

GEOINFORMATICS FOR AGRICULTURAL APPLICATIONS IN HARYANA

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REMOTE SENSING



GEOSPATIAL TECHNOLOGIES IN AGRICULTURE

- **Agricultural land use/ land cover mapping**
- **Wastelands/ Land Degradation Studies**
- **Crop acreage and production estimation**
- **Preparation of sustainable land use plan**
- **Crop damage due to natural disasters**
- **Study of Cropping patterns**
- **Crop stubble burning**
- **Crop diversification**
- **Crop residue biomass estimation for power generation**
- **Modernization of Land records (NLRMP)**
- **Mapping ground water resources**
- **Soil nutrient status mapping**

HARYANA STATISTICS

Demography (2011)

Total	2.53 crore
Decadal growth	19.9%
Literacy rate	76.6% Sq km
Sex Ratio	877
Density	573 per sq km

Geography

Geog. Area	44212	
Net crop area	35180	(80.0%)
Double crop area	29870	(67.6%)
Gross crop area	65050	(136.5%)
Cropping intensity	185 %	
Net Irrigated area	82.1%	
Tube-well irrigated	57%	
Canal Irrigated	43%	
Forest area	1558	(3.5%)

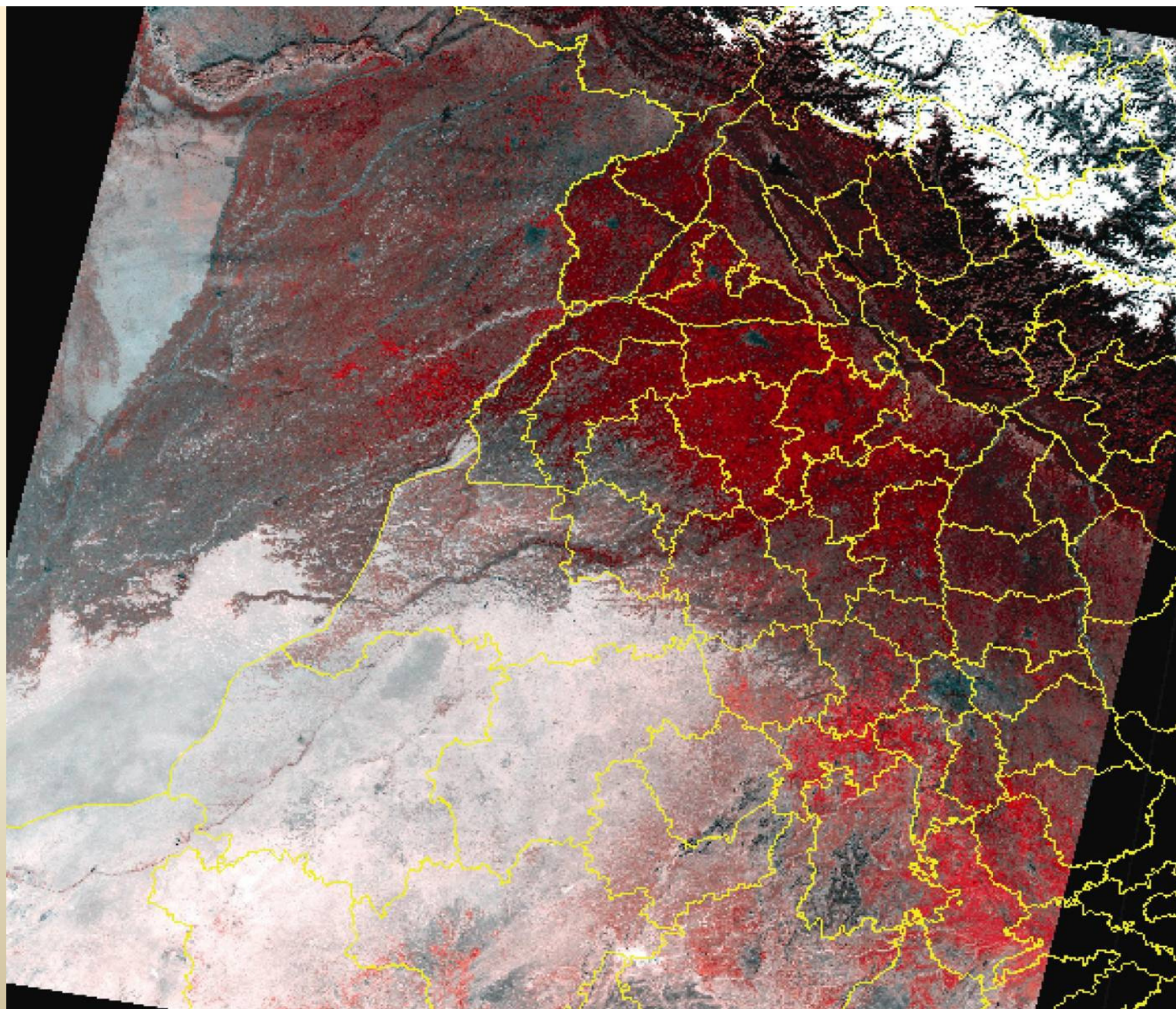
Administration

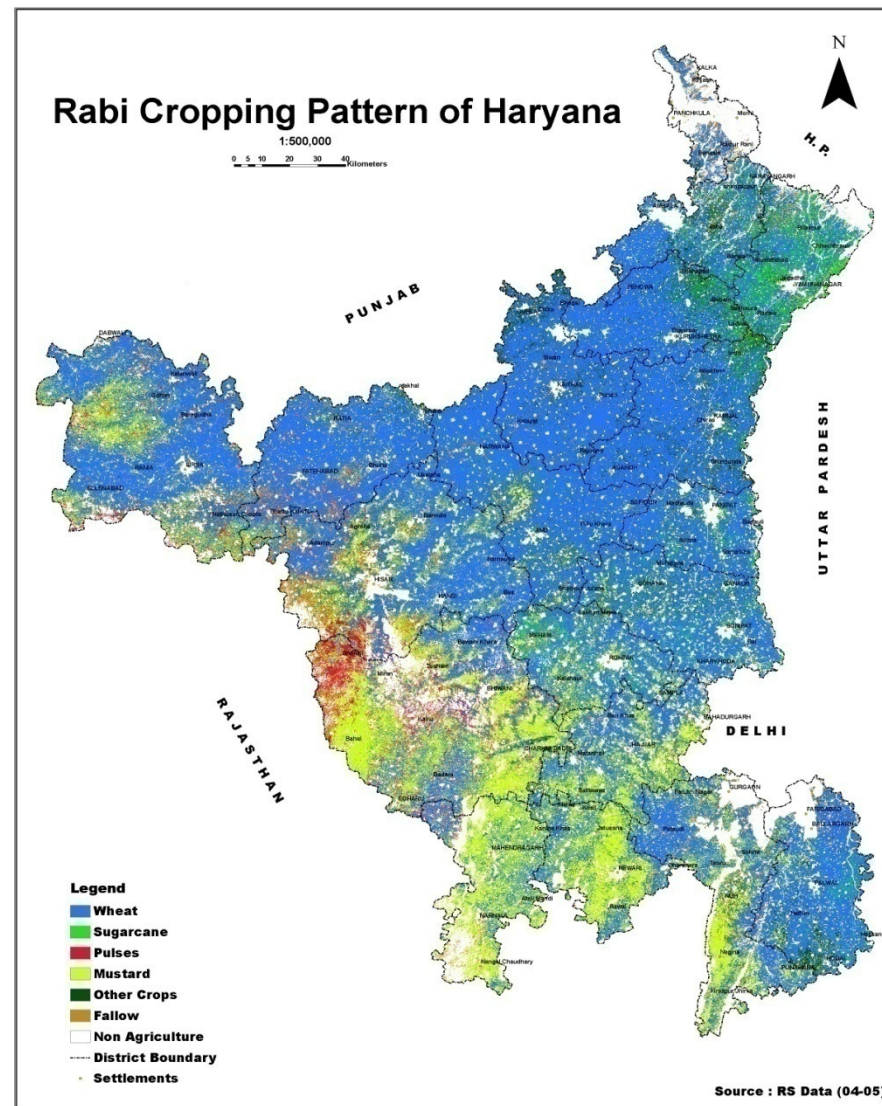
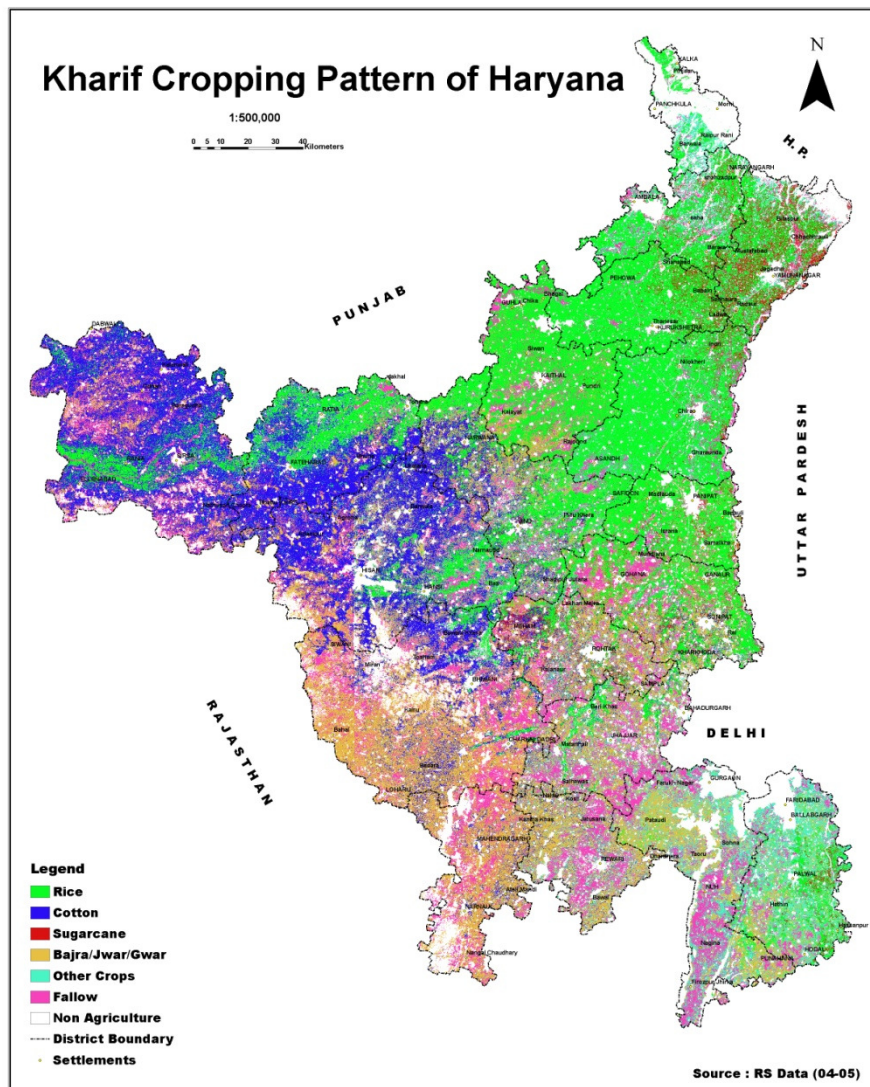
Divisions:	4
Districts	20
Sub-divisions	54
Tehsils/ Taluks	75
Blocks	119
No. of Villages	6764
No. of Towns	106
Parl. constituencies	10
Assembly constituencies	90

