GEOSPTIAL TECHNOLOGY FOR AGRICULTURAL MANAGEMENT IN PUNJAB

Remote Sensing Data



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OUTLINE

- > District-wise crop acreage and yield estimation
- Soil and water resource constraint
- Mapping area under crop residue burning
- Research on carbon farming



YEAR	CROPS COVERED	REMARK
2013-14	Kharif paddy, Maze, Cotton, winter Vegetables, Rabi, & Zaid crops	• Six crops at district level
2014-15	Kharif paddy, Maze, Cotton, winter vegetables, Rabi & Zaid crops	 Rabi crop in progress Paddy & Cotton Crop in association with MNCFC under FASAL

Accurate crop production forecasts require accurate forecasts of acreage at harvest, its geographic distribution, and the associated crop yield determined by local growing conditions. There can be significant yearto-year variability which requires a systematic monitoring capability. Therefore a study Satellite "Remote sensing based District-wise Crop Acreage and Crop Condition Monitoring in Punjab" was undertaken with the following Objectives:

- To establish comprehensive digital database on spatial domain of crops
- To monitor in-season health conditions of the crop
- To monitor temporal changes in crop area

MAIZE



Temporal coverage of False Color Composite of AWiFS images



20 June 2013

CROP YEAR 2013-14



26 August 2013



19 September 2013

CLASSIFIED IMAGE OF MAIZE



GROUN TRUTH POINTS OVERLY ON CLASSIFIED MAIZE IMAGE



CHAKOWAL BRAHMNA / PATHRALIAN Identified Villages of district HOSHIARPUR



DALEPUR /SAROWAKL Identified Village of SBS Nagar Districts

MAIZE Condition during the ground truth



SAUPUR Identified Village of district RUPNAGAR







Ground Truth Verification of the Classified Images in Hoshiarpur District



MAIZE ACREAGE 2013-2014

MAIZE ACREAGE 2014-2015

Districts	Area ('000 ha)	District	Area ('000 ha)
Gurdaspur/Pathnkot	17.45	Patahnkot	11.43
Hoshiarpur	62.55	Gurdaspur	8.58
Jalandhar	10.81	Hoshiarpur	70.44
Kapurthala	4 13	Kapurthala	3.22
		Jalandhar	15.52
SBS Nagar	14.83	SBS Nagar	13.84
Rupnagar	23.69	Rupnagar	22.38
SAS Nagar	9.14	SAS Nagar	9.42
Total of seven districts	142 54	Total of seven districts	154.83
	172.54		
Extrapolated to State	149	Extrapolated to State	162.97



COTTON (2013-14)

Acreage Estimation for Cotton in Major Cotton Growing Districts of Punjab







False Color Composite of AWiFS images with Districts Boundaries:





19 September 2013

COTTON ACREAGE



GROUND TRUTH POINTS OVERLAY ON CLASSIFIED COTTON IMAGE



CLASSIFIED IMAGE



Identified Cotton Growing Villages in the Classified Satellite image with Ground Truth Point and respective field image:



COTTON Condition during the ground truth

JIWAN SINGHWALA Identified Village of BATHINDA District



COTTON Condition during the ground truth

COTTON ACREAGE 2013-2014

Districts	Area in Thousand Hectares
Barnala	9.99
Bathinda	153.43
Faridkot	14.88
Muktsar	90.90
Mansa	91.56
Sangrur	8.56
Fazilka & Firozpur	127.80
Total of eight districts	497.12
Extrapolated to State	503.16

WINTER VEGETABLES (2013-14)





False Color Composite of AWiFS images with Districts Boundaries:

20 Jan 2014 29 Dec 2013

False Color Composite of AWiFS images with Districts Boundaries:

CLASSIFIED IMAGE OF VEGETABLES





Identified Vegetables (Potato) in AMRITSAR District

Potato Condition during the ground truth

VEGETABLE ACREAGE 2013-2014

Districts	Area in Thousand Hectares
Pathankot	3.80
Gurdaspur	14.99
Amritsar	39.69
Tarntaran	9.60
Kapurthala	9.97
Jalandhar	21.86
Hoshiarpur	50.42
SBS Nagar	9.30
Rupnagar	3.32
SAS Nagar	6.90
Ludhiana	7.25
Fatehgarh Sahib	5.32
Barnala	1.64
Bathinda	5.10
Faridkot	0.60
Mansa	0.20
Fazilka	0.30
Мода	2.76
Firozpur	2.65
Sangrur	2.43
Muktsar	0.81
Patiala	5.02
Total	203.93

Acreage Estimation for Winter Vegetables (2014-15)



False Color Composite of AWiFS images with Districts Boundaries:



Classified Vegetables Area in Punjab



Vegetables Acreage = 196.17 000' ha

VEGETABLE ACREAGE 2014-2015

DISTRICT Name	Acreage in Thousand Hectares
AMRITSAR	35.05
BARNALA	1.24
BATHINDA	1.83
FARIDKOT	1.41
FAZILKA	1.09
F.G. SAHIB	5.28
FIROZPUR	3.09
GURDASPUR	11.48
HOSHIARPUR	54.61
JALANDHAR	19.33
KAPURTHALA	10.94
LUDHIANA	8.68
MANSA	0.20
MOGA	3.05
MUKTSAR	1.18
SBS NAGAR	9.06
PATHANKOT	1.16
PATIALA	8.56
SANGRUR	3.48
RUPNAGAR	2.28
SAS NAGAR	5.16
TARN TARAN	8.02
Total	196.17

VEGETABLE ACREAGE 2013-2014

VEGETABLE ACREAGE 2014-2015

DISTRICTS	Area in Thousand Hectares
AMRITSAR	39.69
BARNALA	1.64
BATHINDA	5.10
FARIDKOT	0.60
FAZILKA	0.30
FATEHGARH SAHIB	5.32
FIROZPUR	2.65
GURDASPUR	14.99
HOSHIARPUR	50.42
JALANDHAR	21.86
KAPURTHALA	9.97
LUDHIANA	7.25
MANSA	0.20
MOGA	2.76
MUKTSAR	0.81
SBS NAGAR	9.30
ΡΑΤΗΑΝΚΟΤ	3.80
PATIALA	5.02
SANGRUR	2.43
RUPNAGAR	3.32
SAS NAGAR	6.90
TARNTARAN	9.60
TOTAL	203.93

DISTRICTS	Acreage in Thousand Hectares
AMRITSAR	35.05
BARNALA	1.24
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MANSA	0.20
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SANGRUR	3.48
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SAS NAGAR	5.16
TARN TARAN	8.02
TOTAL	196.17
WHEAT

Wheat acreage analysis in the State of Punjab was carried using Multi-date IRS R2 (Resource2) AWiFS digital data (October to March) and LISS_III data at maximum vegetative stage of wheat crop. An unsupervised classification was run on the stacked images and the district wise acreage estimation were determined following total enumeration approach with district as a unit.



Data Used FCC: IRS R2 AWIFS FCC: IRS R2 AWIFS 23Oct, 2013 16Nov, 2013

FCC: IRS R2 AWiFS 29Dec, 2013

FCC: IRS R2 AWiFS 27Jan, 2014

FCC: IRS R2 AWiFS 25 Feb, 2014



Identified Wheat in Firozpur District

Wheat Condition during the ground truth

Satellite Image of 27Jan2014 Wheat Area Showing Fallow Land Signature in Hoshiarpur



In Satellite Image of 27Jan2014 Wheat Area Showing Fallow Land Signature in Fazilka District





WHEAT ACREAGE 2013-2014, 1st Estimate WHEAT ACREAGE 2013-2014, 2nd Estimate

Districts	Area (000 ha)	Distric
Pathankot	40.36	Pathan
Gurdaspur	186.70	Gurda
Amritsar	183.15	Amrits
Tarntaran	172.35	TarnTa
Kapurthala	108.29	Kapur
Jalandhar	166.94	Jaland
Hoshiarpur	152.69	Hoshia
SBS Nagar	82.78	SBS N
Rupnagar	62.32	Rupna
SAS Nagar	49.39	Mohal
Ludhiana	253.48	Ludhia
Fatehgarh Sahib	88.89	Fatehg
Barnala	113.69	Barnal
Bathinda	248.32	Bathin
Faridkot	117.85	Faridk
Mansa	163.94	Mansa
Fazilka	164.99	Fazilka
Moga	179.10	Moga
Firozpur	185.80	Firozp
Sangrur	288.86	Sangru
Muktsar	199.67	Mukts
Patiala	234.98	Patiala
Total	3428.54	

Districts	Area (000 ha)
Pathankot	40.36
Gurdaspur	186.70
Amritsar	187.78
FarnTaran	179.80
Kapurthala	108.29
Jalandhar	166.94
Hoshiarpur	147.29
SBS Nagar	82.78
Rupnagar	62.32
Mohali	49.39
Ludhiana	253.48
Fatehgarh Sahib	88.89
Barnala	113.69
Bathinda	254.32
Faridkot	117.85
Mansa	167.44
Fazilka	203.37
Moga	179.10
Firozpur	185.80
Sangrur	282.86
Muktsar	209.01
Patiala	234.98
Total	3502.44

ZAID CROPS (Summer 2014)

ZAID CROPS

- The farmers in the State have assured irrigation either through canal or tube wells, as a result significant area also goes under zaid crops
- Major summer crops of Punjab are summer-maize, sunflower, vegetables (mainly-cucurbits), potato, mentha, summer-moong and fodder
- There is no authentic information of the acreage under these crops, it is therefore monitoring and estimating crop acreage is required
- Acreage estimation of these summer crops, using remote sensing and GIS helps to get a correct estimates.



