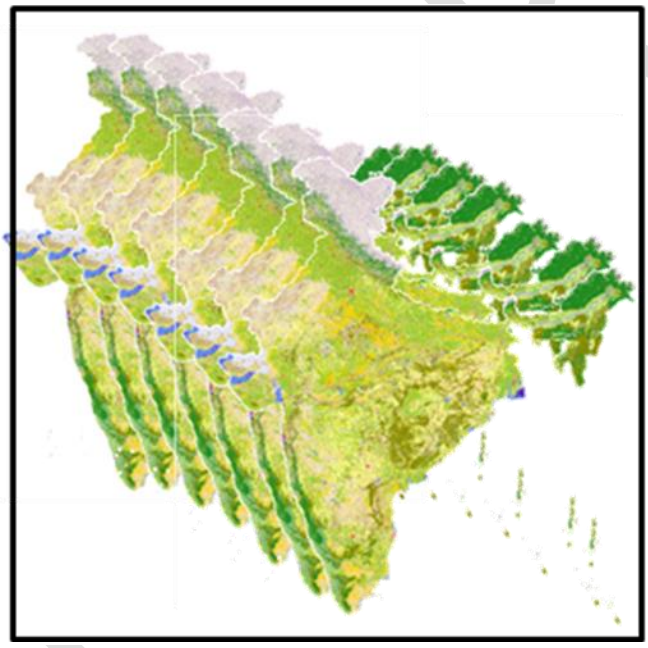
ANNUAL CROPLAND DATA SET

GRIDDED FRACTION AREA OF KHARIF, RABI, FALLOW,

NET SOWN AREA

Technical Document



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February 2016

Document Control Sheet

Document Number	**NRSC-RSAA-LRUMG-SLRAD-Feb 2016-TR-813**
Title	Annual crop land data sets
Type of Document	Technical Report
Number of pages	7
Author(s)	Soil and Land Resources Assessment Division
Reviewed by	Group Head, LRUMG
Approved by	DD (RSAA), NRSC
Abstract	The 1:250K LULC data sets derived from multi-temporal AWiFS data were further decomposed to kharif, rabi, fallow and net sown areas through rule based selection at 56m resolution. The fractional areas of each class grid wise are generated for 5 km X 5 km grid cell for 10 cycles using GIS analysis tools. The total data set consists of fraction of Net sown, Kharif, Rabi, Fallow area for 10 continuous years from 2005-6 to 2014-15 (40 products). The 5km resolution product indicating the fraction of kharif, rabi, net sown areas along with fallow should be useful as inputs to meso-scale scientific research for assessing impact of agriculture land cover changes on weather / climate prediction, carbon cycle, hydrological cycle, energy budget studies, etc. at regional scale.
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ANNUAL CROPLAND DATA SET

FRACTION AREA OF KHARIF, RABI, FALLOW, NET SOWN AREA

Overview

The management of the natural resources serving the needs of around a billion population and varied ecological functions has become complex due to continuous exploitation, increase in population, industrialization and with large variations in climate and natural disasters. Since independence the population has increased by 284 per cent (363 to 1033 m) and food grain production by 386 percent (51 to 196 mt). Apart from this, trend of switching to commercial non-food grain crops is a cause of concern. While food grain production increased only by 1.7 times over the last two decades, non-food grain production quadrupled during the same period. Spatial accounting and monitoring of land use and land cover (LULC) systems like agriculture, surface water bodies, waste lands, forests etc. has become essential for the sustainable utilization of natural resources.

The national spatial databases enabling the monitoring of temporal dynamics of agricultural ecosystems, forest conversions, and surface water bodies etc. are lacking. These kinds of databases are primarily important for national accounting of natural resources and planning at regular intervals. Land use and land cover mapping addressing Kharif, Rabi and Zaid crops, greening of wastelands, seasonality of wetlands/surface waterbodies, forest vegetation and other high temporal land use practices using satellite remote sensing data can provide a reliable database.

In this context under NR-CENSUS programme, mapping of Land use land cover (LULC) using multi-temporal satellite data, was initiated in the year 2004 and 11 cycles of such assessments have been completed so far. These assessments are done using multi-temporal satellite data analysis, which has brought out explicit spatial distribution of cropping and their pattern across the country. From the 11th cycle necessary automation is brought in for proper mapping with assured geometric and

radiometric consistency. Accordingly customized software has been developed and deployed for automatic otho-rectification of Resourcesat-2 AWiFS quadrant data and methodology was revised to attain automated land cover assessment with special focus on agriculture land cover using multi-temporal AWiFS data. So far 11 cycles of assessment has been completed. All these products were hosted on Bhuvan (http://bhuvan.nrsc.gov.in/gis/thematic/index.php)

Scope of the study

- The fractional net sown area products under various cropping seasons of 10 annual cycles starting from 2004-05 is a valuable information for understanding the contribution of land cover changes in meso-scale climatological and hydrological models.
- This study also provides spatial database on regional changes in net sown area facilitating the monitoring and assessment of regional changes in cropping systems.