POLITICAL MAP Haryana



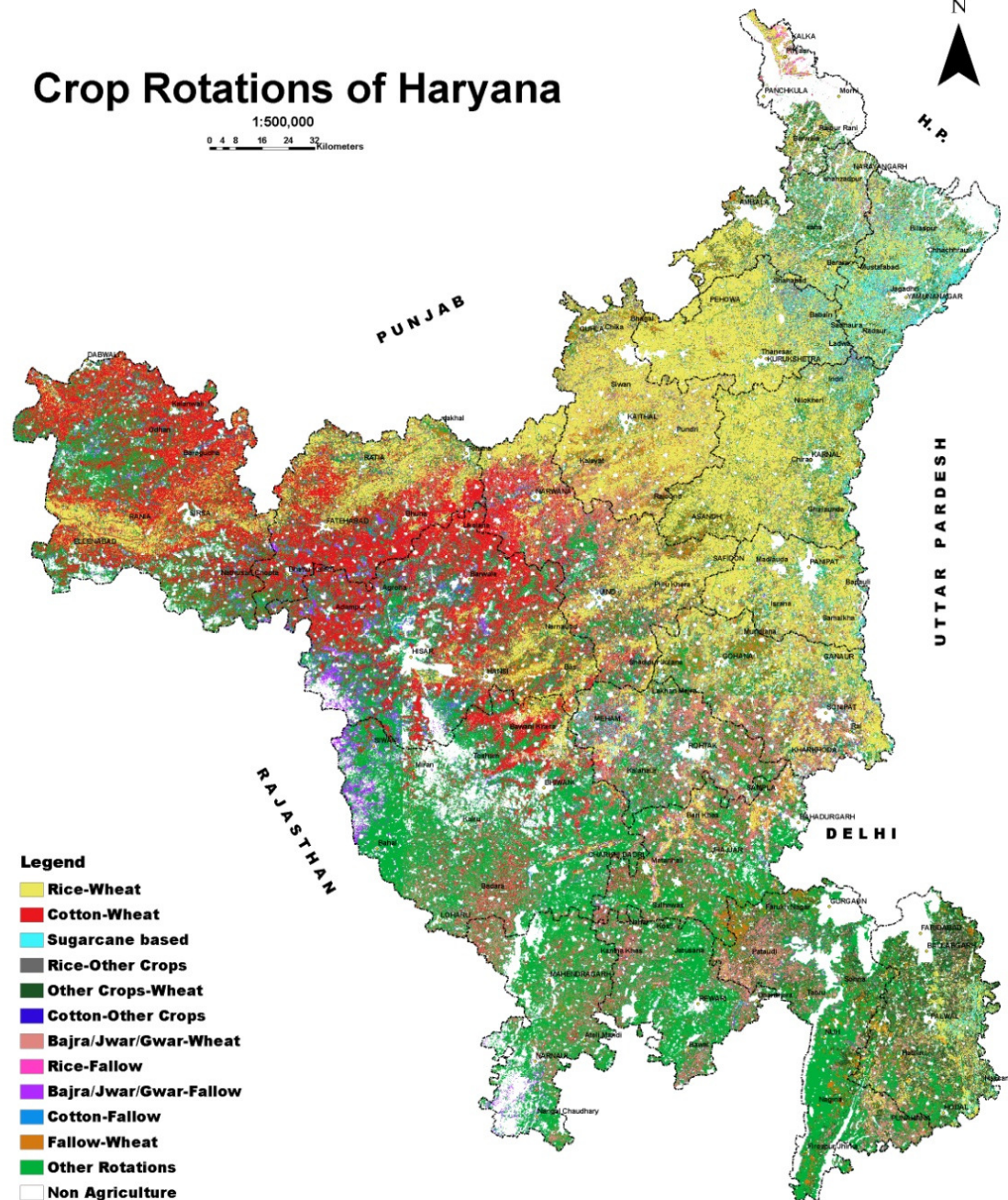
Source : HARSAC, Hisar, Haryana





Crop Rotations of Haryana

1:500,000
0 4 8 16 24 32 Kilometers



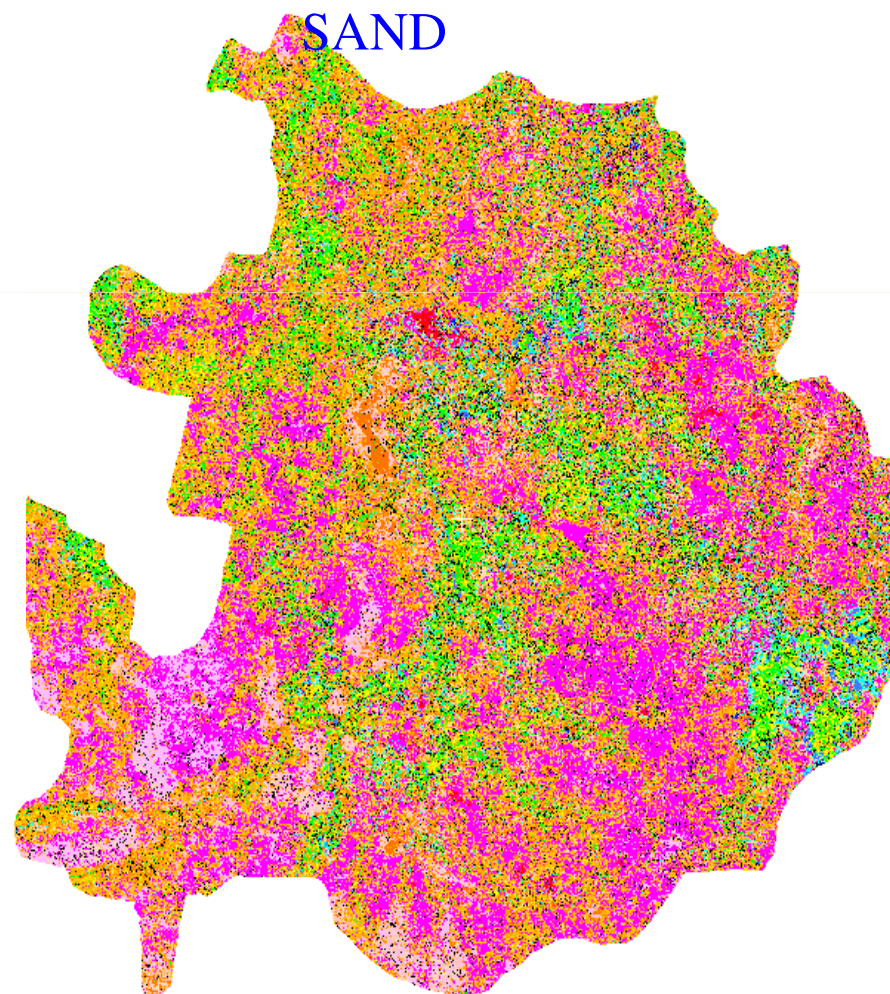
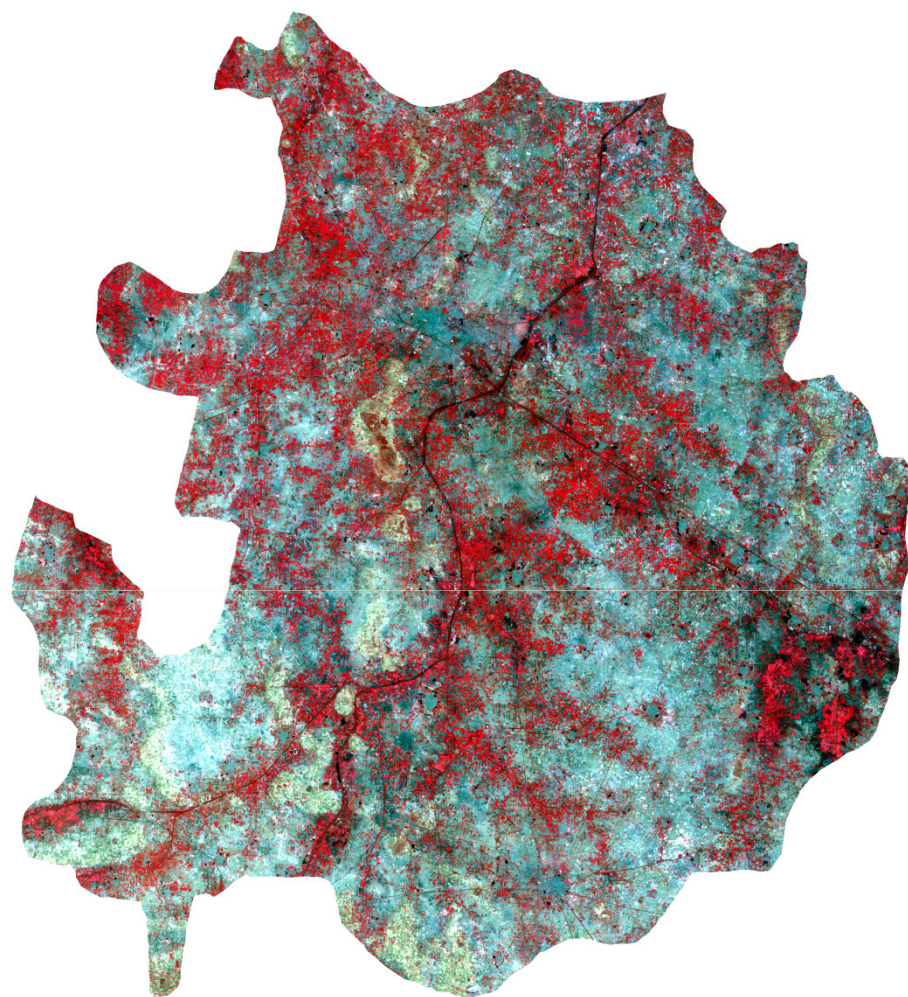
Legend

- Rice-Wheat
- Cotton-Wheat
- Sugarcane based
- Rice-Other Crops
- Other Crops-Wheat
- Cotton-Other Crops
- Bajra/Jwar/Gwar-Wheat
- Rice-Fallow
- Bajra/Jwar/Gwar-Fallow
- Cotton-Fallow
- Fallow-Wheat
- Other Rotations
- Non Agriculture
- District Boundary
- Settlements

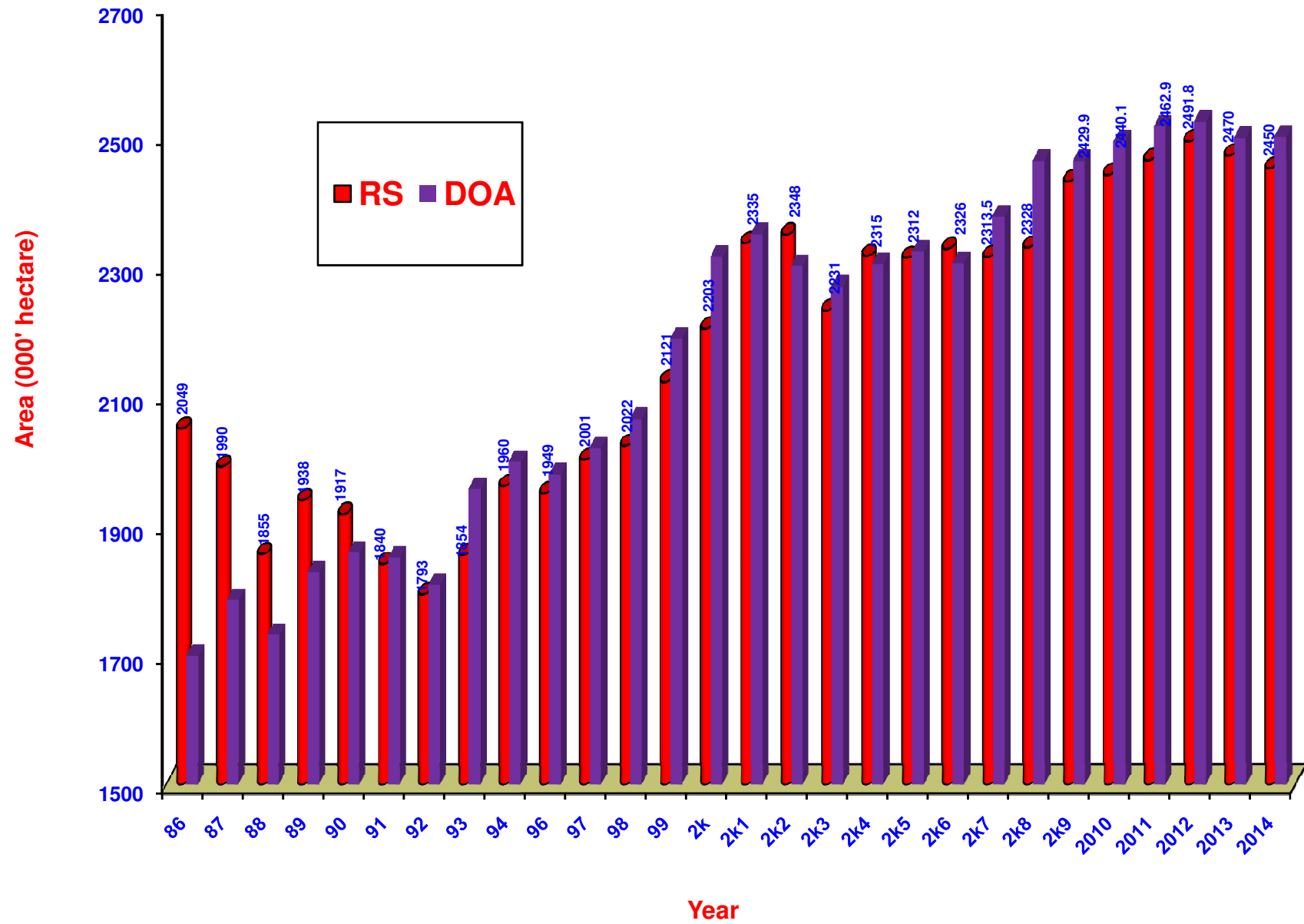
Source : RS Data (04-05)

CROP ACREAGE AND PRODUCTION FORECASTING

SUGAR CANE
PADDY
FALLOW/ WASTE
BUILT UP
WATERLOGGED
SAND



Wheat Area Estimates in Haryana



ZONAL SPECTRO-TREND-AGORMET WHEAT YIELD MODELS

Zone 1: Ambala Panchkula, Y/Nagar and Kurukshetra

$$Y = -39.96 + 0.932 \text{ GDD}_1 - 0.567 \text{ ARF}_6 + 0.801 \text{ Yt} - 1.662 \text{ VI} \quad R^2 = 0.89$$

Zone 2: Karnal, Kaithal, Jind, Panipat, Sonapat, Rohtak

$$Y = -10.46 + 0.146 \text{ TD}_1 + 0.148 \text{ TD}_3 + 0.175 \text{ GDD}_3 + 1.079 \text{ Yt} - 0.585 \text{ VI} \quad R^2 = 0.92$$

Zone 3: M/garh, Rewari, Jhajjar, Gurgaon, Faridabad

$$Y = -11.46 + 0.045 \text{ TD}_6 + 0.28 \text{ ARF}_4 + 1.04 \text{ Yt} - 3.391 \text{ VI} \quad R^2 = 0.91$$

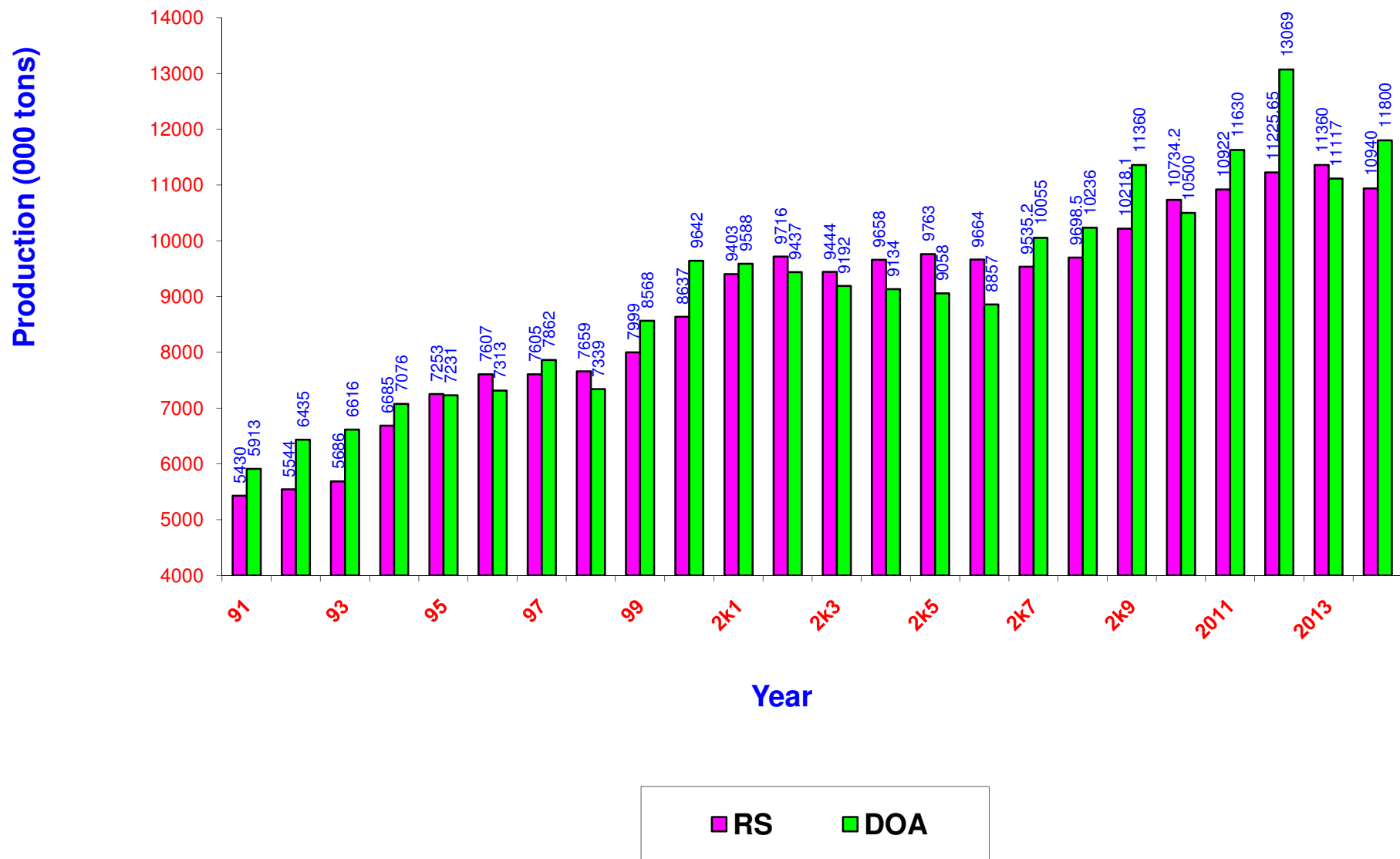
Zone 4: Sirsa, Hisar, Fatehabad and Bhiwani

$$Y = 13.768 - 0.217 \text{ GDD}_4 + 0.138 \text{ GDD}_7 + 0.16 \text{ ARF}_1 + 0.855 \text{ Yt} - 3.101 \text{ VI} \quad R^2 = 0.91$$

