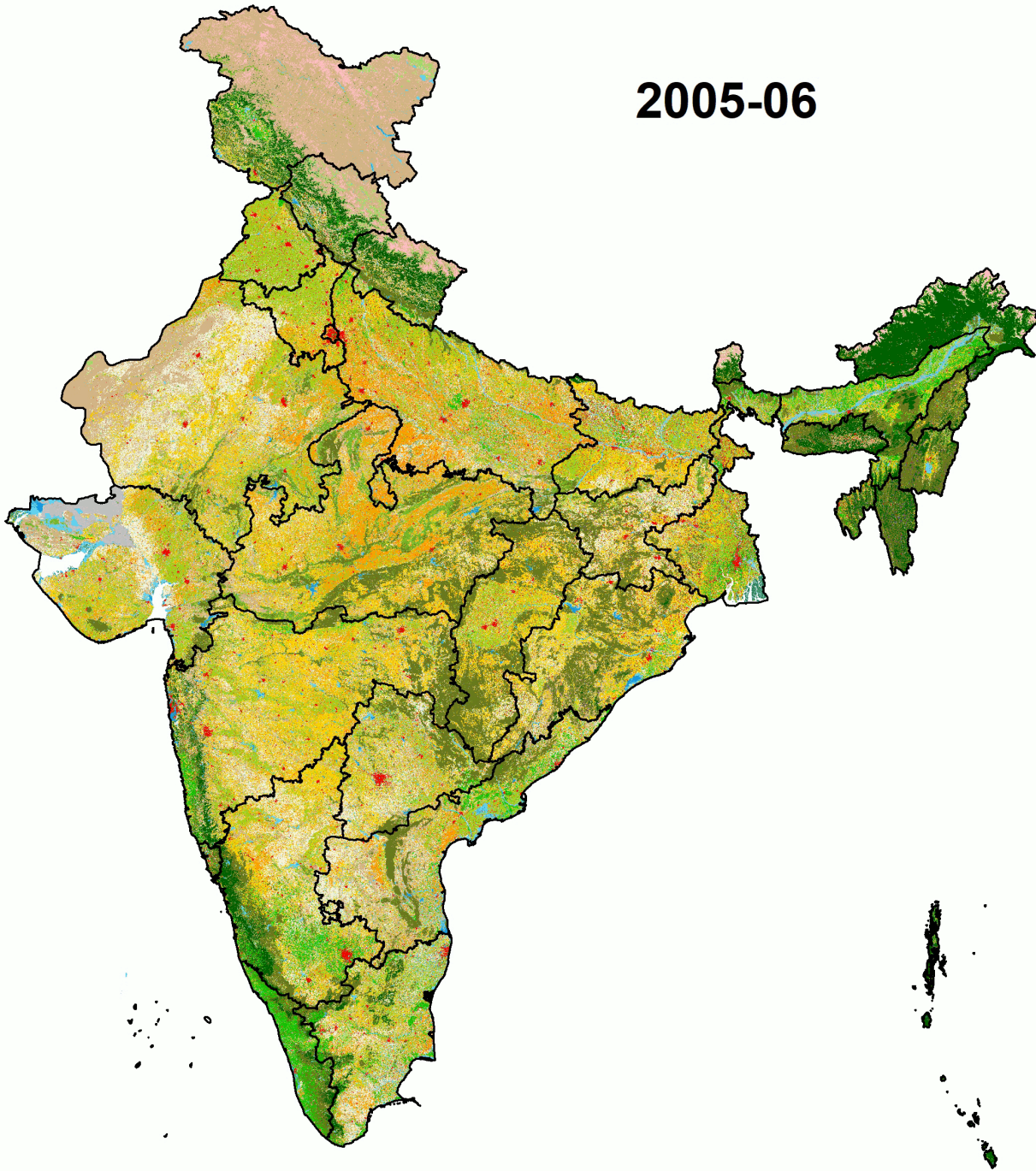


Legend

 Built-up	 Degraded/ scrub forest
 Kharif crop	 Littoral swamp
 Rabi crop	 Grassland
 Zaid crop	 Shifting cultivation
 Double/triple crop	 Wasteland
 Current fallow	 Rann
 Plantation	 Waterbodes max
 Evergreen forest	 Waterbodes min
 Deciduous forest	 Snow cover