Sr. No	Satellite	Sensor	Path/Row	Date of Pass
1	IRS R2	AWiFS	94/48	20 June 2014
2	IRS R2	AWiFS	95/48	25 Feb 2014
3	IRS R2	AWiFS	94/48	09 April 2014
4	IRS R2	AWiFS	93/48	28 April 2014
5	IRS R2	AWiFS	95/48	08 May 2014
6	IRS R2	AWiFS	93/48	22 May 2014
7	IRS R2	LISS-IV	94/48	28 April 2014
8	IRS R2	LISS-IV	95/48	28 April 2014
9	IRS R2	LISS-III	94/48	09 April 2014
10	IRS R2	LISS-III	94/49	09 April 2014
11	IRS R2	LISS-III	94/50	09 April 2014
12	IRS R2	LISS-III	93/48	28 April 2014
13	IRS R2	LISS-III	93/50	28 April 2014

Table : Remote Sensing Data used

IRS R2 LISS IV 28 April 2014 Kapurthala and Jalandhar Districts



IRS R2 LISS IV 28 April 2014 Kapurthala District

Sunflower

Maize





Sunflower Acreage:4.2 000'haMaize Acreage:9.9 000'ha









District Boundary

Classified Zaid Crops in Punjab : IRS R2 AWiFS 8 May 2014



Zaid Crop Acreage = 191.16 000' ha

Classified Zaid Crops in Punjab



Zaid Crop Acreage = 191.16 000' ha

District	Acreage (Thousand Hectares)
Amritsar	7.24
Barnala	0.24
Bathinda	0.42
F.G. Sahib	5.37
Faridkot	0.17
Fazilka	0.60
Firozpur	1.20
Gurdaspur	9.16
Hoshiarpur	38.73
Jalandhar	37.35
K.P.T	24.26
Ludhiana	13.18
Mansa	0.08
Moga	1.29
Muktsar	0.12
SBS Nagar	13.18
Pathankot	9.85
Patiala	6.47
Rupnagar	12.53
Sangrur	1.19
Sas Nagar	6.44
Tarn Taran	2.07
Total	191.16

District wise Estimated Acreage under Zaid Crop



Remote Sensing and GIS Based Inventory of Orchards in Fazilka, Muktsar, Bathinda and Hoshiarpur Districts (Punjab) for Better Management and Planning



OBJECTIVES

• Development of RS & GIS based Inventory of Orchards

The digital database as well as statistics regarding number, type and area of orchards falling in various administrative units generated in GIS environment. The ownership and other parameters/attribute details like subsidy given for various purposes and facilities etc. to be incorporated in the database as per requirement of the Department, as provided by the Horticulture Department.

• Delineation of Fruit Plant Nurseries (Govt./Private), Seed farms, Demonstration Orchards, Fruit Preservation Laboratories, and Community Canning Centres

These units shall be marked using Remote Sensing (RS) data and Global Positioning System (GPS) based on information and location supplied by Department of Horticulture, Punjab

• Creation of digital database in respect of Settlements, Road and Rail Network

The location of settlements and detailed roads and rail network shall be marked from the high resolution satellite data as these are very important for planning marketing policy of fruits.









Note: Plantation of Litch Identify by Stakeholders Department of Horticulture (Hoshiarpur



Note: Plantation of Kinow Identify by Field Survey Using GPS Technology





MIXED PLANTATION (AGRICULTURAL PLANTATION WITH HORTICULTURAL PLANTATION)



CARTOSAT-1 PAN+LISS-IV



FIELD PHOTOGRAPH



GOOGLE EARTH IMAGE

CARTOSAT-1 PAN+LISS-IV





GROUND TRUTH

GOOGLE EARTH IMAGERY









Note: Plantation of Litch Identify by Stakeholders Department of Horticulture (Hoshiarpur



Note: Plantation of Kinow Identify by Field Survey Using GPS Technology

Soil and Water Management

Soil Nutrient Management


Ground Water Quality Management



Monitoring Crop Residue Burning













Identified Burnt Area in Punjab Using IRS R2 AWiFS Sensor Satellite Data 11 Nov 2014





Area under Crop Residue Burning in Punjab as Classified from Satellite Images (up to 16th November, 2014)

Burnt Area Identification through Ground Truth Point in Satellite Data



Field Condition while GT

Identified Burnt Area in Faridkot Distt.





Understanding Organic Carbon Turnover in Salt-affected Soils by Linking Remote Sensing, Carbon Modelling, Soil Chemistry and GIS

Introduction

- SOC = 2.5*vegetation C and 2.0*atmosphere C
- Successful calibration and validation of C models predicting SOC stocks/ CO₂ release from non-saline soils.
- Predicting CO₂ release is important for C sequestration and climate change.
- Very few studies on SOC modelling in salt-affected soils.
- Is prediction of SOC stocks /CO₂ release from saline soils overestimated or underestimated ???????

Approach

74°0'0"E





Expected Outcomes

- Accurate modelling of SOC stocks under future climate
- Prediction of CO₂ emissions from soilplant system
- Carbon farming
 (Slow decomposition in saline soils
 Carbon Credit)

THANKS FOR YOUR PATIENCE & ATTENTION



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