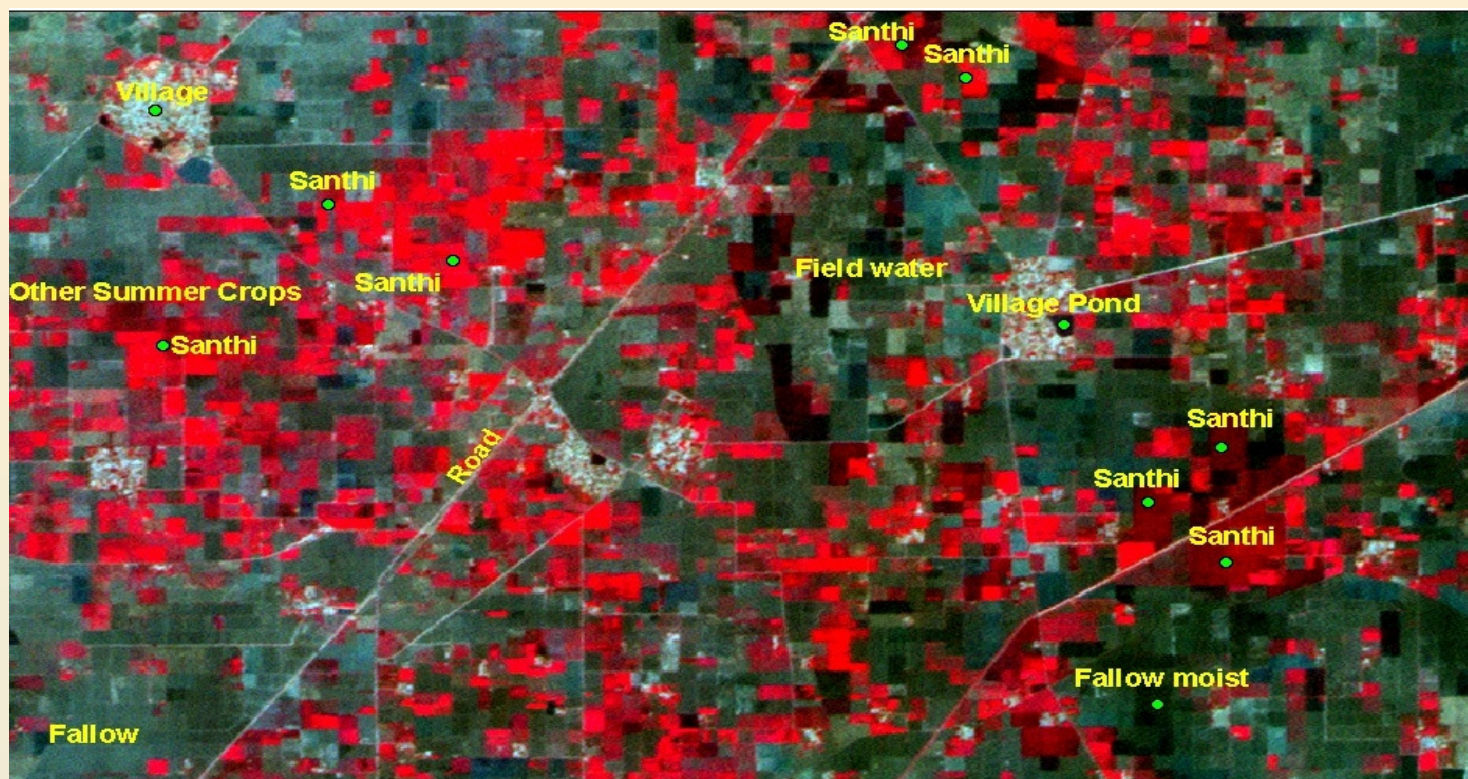
Where: TD – Temperature Difference
GDD – Growing Degree Days
ARF – Accumulated Rainfall
VI = Vegetation Index
Yt = Trend predicted yield

- 1. Crown root initiation stage**
- 2. Tillering stage**
- 3. Jointing stage**
- 4. Flowering stage**
- 5. Milking stage**
- 6. Dough stage**
- 7. Maturity stage**

Wheat Production Estimates in Haryana



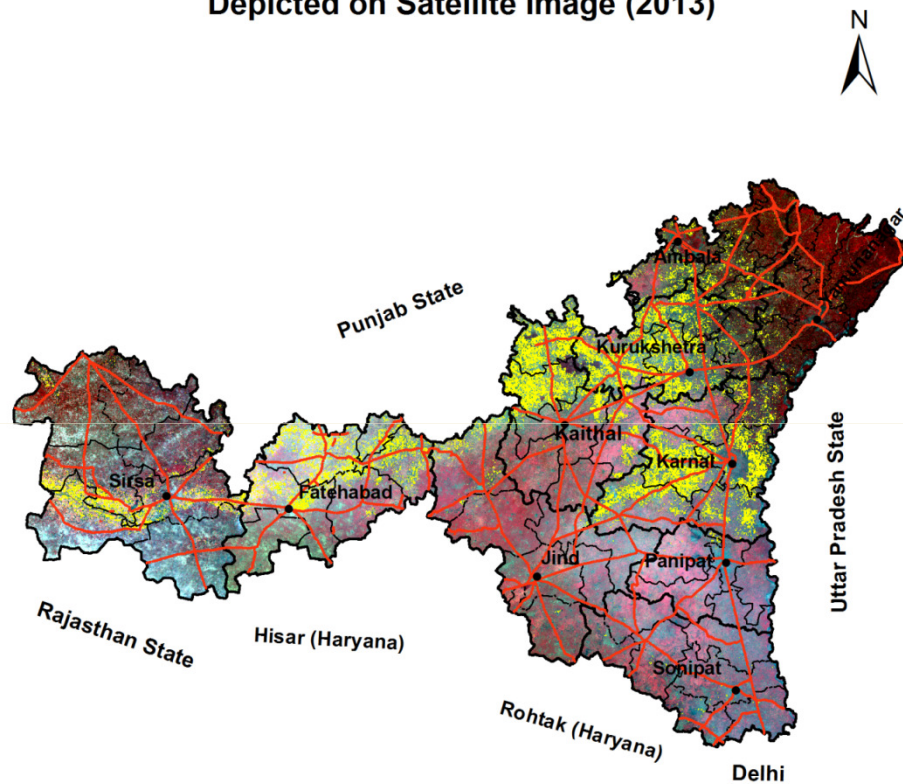
MONITORING SANTI (SUMMER PADDY) AREA



District	Sathi Area (hectares)					
	2000	2002	2003	2006	2007	2008
1. Fatehabad	4981	2393	2274	383	21	Nil
2. Kaithal	3228	3928	5017	197	183	312
3. Kurukshetra	9118	2683	1589	176	173	257
4. Karnal	22475	14859	12582	493	111	1100
Total (4 Dist.)	39802	23863	21462	1249	488	1668

Rice Stubble Burning Area in Project Districts Depicted on Satellite Image (2013 & 2014)

Rice Stubble Burning Area in Project Districts
Depicted on Satellite Image (2013)



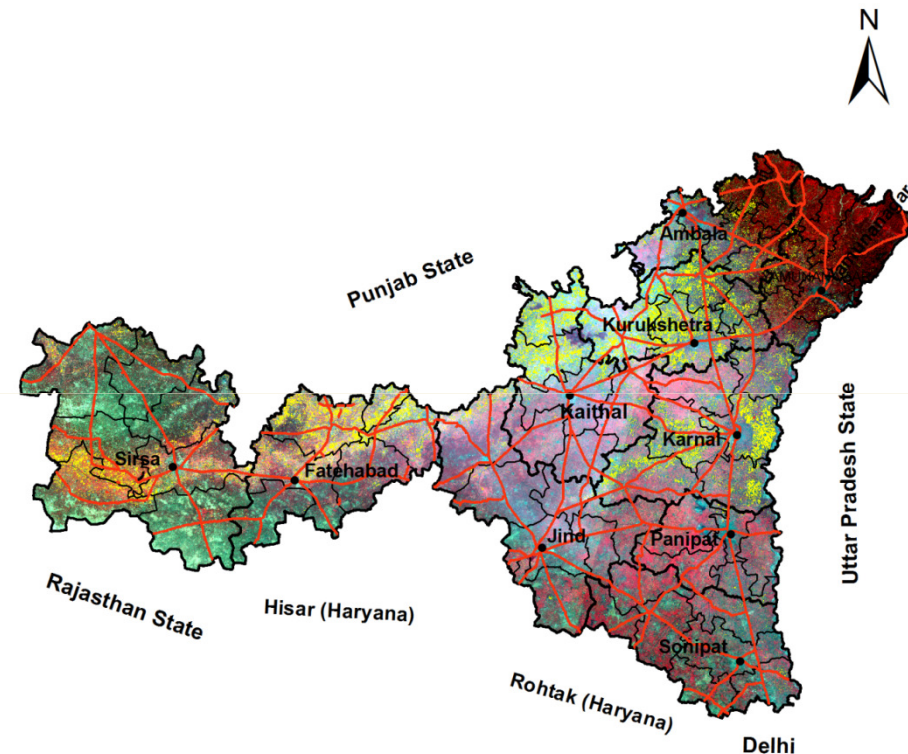
Legend

- Road
- Dist. Boundry
- Block Boundry
- Burnt Area

Prepared by :
Haryana Space Applications Centre (HARSAC),
CCS HAU Campus, Hisar-125004
For :
Haryana State Pollution Control Board (HSPCB), Panchkula - 134109

Source: Satellite Data

Rice Stubble Burning Area in Project Districts
Depicted on Satellite Image (2014)



Legend

- Road
- Dist. Boundry
- Block Boundry
- Burnt Area

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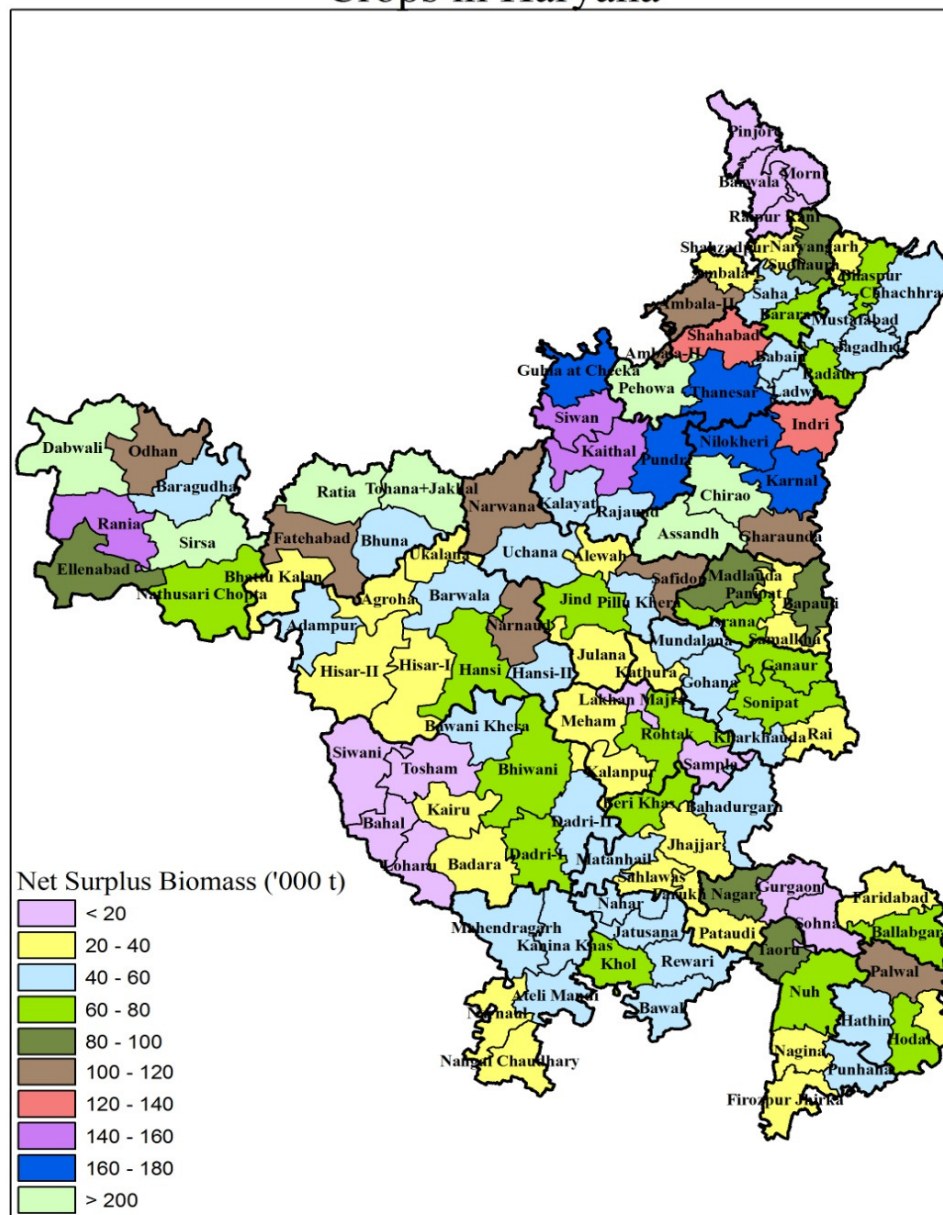
Source: Satellite Data