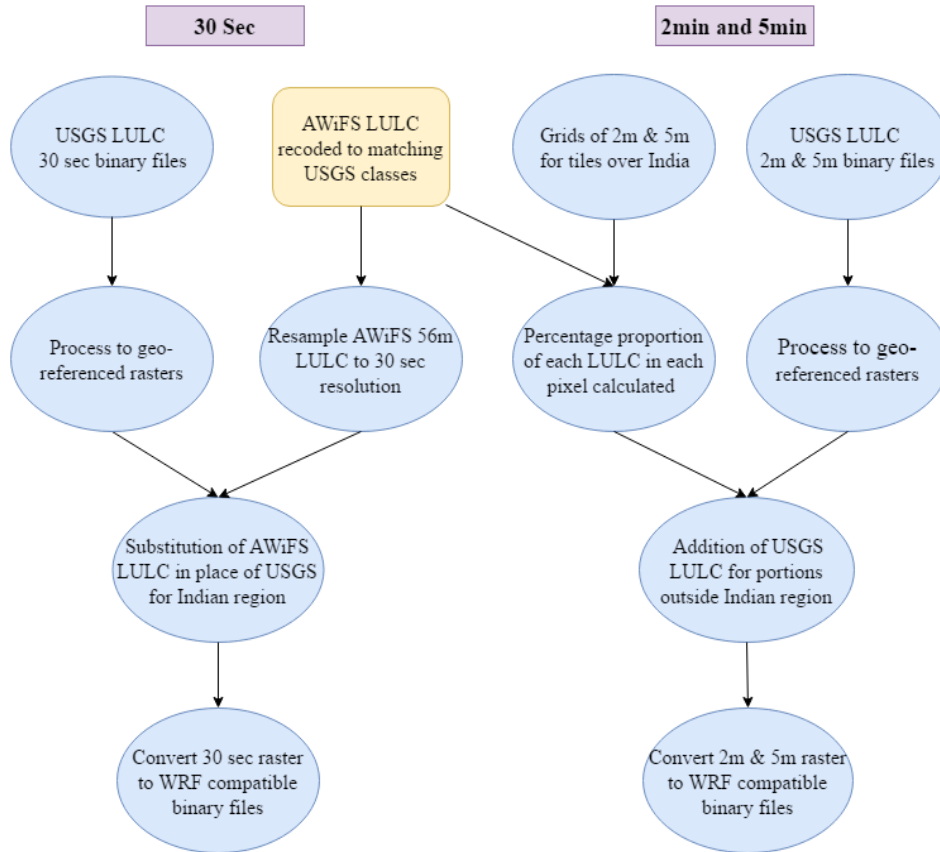


2005-06



Spatial integration of AWiFS derived LULC with global land cover dataset for Indian Region

Methodology



USGS ID	USGS Class Name [#]	AWiFS ID	AWiFS Class Name	Regrouped USGS ID
1	Urban and built-up land	I	Built up	1
2	Dryland cropland and pasture	II	Kharif	2
3	Irrigated cropland and pasture	III	Rabi	3
5	Cropland/grassland mosaic	IV	Zaid	3
6	Cropland/woodland mosaic	V	Double/tripple crop	3
7	Grassland	VI	Current fallow	5
8	Shrubland	VII	Plantation	15
9	Mixed shrubland/grassland	VIII	Evergreen forest	13/14*
10	Savanna	IX	Deciduous forest	10/11 [^]
11	Deciduous broadleaf forest	X	Degraded/scrub forest	8
13	Evergreen broadleaf forest	XI	Littoral swamp	18
14	Evergreen needleleaf forest	XII	Grassland	7
15	Mixed forest	XIII	Shifting cultivation	15
16	Water bodies	XIV	Wasteland	19
18	Wooded wetland	XV	Rann	19
19	Barren or sparsely vegetated	XVI	Water bodies max	16
21	Wooded tundra	XVII	Water bodies min	16
24	Snow or ice	XVIII	Snow covered	24

1. Mixed dryland/irrigated cropland and pasture (USGS ID: 4)
2. Deciduous needleleaf forest (USGS ID: 12)
3. Herbaceous wetland (USGS ID: 17)
4. Herbaceous tundra (USGS ID: 20)
5. Mixed tundra (USGS ID: 22)
6. Bare ground tundra (USGS ID: 23)