- Serves as primary database for global environmental issues like biodiversity, climate change, land cover-atmosphere interactions, carbon sinks etc.

Objective

Considering the need for the sustainable utilization of natural resources and the potential of Resourcesat AWiFS sensor in monitoring the natural resources, national level LULC mapping on 1:2,50,000 scale using multi-temporal AWiFS datasets was taken up during 2004 with the vision of fulfilling the following objectives:

- to provide the net sown area for different cropping seasons (Kharif, rabi, zaid) and the integrated LULC map at the end of each year addressing cropping patterns and other LULC classes

The current study utilized the outputs generated under above project to reprocessed with following objective:

- to generate grid-wise fractional areas of kharif, rabi, fallow and net sown areas from 2005-06 to 2014-15 for a 5kmx5km grid.

Data Source

Land Use Land Cover maps were generated at 1:250,000 using multi-temporal terrain corrected / ortho-rectified AWiFS images processed under NRC-AWiFS LULC project. About 110 AWiFS quadrant datasets were used per month. Besides, land use/cover map on 1:50000 scale, forest cover map generated by Forest Survey of India (FSI) were also used as reference.

Methodology

The study involved the use of multi temporal AWiFS data covering Kharif (Aug –Nov), Rabi (Jan- Mar), Zaid (April- May) seasons to address spatial and temporal variability in cropping pattern and other land cover classes. Cloud-covered and quality-affected AWiFS datasets were supplemented with WiFS/RiSAT data. The methodology adopted for satellite data pre-processing as well as classification into various land cover classes has been modified from the 11th cycle (year 2014-15). Till 2013-14, quadrant based AwiFS products were terrain corrected using image to image tie down procedures. Subsequently, the Top of Atmosphere (TOA) reflectance was calculated based on a physical model and AWiFS sensor calibration factors. Atmospheric correction was done with modified dark object subtraction method. The state (administrative unit) based quadrant mosaic for each calendar month.

The following project parameters were used for all the satellite data as well as output products:

The final outputs were later converted Albers equal area with following parameters.

Projection:	Albers Conical Equal Area projection
Spheroid:	WGS84
Datum:	WGS84
Standard Parallel 1:	28:00:00 N
Standard Parallel 2:	12:00:00 N
Central Meridian:	78:00:00 E
Origin of Latitude:	20:00:00 N
False Easting:	2000000 Meters
False Northing:	2000000 Meters

Field data was collected for various land cover classes and temporal digital values were extracted. Decision Tree approach was used for the classification of multi-temporal AWiFS data. Rules were framed from this data using SEE5 software and imported to ERDAS Imagine's knowledge engineer for knowledge-based classification. In a few cases where temporal inconsistency as well as cloud infestation is affecting the classification, scene-wise maximum likelihood classification was employed and has been integrated through rule sets. The classified output was checked for border conformities and mosaicked.

From the 11th cycle (2014-15) onwards, tile-based (200kmx200km) tile approach was adopted to reduce temporal inconsistencies and to bring about greater automation in the digital classification process.

All the quadrant products were ortho-rectified was done using Rational Polynomial Coefficients (RPC) sensor model. A customized data processing software was developed to carry out the entire process automatically. The ortho-rectified data sets were converted to TOA reflectance followed by atmospheric correction and were cut into 200kmx200km tiles. Rule based approaches were developed to automate the sown area classification using temporal NDVI as a parameter. LULC classes like

forest cover, water spread, snow cover and built-up areas were derived from AWiFS data and integrated to give the final LULC product.

LULC outputs of cycle 1 to cycle 10 were harmonized using a rule-based approach. Temporal NDVI images, FSI forest cover, water and snow cover layers, and ground truth information were used for this harmonization process.

Generation of 5kmx5km grid of sown areas

From this LULC output, grid-wise fractional area images were generated using the following method:

Zonal areas of LULC were computed for the 5kmx5km grid for the classes Kharif crop, rabi crop, fallow and net sown area. These areas were then converted to fractions of grid cell area.