0 12.5 25 50 75 100
KM

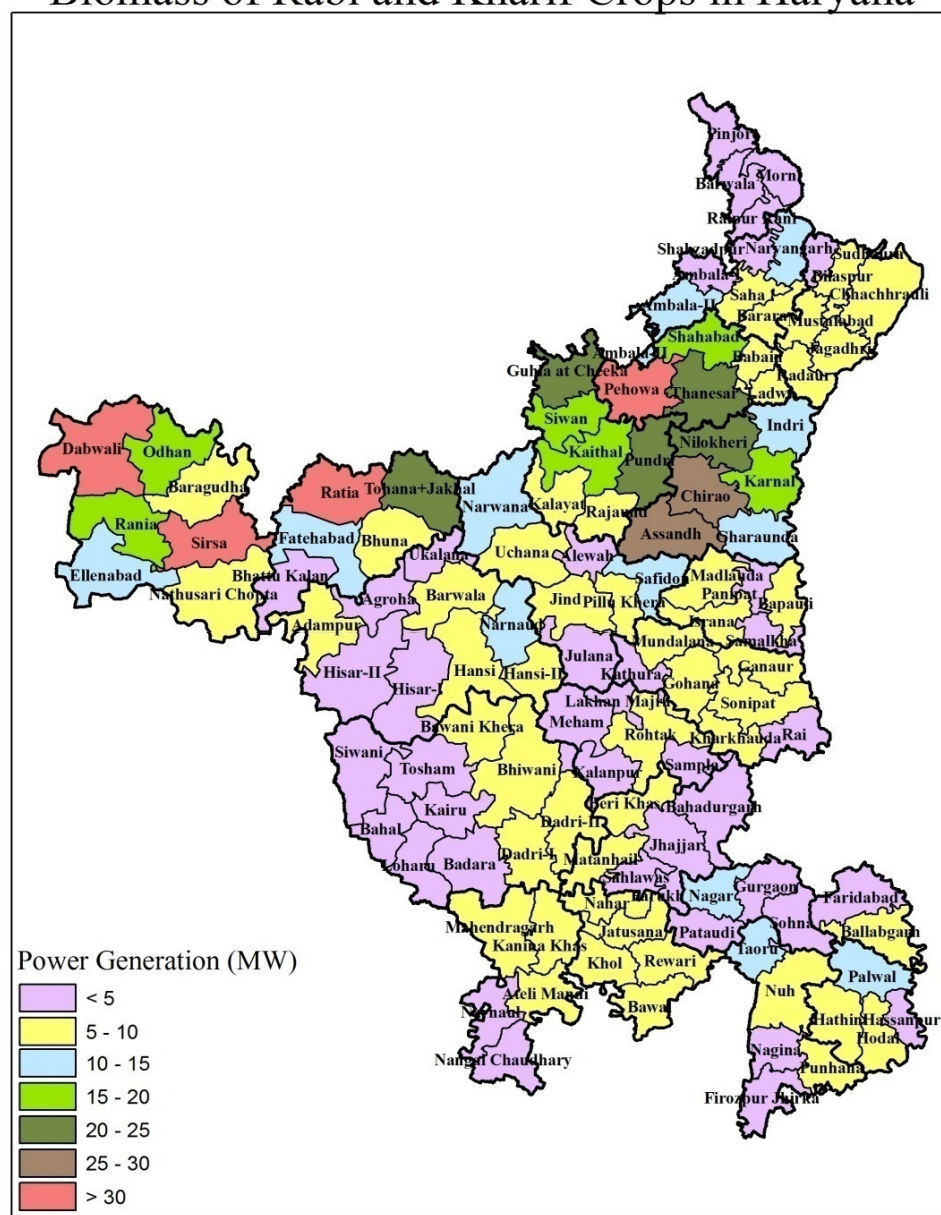
Rice Stubble Burning Area of Project Districts (2013 & 2014)

Sr. No.	District/ Parameter	Stubble Burning Area ('000 ha)		% RD
		2013	2014	
1	Ambala	12.3	10.8	-12.0
2	Fatehabad	32.7	29.1	-10.9
3	Jind	04.2	03.7	-11.9
4	Kaithal	41.4	26.6	-35.9
5	Karnal	54.3	34.4	-36.7
6	Kurukshetra	39.8	38.8	-2.7
7	Panipat	00.8	01.2	53.6
8	Sirsa	19.6	18.1	-7.6
9	Sonipat	01.2	01.8	43.1
10	Y/Nagar	02.0	04.5	128.5
	Total	208.3	168.9	-18.9

Net Surplus Biomass of Rabi and Kharif Crops in Haryana



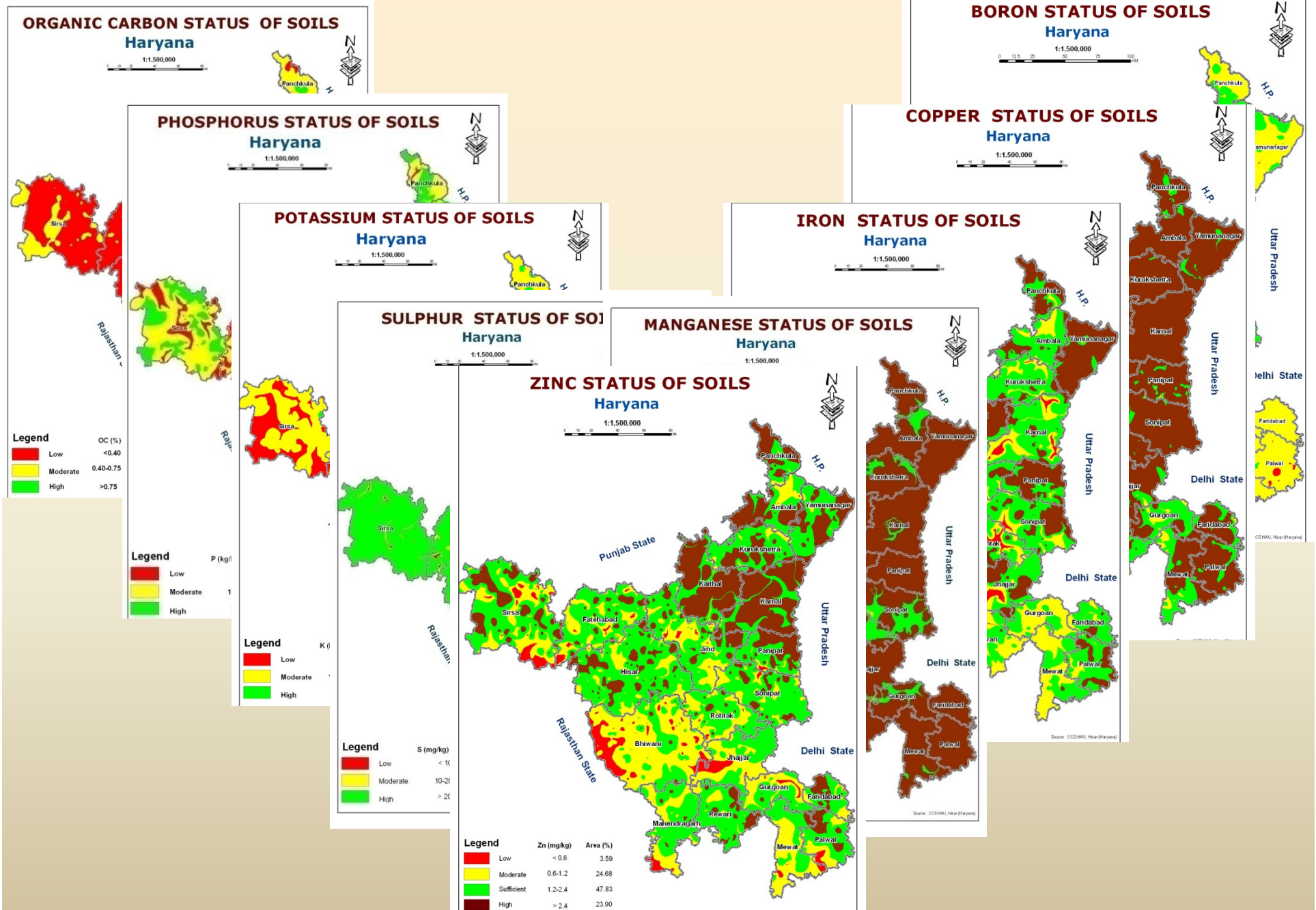
Power Generation Potential from Net Surplus Biomass of Rabi and Kharif Crops in Haryana



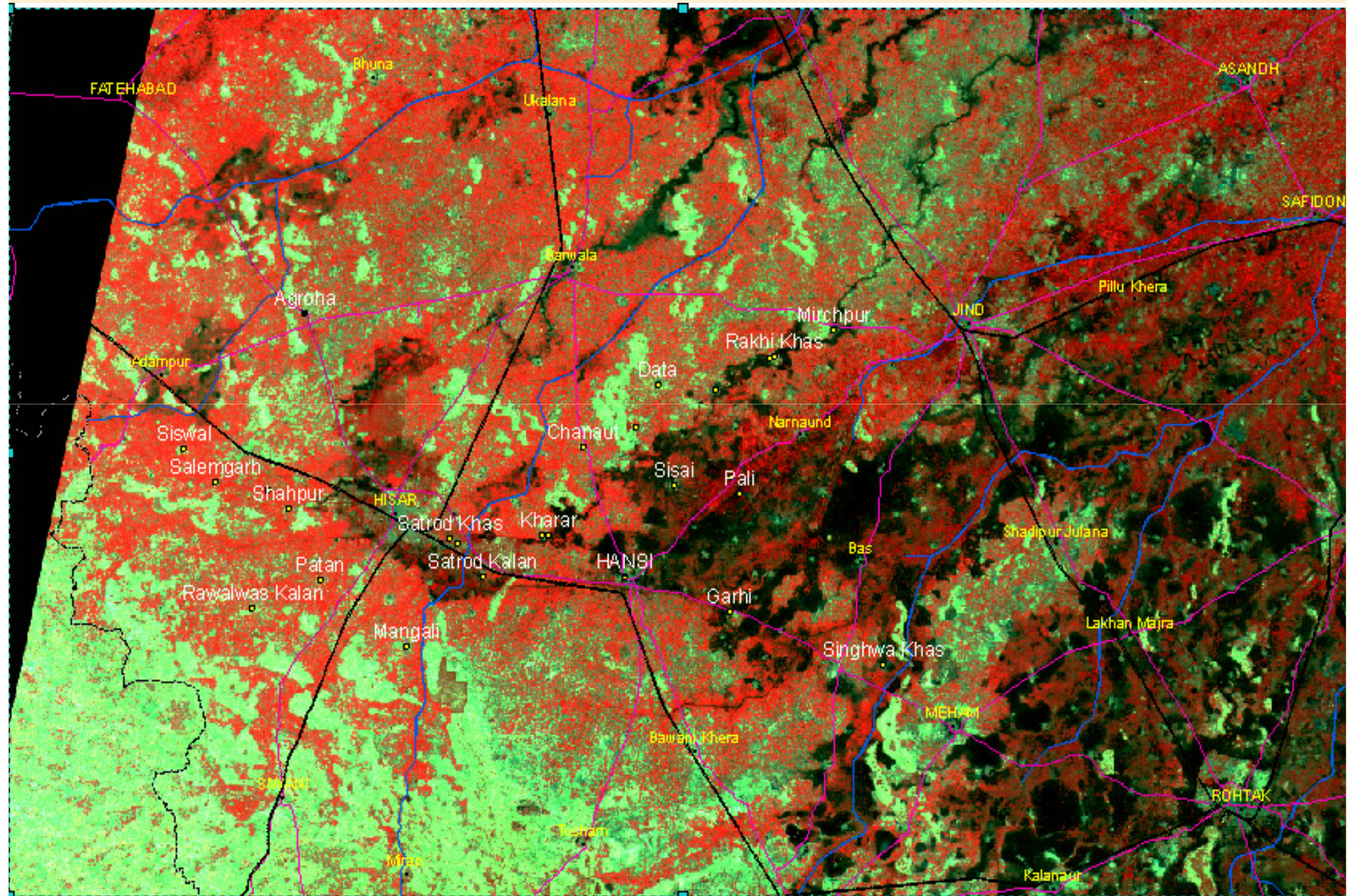
Surplus Crop Biomass & Power Generation Potential

Season	Area '000 ha.	Crop Biomass (^{'000} t)	N.G./N.E. Crop Biomass (^{'000} t)	Net Surplus Biomass (^{'000} t)	Pow. Gen. potential of Surplus Crop Biomass (MW)
Kharif	2509	24795	11108	6109	730
Rabi	3068	26604	15697	2307	288
Total	5578	51400	26806	8416	1018