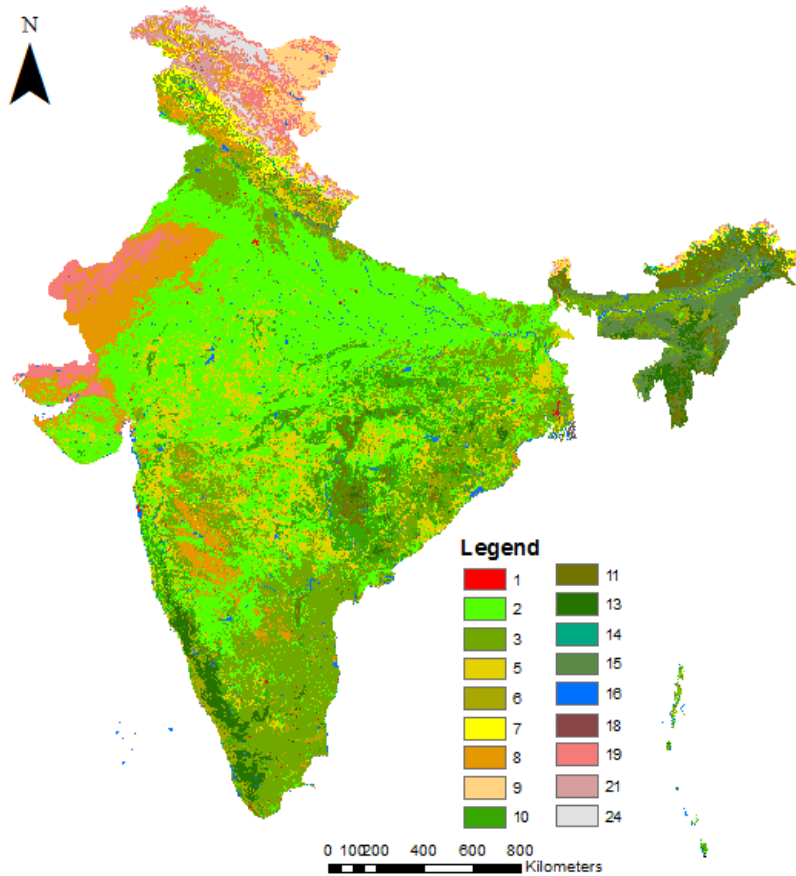
These classes had less than 300 cells (total area less than 280km²) all over India in the USGS 30 second resolution LULC outputs.

*14 is recoded for Evergreen forests in the Himalayan Regions only

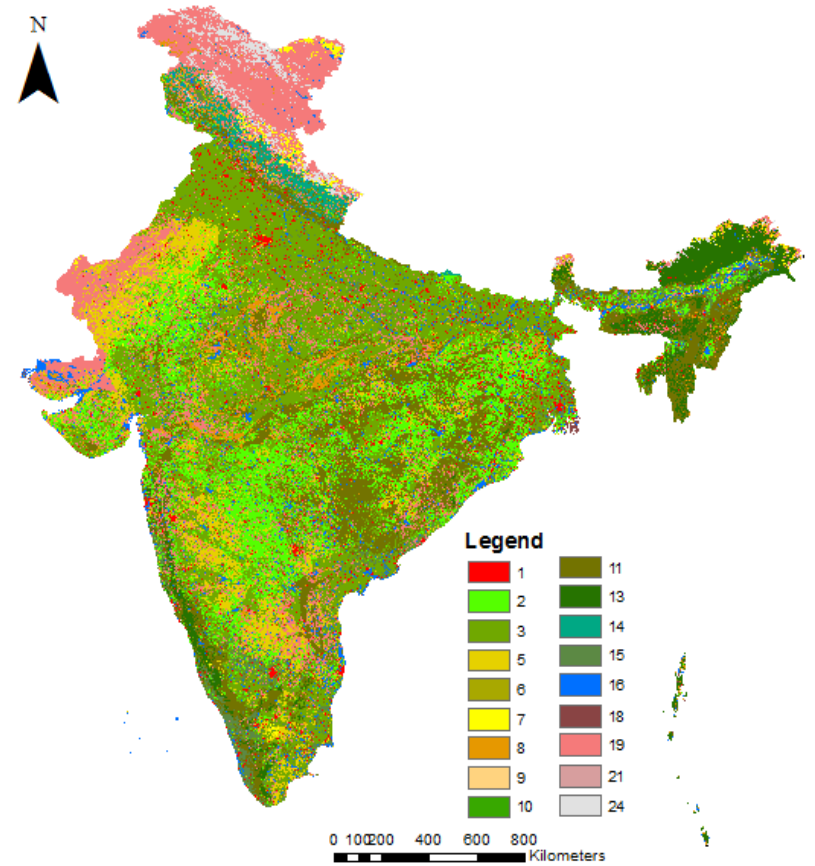
[^]10&11 is recoded using the maximum NDVI data and Deciduous Forest class of AWiFS LULC (discussed in Methodology)

Only the classes which are significant in India are shown. Those classes having less than 300 cells (total area less than 280km²) in the 30 sec USGS LULC output for Indian region are removed from the list.