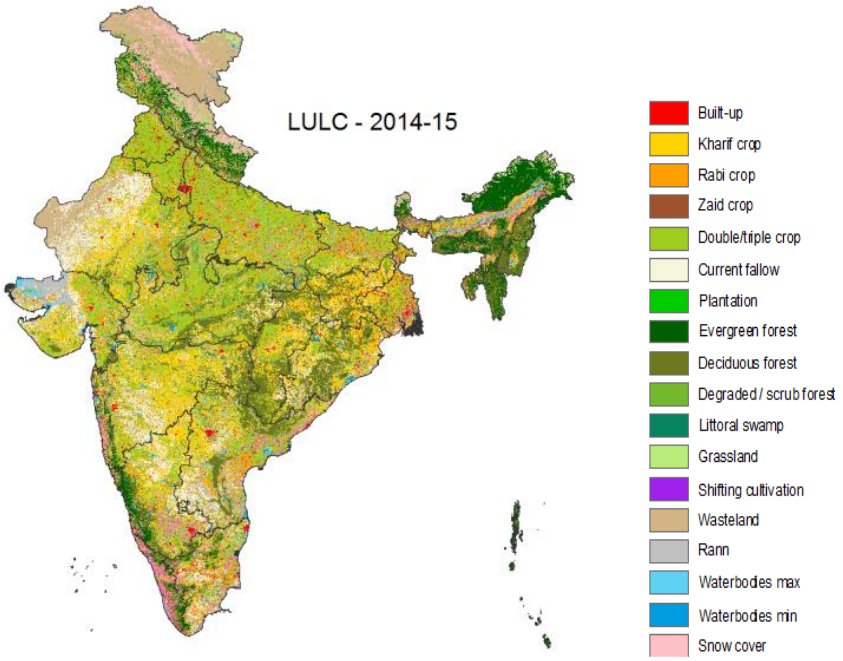
The fractional areas were joined to the attribute table of the 5kmx5km grid.

The 5kmx5km grid was then converted into raster format to generate:

- Fractional area – Kharif
- Fractional area – Rabi
- Fractional area – Fallow
- Fractional area – Net sown

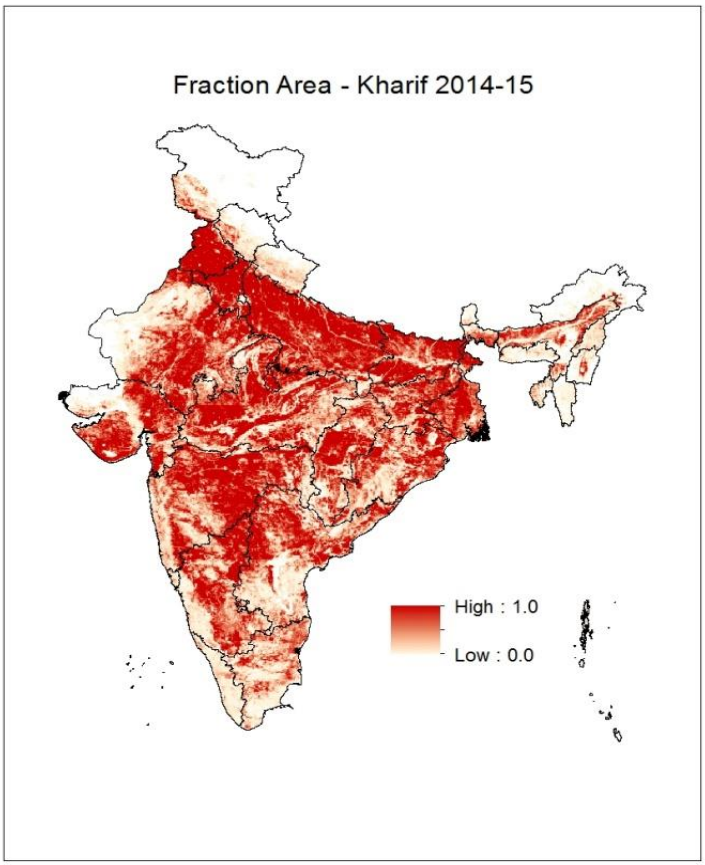
These four products were generated for the years 2005-06 to 2014-15. Due to relatively high classification errors, 2004-5 season data has been omitted.

The latest LULC output generated from AwiFS LULC project has been appended down below.



Land Use / Cover map of India (2014-15)

A sample product for fraction of kharif sown area derived from above data has been appended hereunder:



Acknowledgements

Author thank Director, NRSC for approving the products (input for MM5/WRF) hosting in Bhuvan under NICES.

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