Preparation of District wise soil fertility maps



Flood Damage to Crops

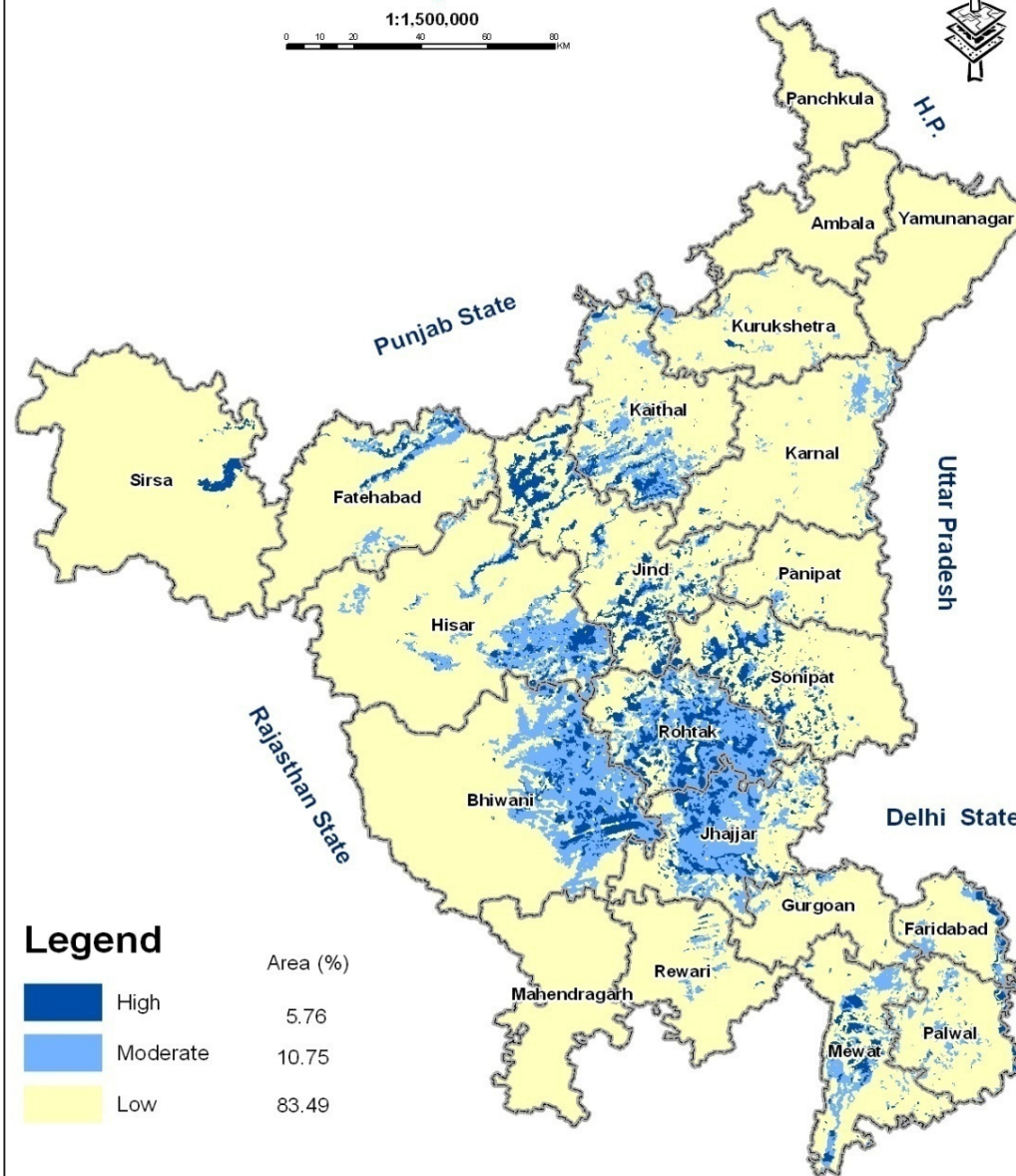


FLOOD PRONE AREA MAP

Haryana

1:1,500,000

0 10 20 40 60 80 KM

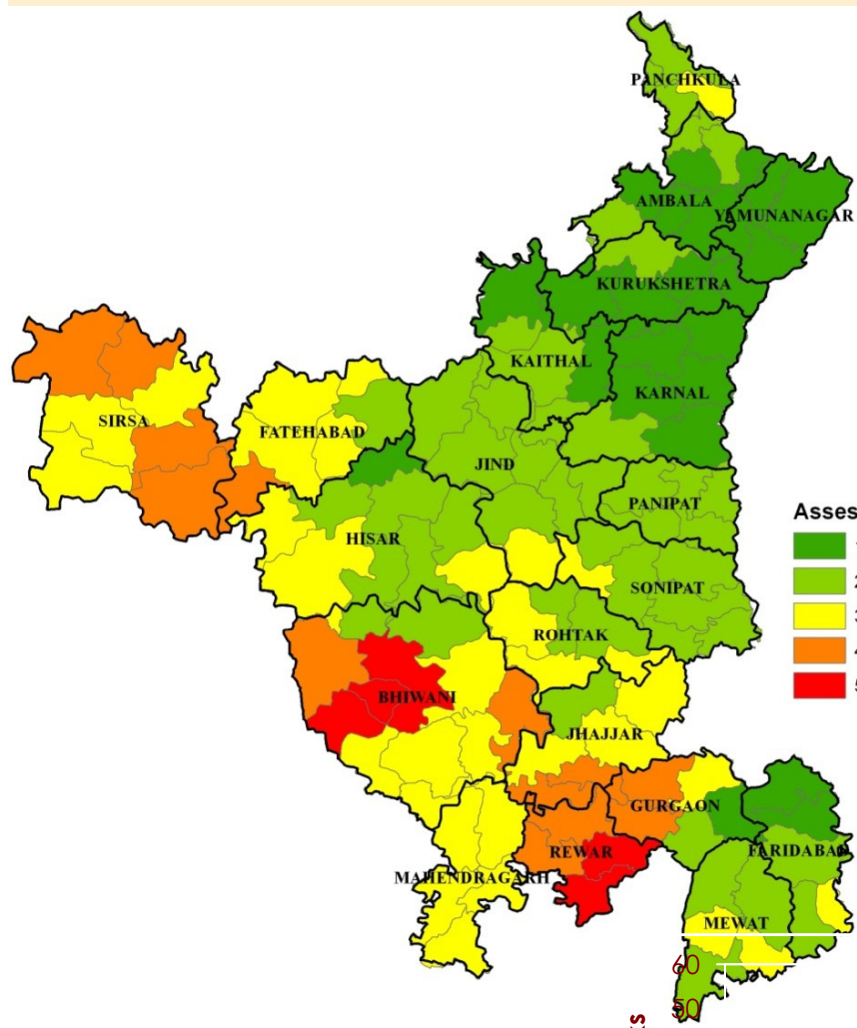


Legend

	High	5.76
	Moderate	10.75
	Low	83.49

Source : HARSAC, Hisar (Haryana)

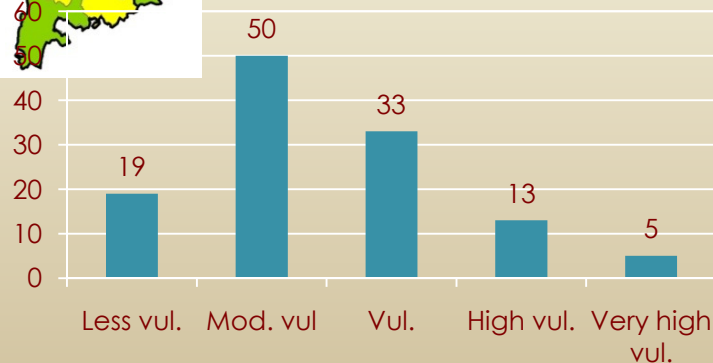
Agricultural Drought Vulnerability Assessment – Haryana state



*C1-less vulnerable,
C2 -moderate vulnerable
C3- vulnerable,
C4-high vulnerable,
C5-very high vulnerable*



No. of blocks



Distribution of blocks in different vulnerability classes

District	C1	C2	C3	C4	C5
Ambala	4	2	0	0	0
Bhiwani	0	1	4	2	3
Faridabad	2	2	1	0	0
Fatehabad	0	1	4	1	0
Gurgaon	1	1	1	2	0
Hisar	1	5	3	0	0
Jhajjar	0	1	3	2	0
Jind	0	6	1	0	0
Kaithal	3	4	0	0	0
Karnal	4	1	0	0	0
Kurukshetra	4	1	0	0	0
Mahendragarh	0	0	5	0	0
Mewat	0	3	2	0	0
Panchkula	0	3	1	0	0
Panipat	0	5	0	0	0
Rewari	0	0	0	2	2
Rhotak	0	2	3	0	0
Sirsa	0	0	3	4	0
Sonipat	0	6	1	0	0
Yamunanagar	0	6	1	0	0
State	19	50	33	13	5

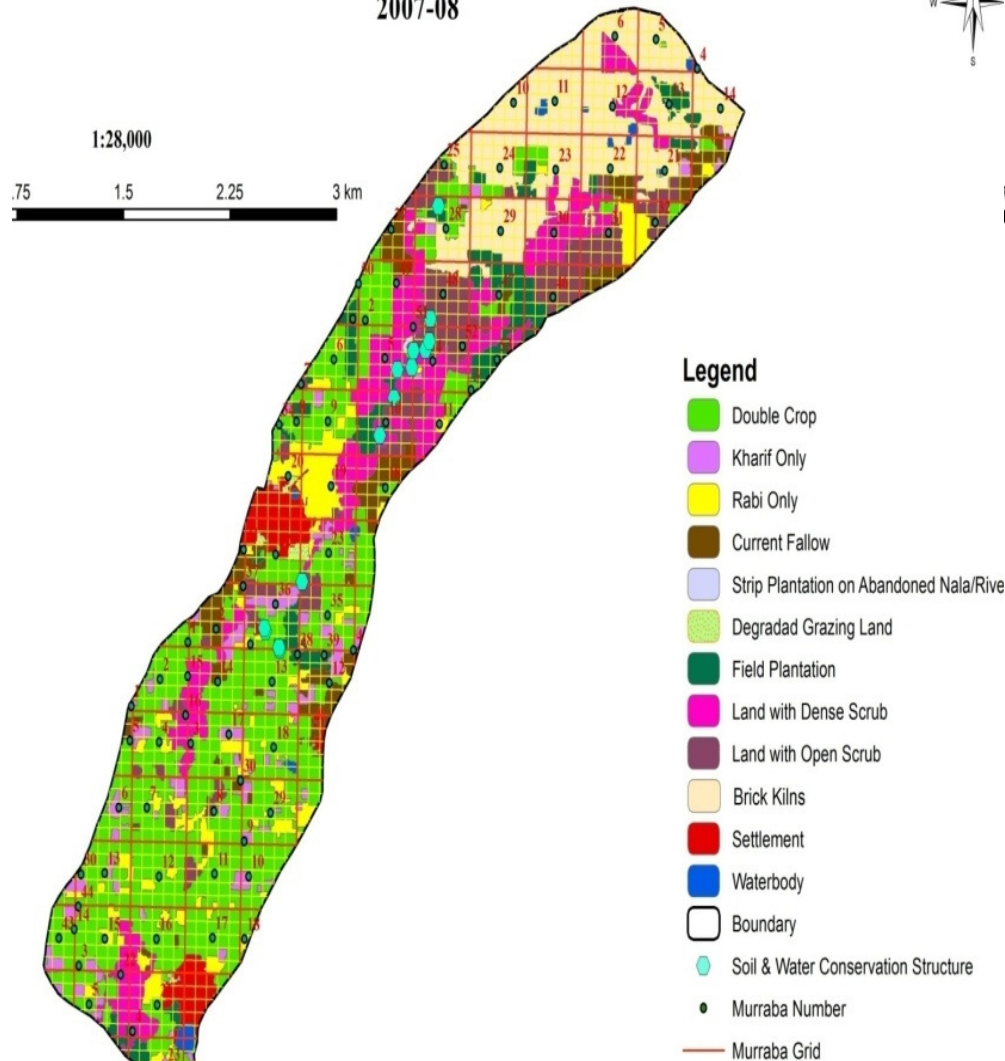
Monitoring/ Evaluation of Watersheds

Rashidpur Micro-watershed

76°58'30"E 76°59'0"E 76°59'30"E 77°0'0"E 77°0'30"E 77°1'0"E 77°1'30"E 77°2'0"E 76°58'30"E 76°59'0"E 76°59'30"E 77°0'0"E 77°0'30"E 77°1'0"E 77°1'30"E 77°2'0"E