SPATIAL INTEGRATION OF AWIFS DERIVED LULC WITH GLOBAL LAND COVER DATASET FOR INDIAN REGION

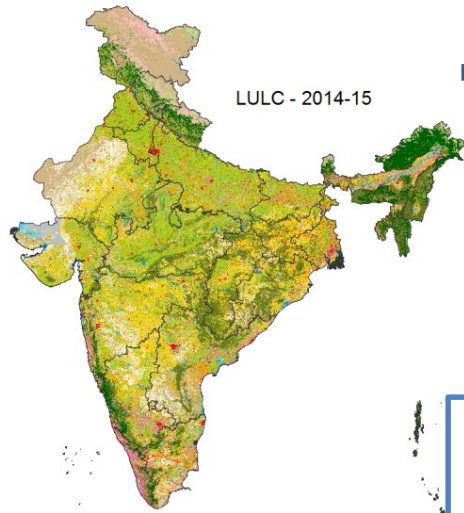


USGS LULC



AWiFS replaced LULC

AGRICULTURAL LAND COVER INPUT TO NATIONAL INFORMATION SYSTEM FOR CLIMATE AND ENVIRONMENT STUDIES (NICES)

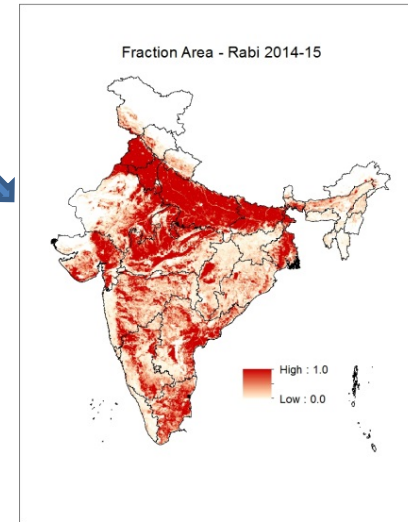
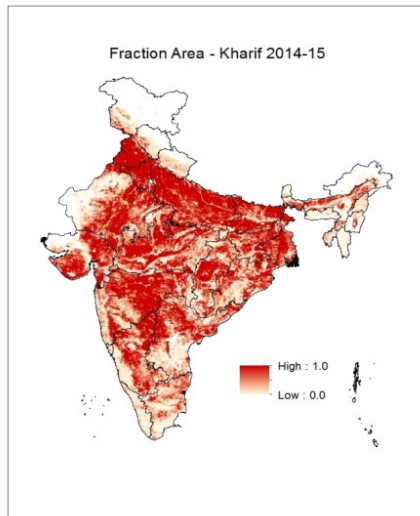


Extraction of kharif, rabi, fallow & gross cropped areas

5km equal area
Grid vector

Zonal statistics & theme-wise fraction area
computation

Rasterization



Data visualization and request for download

<https://bhuvan-app1.nrsc.gov.in/thematic/thematic/index.php>

The screenshot displays the Bhuvan web application interface. At the top, the logo for Bhuvan (Indian Geo-Platform of ISRO) is visible on the left, and the National Remote Sensing Centre logo is on the right. The main navigation bar includes links for Thematic Services, Search, Statistics, Metadata, WebServices, Overlay, and GetData. A search bar is present with the text "Enter City or Lat, Lon(ex:chennai) or".

The central panel contains a map of India with a land use overlay. The legend on the left side of the map lists various land use categories with corresponding color swatches:

- Built-Up
- Kharif Crop
- Rabi Crop
- Zaid Crop
- Double/Triple Crop
- Current fallow
- Plantation
- Evergreen forest
- Deciduous forest
- Degraded/Scrub forest
- Littoral swamp
- Grassland
- Shifting cultivation
- Wasteland
- Rann
- Waterbodies max
- Waterbodies min
- Snow cover

The map interface includes a scale bar at the bottom left showing 0, 200, and 400 kilometers. The top right corner of the interface features a "Welcome User" message with a "Login" link, and navigation links for "Print Map", "Add WMS Layer", "Updates", "Bhuvan Store", "Help", and "Home".

HOW TO GET THE DATA

<http://bhuvan.nrsc.gov.in/gis/thematic/index.php#>

Create Bhuvan account → Login → Place the request → Note the request ID → Fill the MoU on official letter head → Send to NRSC → After approval download through FTP



Indian Geo-Platform of ISRO

Thematic Services

[FAQ](#) [Policy](#) [Disclaimer](#) [Feedback](#)

Bhuvan-Thematic Services facilitate the users to select, browse and query the Thematic Datasets from this portal. Users can consume these Thematic Datasets and integrate into their systems as OGC Web Services.