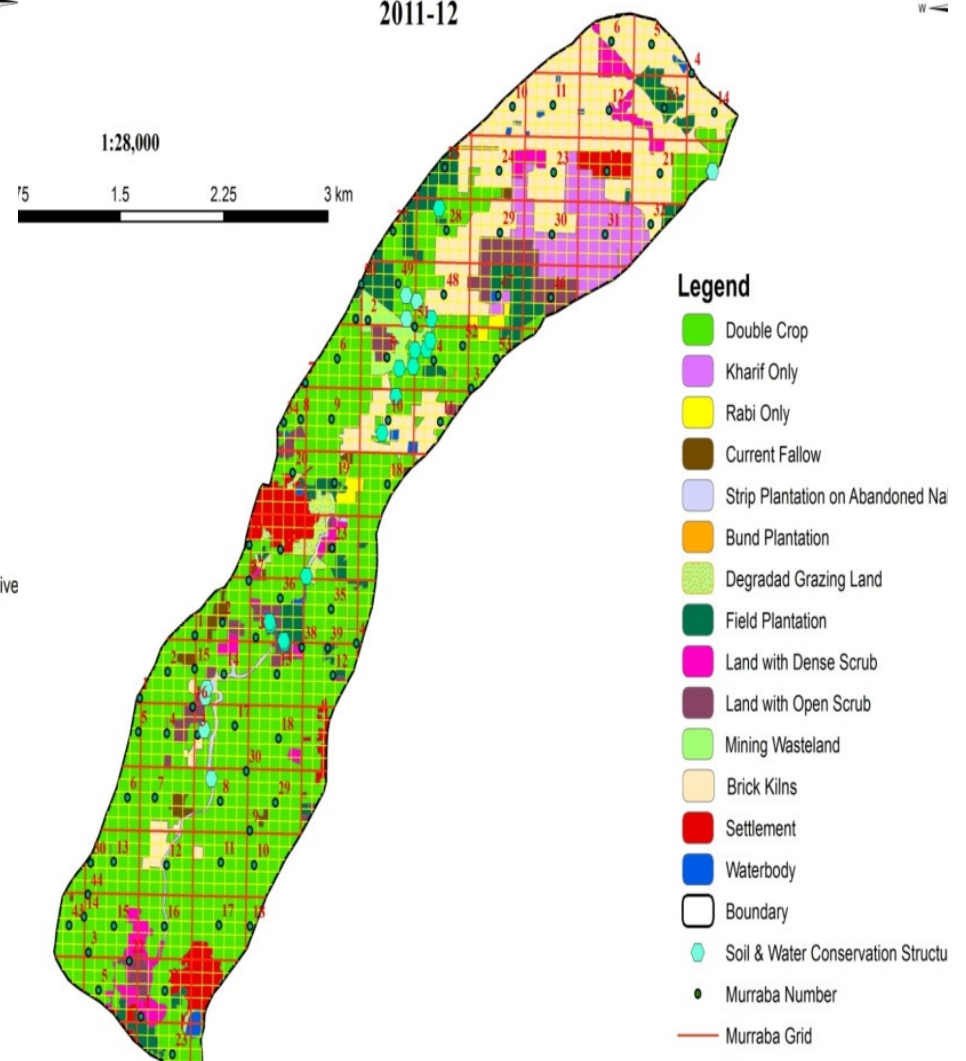
LAND USE / LAND COVER MAP OF RASIDPUR MICROWATERSHED

2007-08

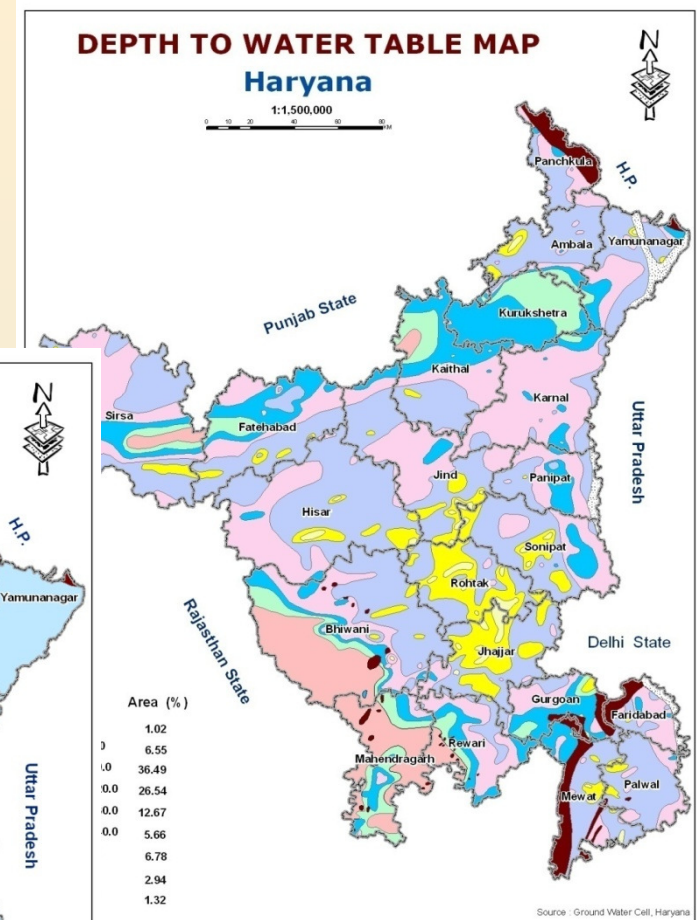
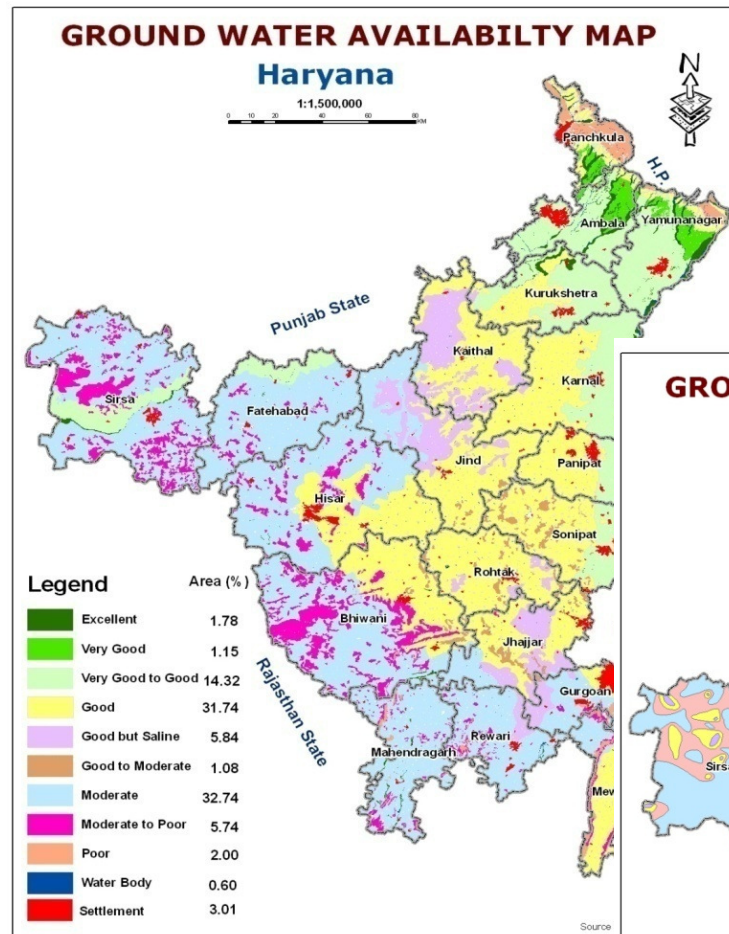


LAND USE / LAND COVER MAP OF RASIDPUR MICROWATERSHED

2011-12



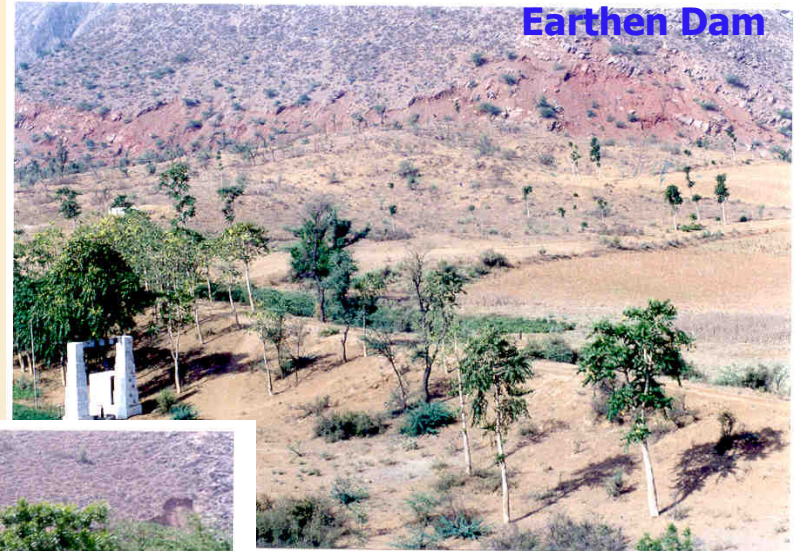
Groundwater Mapping in Haryana



Check Dams near Tikri Village



Earthen Dam



MEWAT DEVELOPMENT PLAN

Gully Plugging

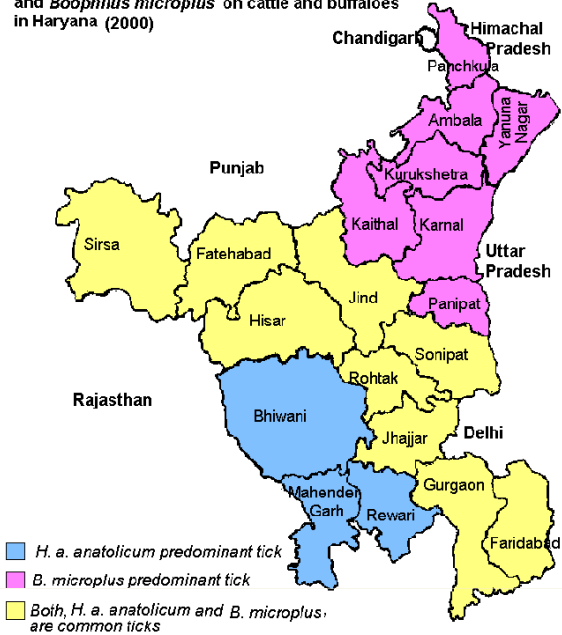


Percolation Tank



Ticks distribution in Haryana

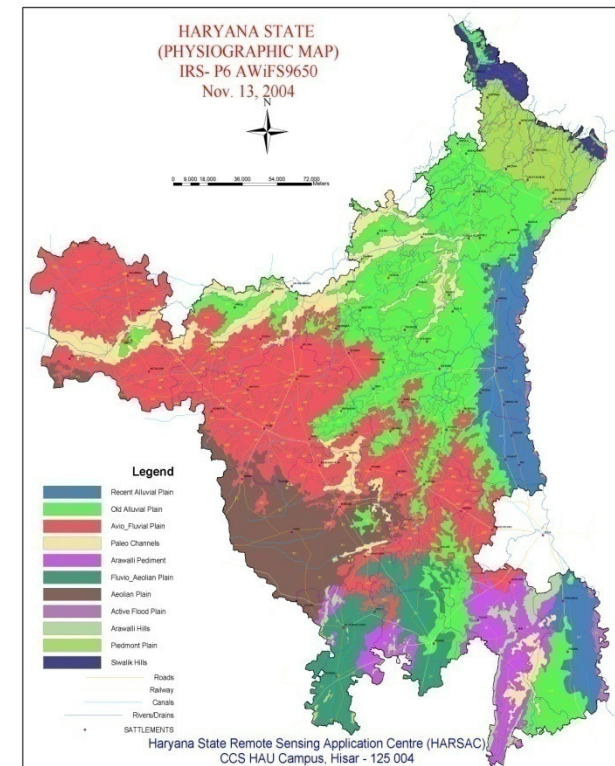
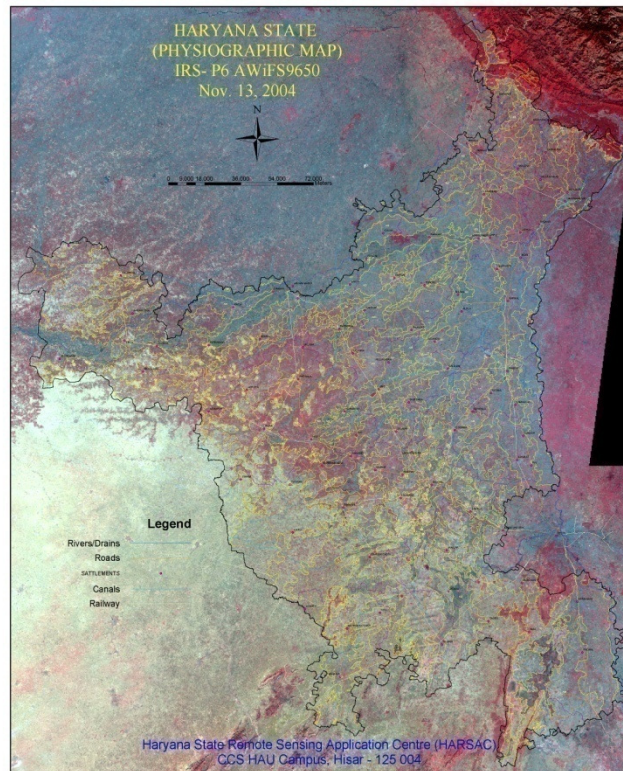
Comparative prevalence of *Hyalomma anatolicum anatolicum* and *Boophilus microplus* on cattle and buffaloes in Haryana (2000)



■ *H. a. anatolicum* predominant tick

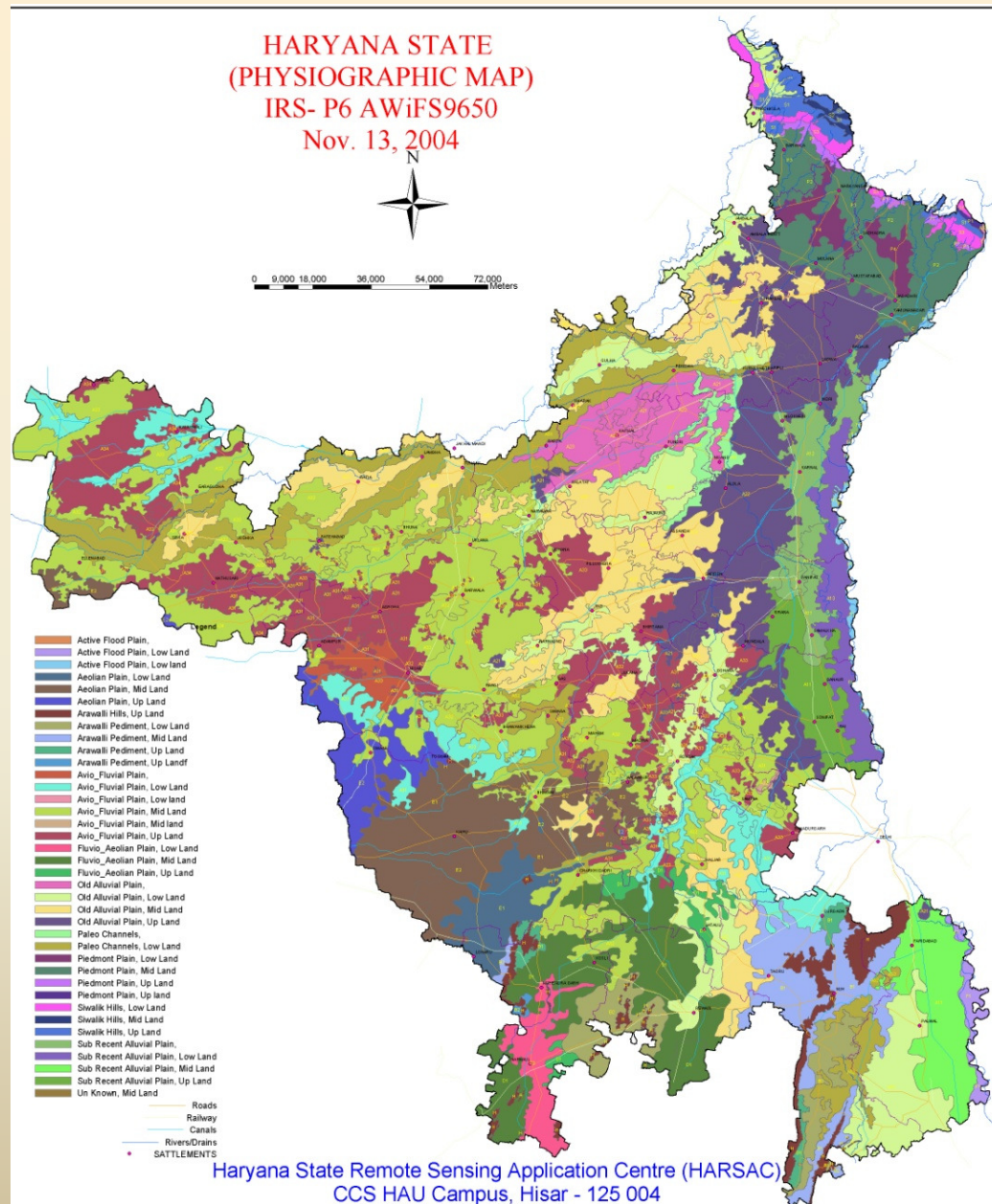
■ *B. microplus* predominant tick

■ Both, *H. a. anatolicum* and *B. microplus*, are common ticks



METHANE EMISSIONS FROM PADDY FIELDS

Stratification and Upscaling using Remote Sensing Data



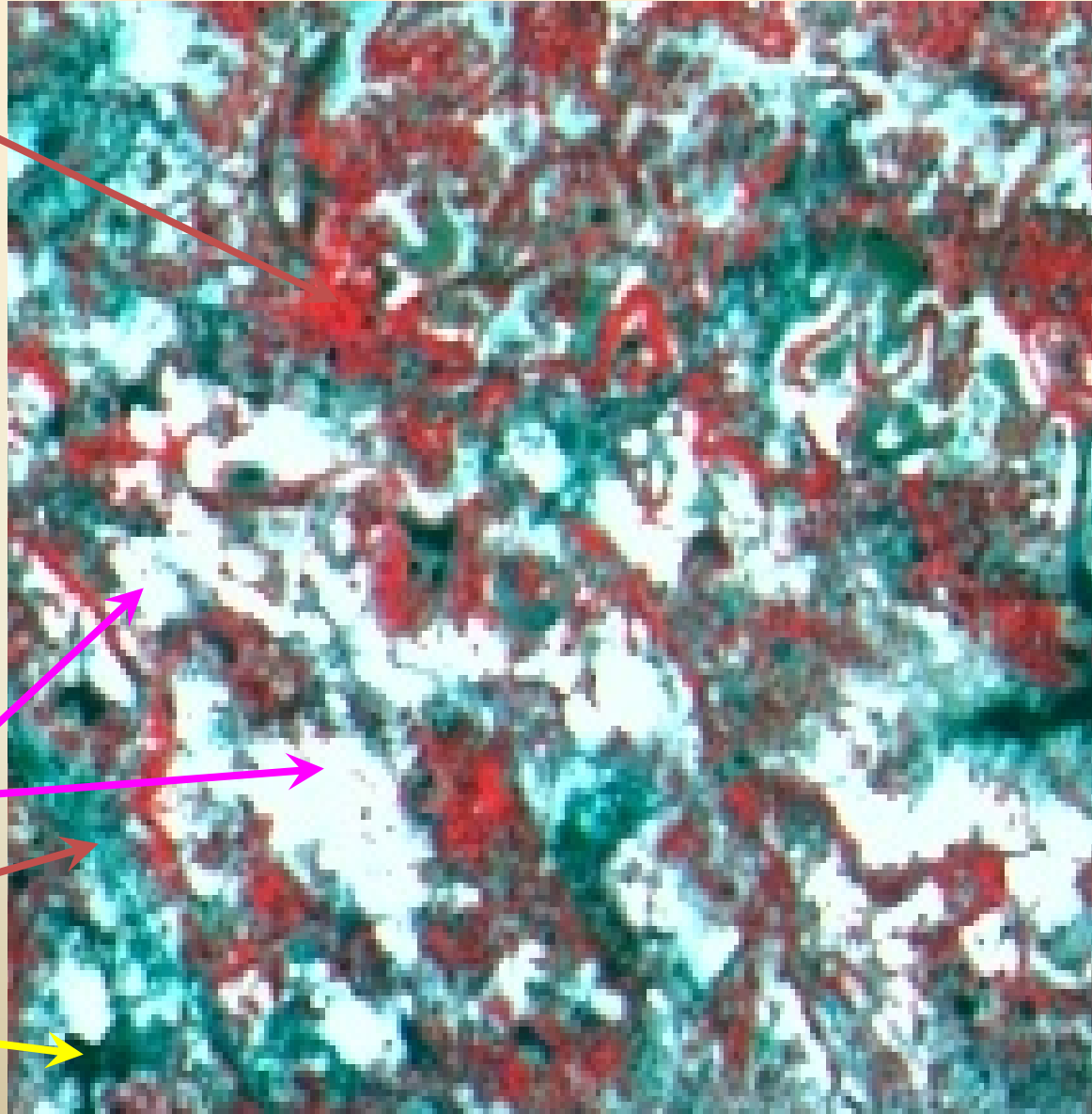
SALT AFFECTED AND WATERLOGGED SOILS

Cropped areas

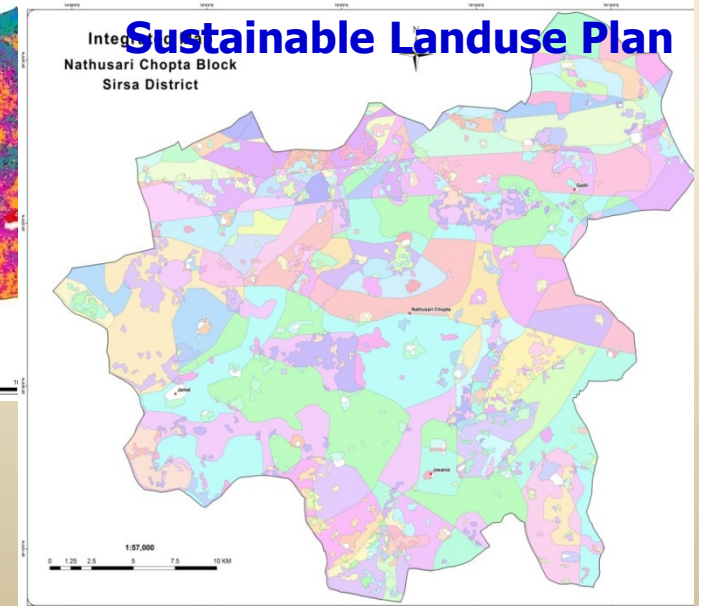
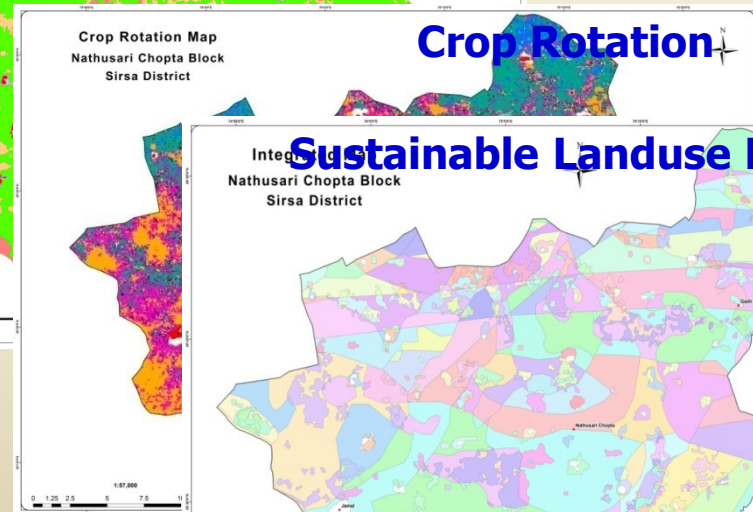
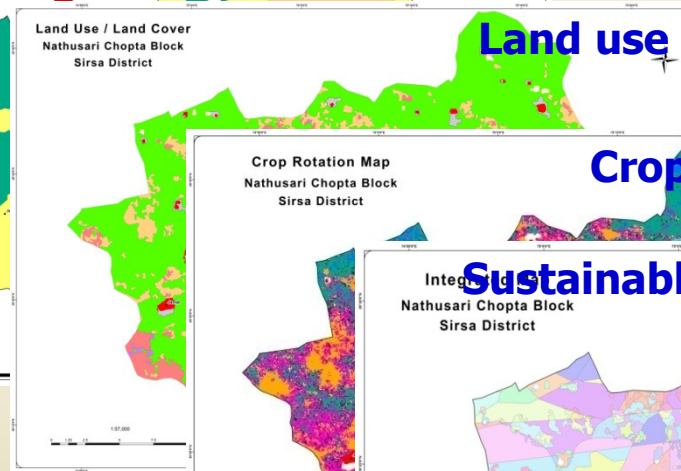
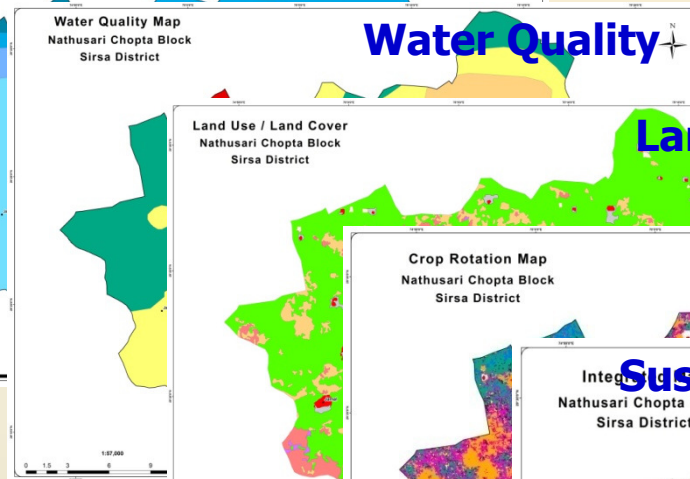
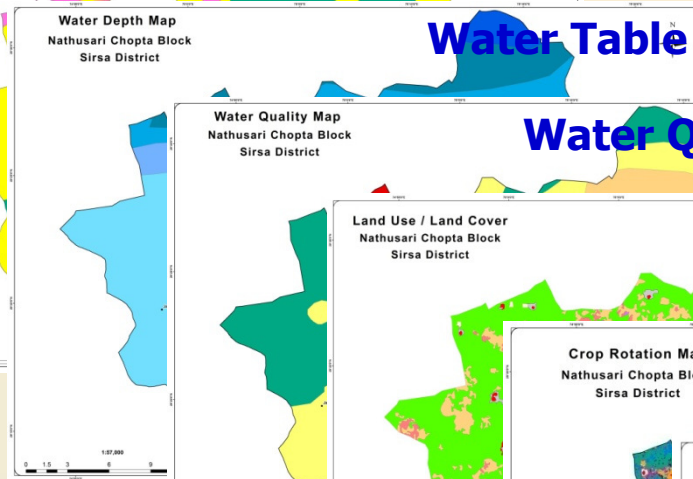
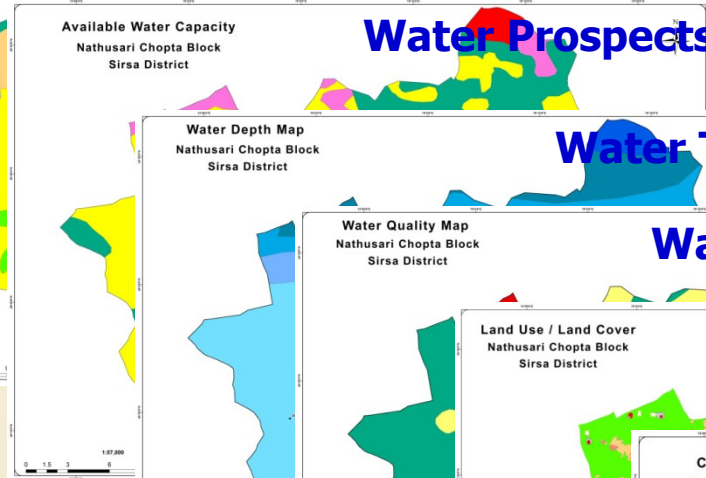
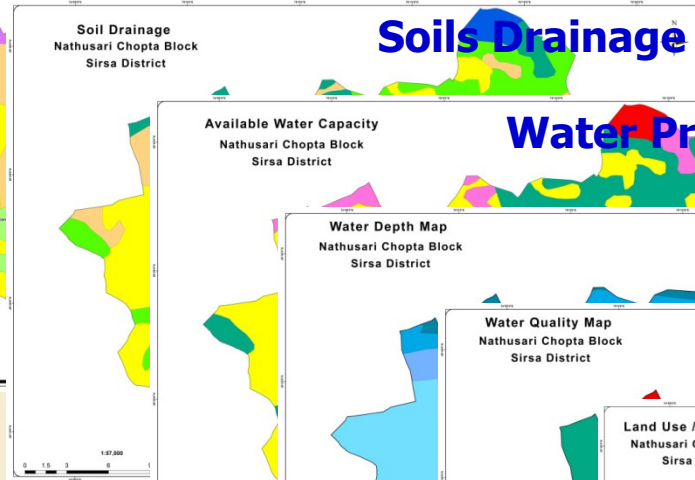
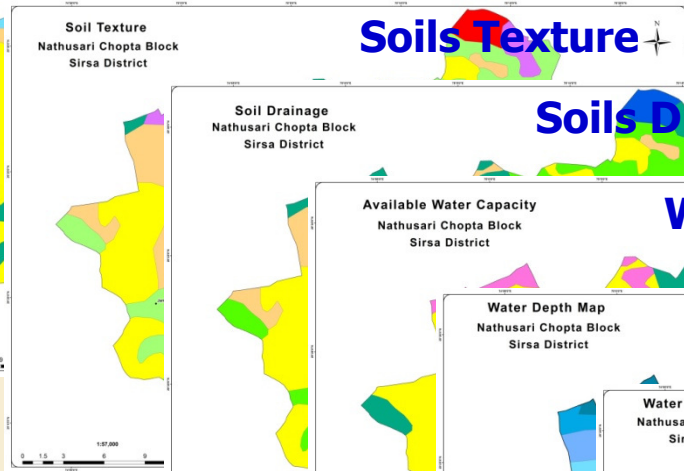
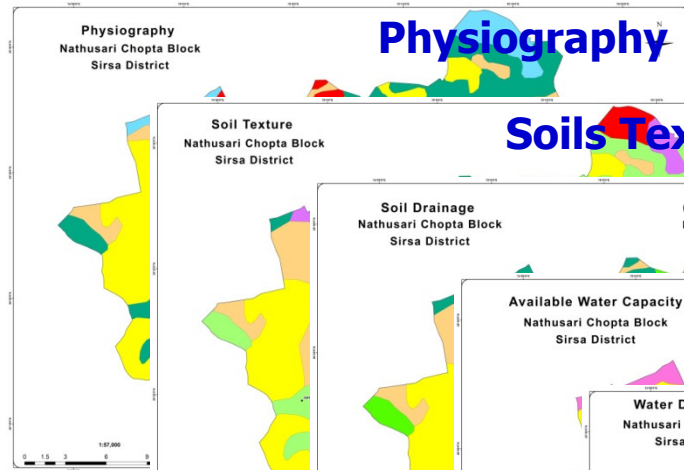
Strongly Salt affected soils