[Search](#) [Statistics](#) [Metadata](#) [WebServices](#) [Overlay](#) [GetData](#)

Submit Request Check status

Please fill the following form and submit for digital database request of LULC-250K datasets. On successful submission of data request, you have to download the Memorandum Of Understanding (MOU) and state the reason very clearly for data request against your request id/s for further processes. After verifying the proposal of utilisation of data, the intimation about the status of the data will be sent to your mail id or else you can check the status online.

Step 1: Choose the required Land Use/Land Cover Data Products / Services?*

(Use Shift key or Ctrl key to have multiple selection)

2005-06 ▲
2006-07 ▲
2007-08 ▲
2008-09 ▼

Step 2: For what purpose you are planning to use this data?*

(Use Shift key or Ctrl key to have multiple selection)

Regional Planning
Research Studies

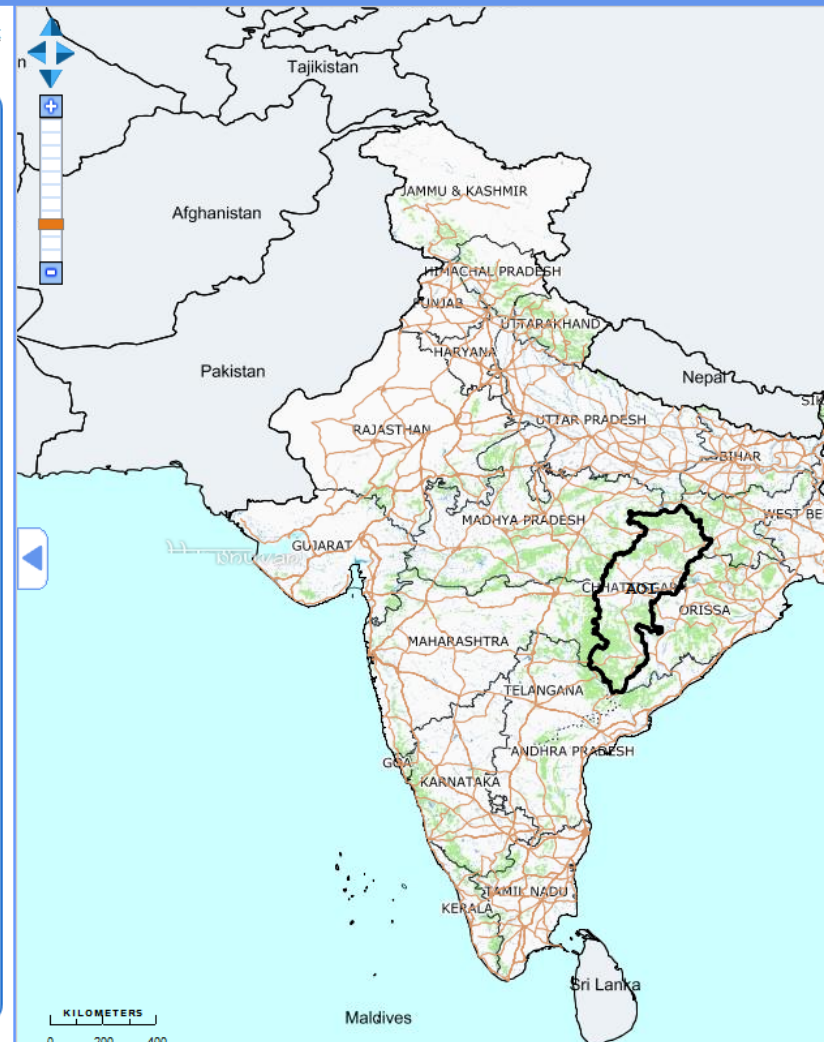
Step 3: Area of Interest*

(Use either one of the option to place your request)

[Administrative Unit](#) [Bounding Box](#) [Draw AOI](#)

State District

CHHATTISGARH ▼



MAJOR UTILITY OF DATA

- Water resources re-assessment
- Flood Forecasting
- Flood Damage Assessment
- Tiger corridor analysis
- Mask layer for crop type mapping.
- Potential rabi fallows for expansion of short duration pulse crop.
- Wind / Solar Energy studies.
- Input to Weather forecast models..
- Soil erosion modelling
- Land degradation assessment for UNCCD.
- Agriculture area expansion studies.
- To map irrigation intensity under major/medium irrigation projects.
- Spatial extrapolation of hydro-meteorological data.

FUTURE DIRECTION

- Kharif estimates with multiple assessments in season and the advanced assessment
- Rabi estimates with multiple assessments in season and the advanced assessment
- Integrated LULC map
- Reprocessed LULC inputs required for NICES and weather forecast models.
- Fractional area outputs for regional modelling

Thanks for your attention