Moderately Salt affected soils

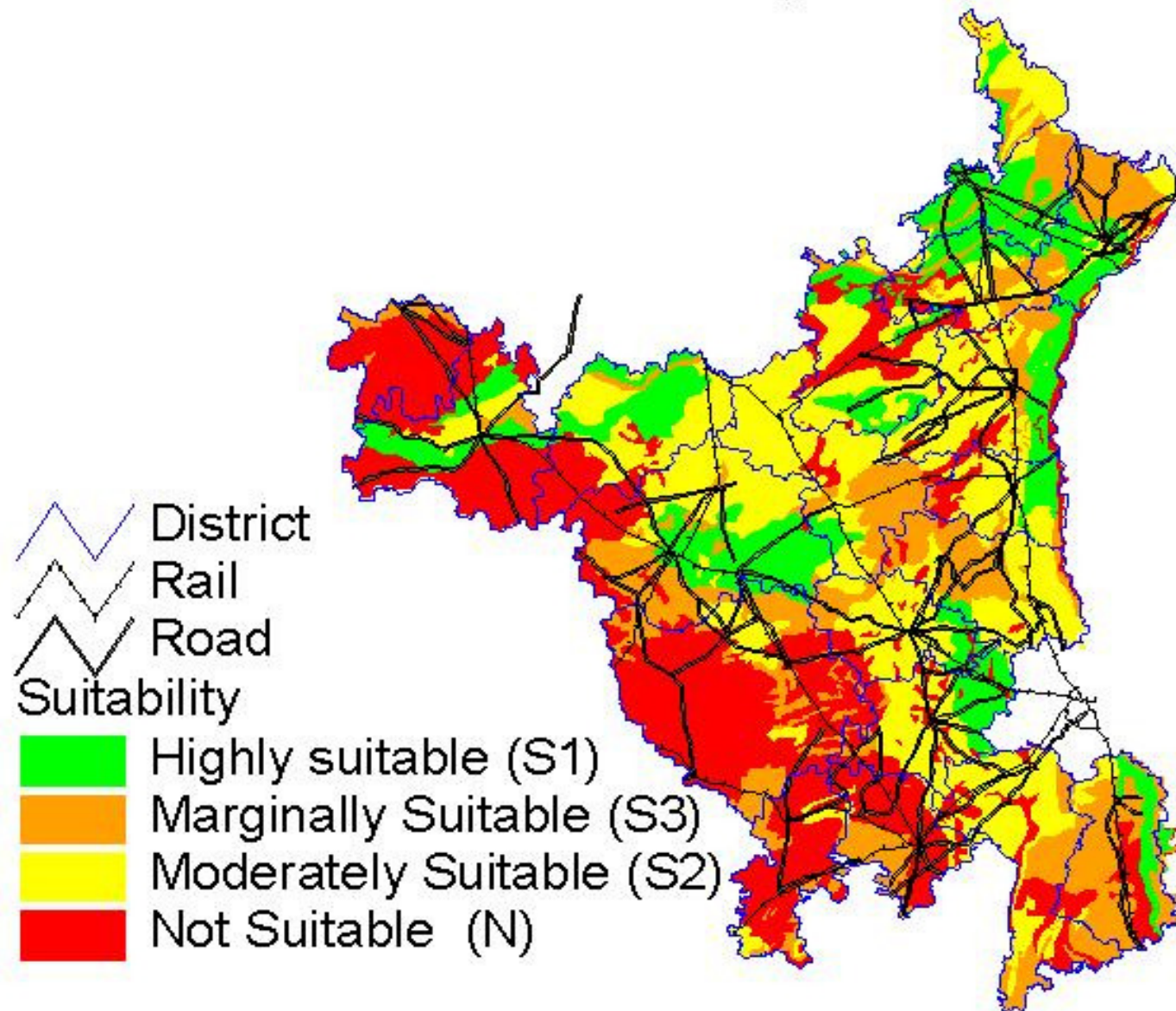
Waterlogged areas

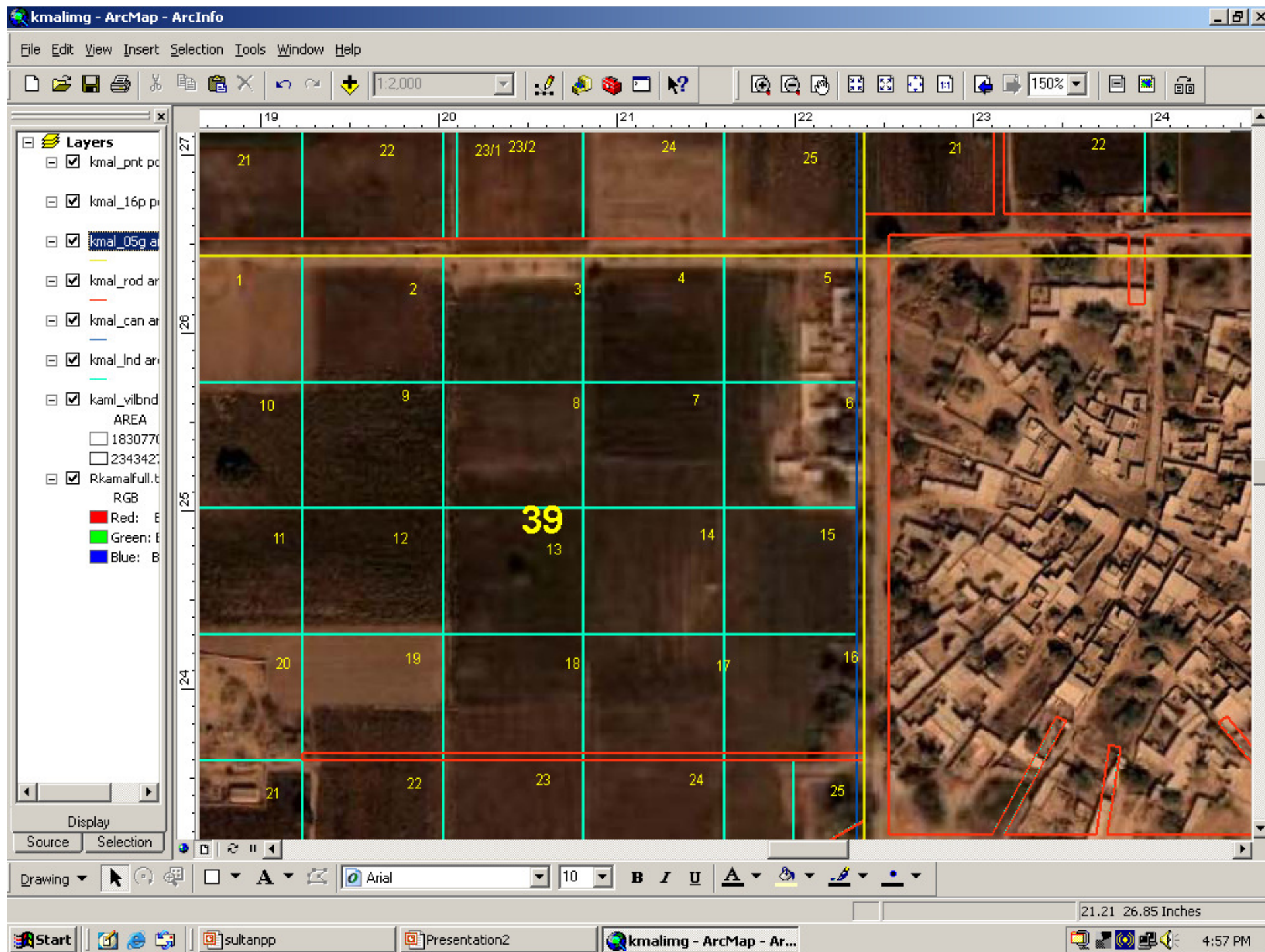


Preparation of Land Use Plan of Haryana (1: 50,000)



Site Suitability for Mulberry





kamal2 - ArcMap - ArcInfo

File Edit View Insert Selection Tools Window Help

0:0

100%

Layers

- E:\Removed
 - ☒ kamal_land
 - kamal_FINAL
- E:\Removed\
 - ☒ Rkamalfull.tif
 - RGB
 - Red: Band_1
 - Green: Band_2
 - Blue: Band_3

Identify Results

Layers: <Top-most layer>

☒ kamal_land

Location: (28300.040321 19700.691506)

Field	Value
code	038130000
KHEWAT	247
KHATONI	366
MUST	038
KHAS	130000
NAME	MUKHTAYAR SINGH
JAMABANDI_	
PROGRESS_R	
R_STATUS	
MUTATION_R	
KHASRA_GIR	
SAJRA_NASA	
ROZNAMCHA_	
LAL_QITAB	
RAIN_FALL	
C_PRICE	
UNIT_MEASU	
HOTO_HYPE	

Display Source Selection

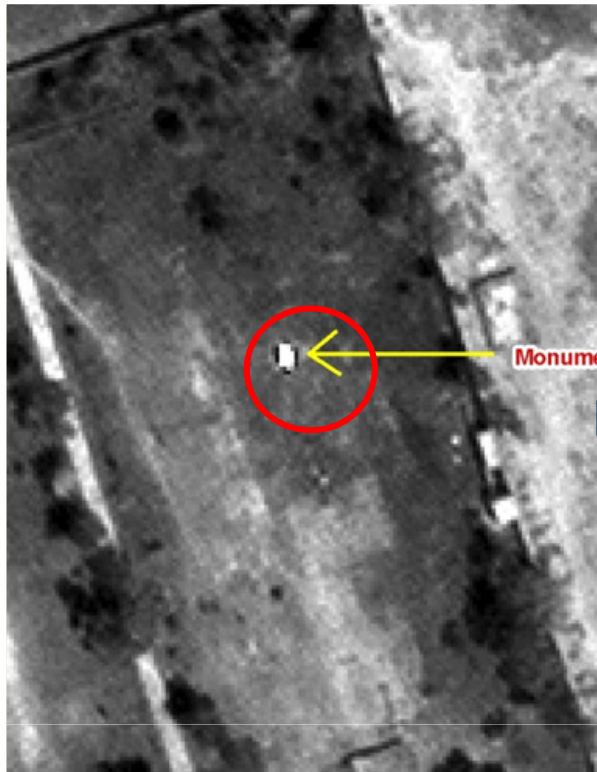
Drawing

Arial 10

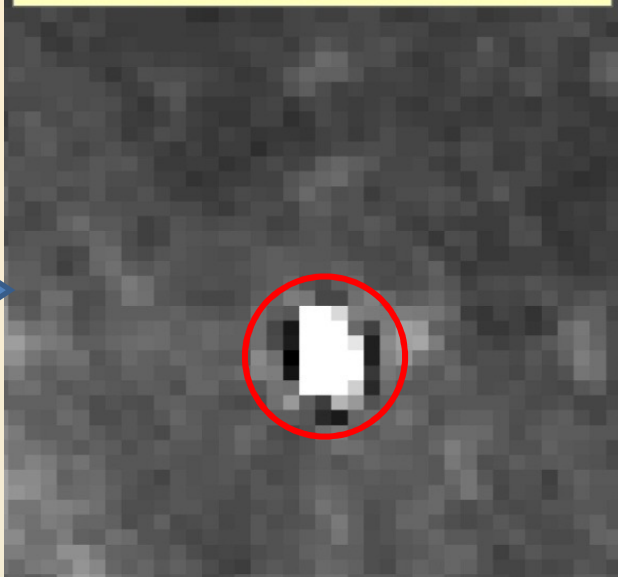
Display the properties of this layer

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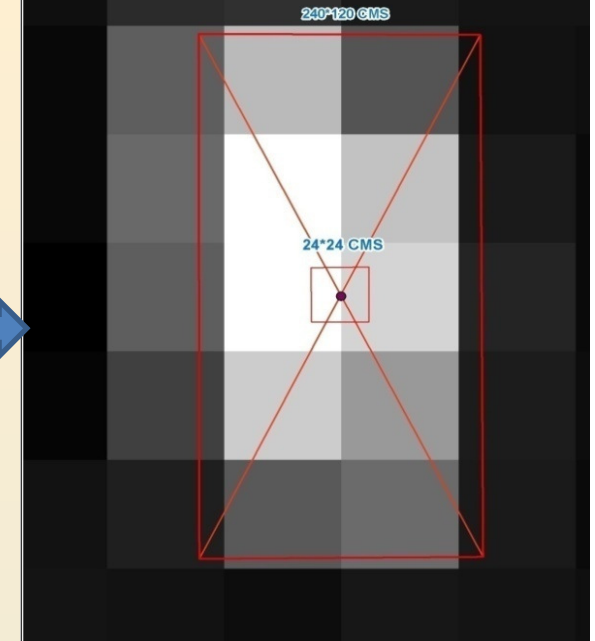
Start | New Volume (E:) | Microsoft Powe... | kamal | kamal2 - Arc... | ArcCatalog - Ar... | 5:57 PM



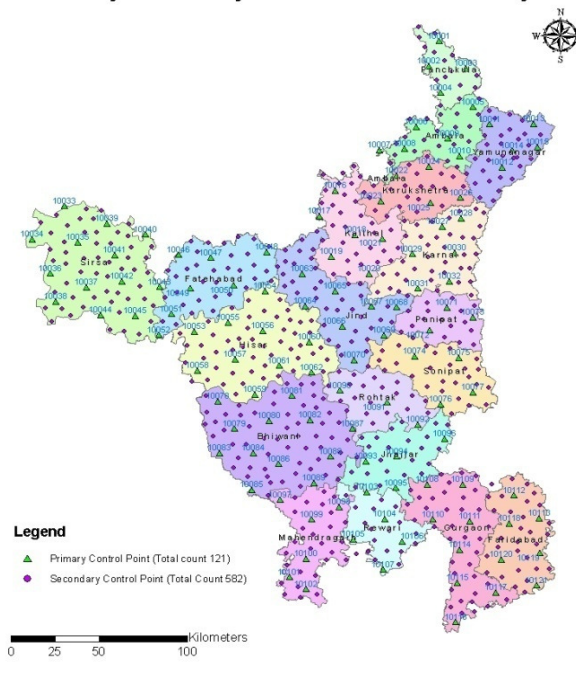
STRUCTURE OF MONUMENT UID 10056



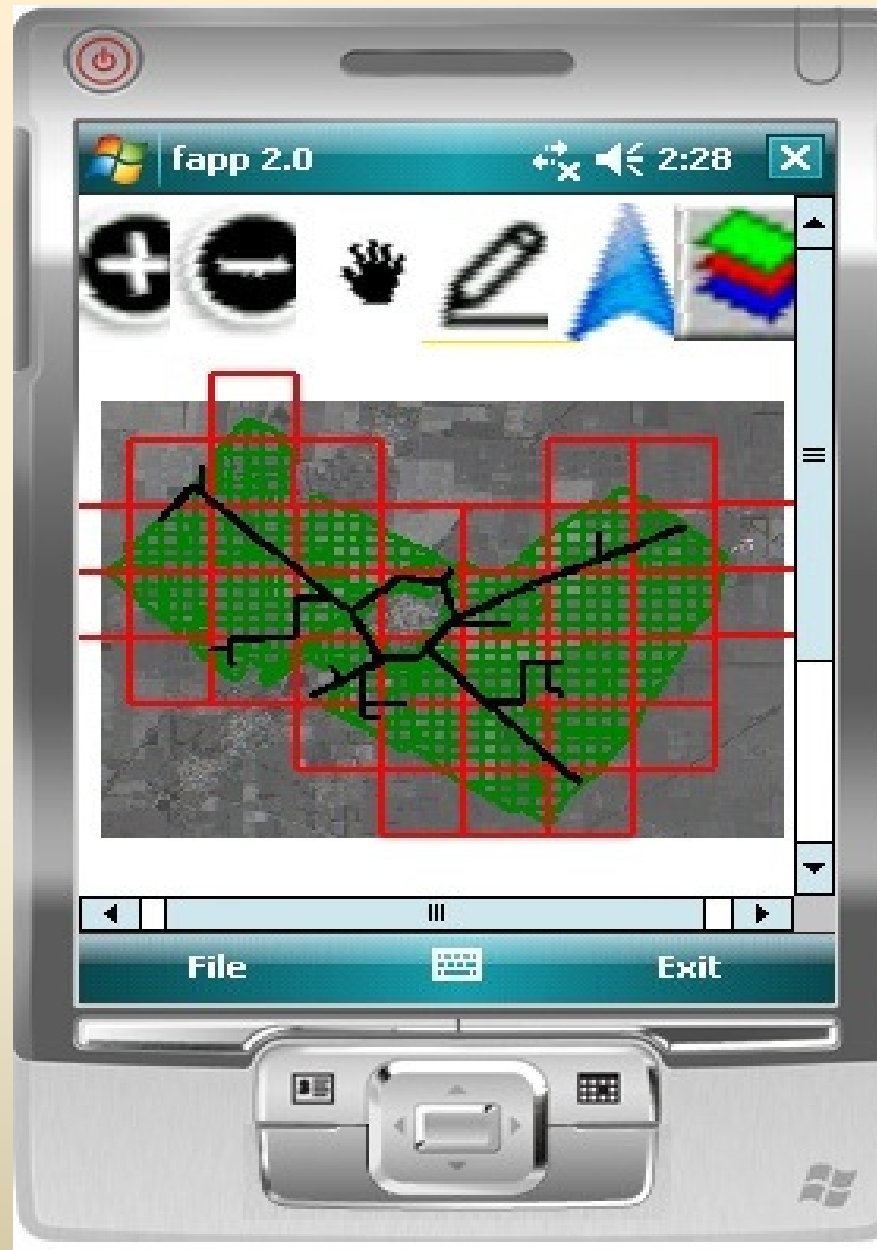
STRUCTURE OF MONUMENTATION UID 10056



Primary Secondary Point Distribution of Haryana



Future-ICT Patwari in Haryana



GPS enabled PDA device with updated digital Sajara & Revenue documents

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