MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -11/2009-10
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-2021

T 0 - T 1 - T 2 - T 3 - T 4 - T 5

AGRICULTURE & SOIL DIVISION
Andhra Pradesh Space Applications Centre (APSAC)
ITE&C Department Govt. of Andhra Pradesh

RURAL DEVELOPMENT AND WATERSHED MONITORING DIVISION
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Remote Sensing Application Area,
National Remote Sensing Centre, ISRO

DEPARTMENT OF LAND RESOURCES
Ministry of Rural Development
Government of India

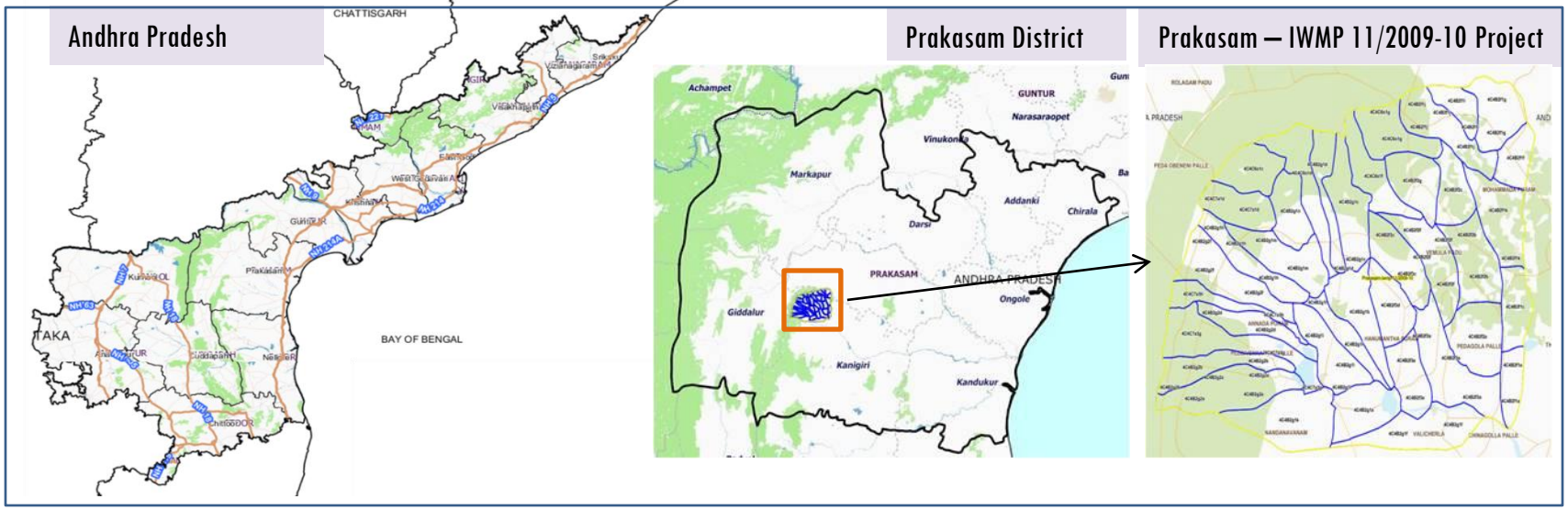
CONTENTS

EXECUTIVE SUMMARY

- Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).
- National Remote Sensing Centre (NRSC), ISRO has designed and developed Bhuvan Geo-ICT Web portal tools namely – Srishti and Drishti for monitoring and evaluation of IWMP watersheds. It uses high spatial and temporal resolution sensors viz., Carto-1/2(2.5 m) , LISS-IV(5.8 m color).
- Current summary report gives details of Project - IWMP-11/2009-10, Prakasam District of Andhra Pradesh. The total geographical area of the project is 18539.02 ha. It comprises of 38 micro watersheds.
- In the project area 10 Drishti photos were uploaded showing 2 check dams, 1 block plantations and 2 Fodder development.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 10 new farm ponds or dug out ponds with 60.41 ha increase in the area.
- Major percentage i.e. 30.50% is covered by the agriculture, 30.35% is covered by forest, 20.55% by scrubland, 15.10% by plantation and remaining by other land use classes.

PROJECT : PRAKASAM - IWMP-11/2009-10
DISTRICT : PRAKASAM , STATE : ANDHRA PRADESH

- The study area falls in Hanumanthunipadu Mandal of Prakasam district of Andhra Pradesh state. he total geographical area of the project is 18539.02 ha. It comprises of 38 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2009-10 (T0) period (***Batch -1***) projects taking 2017-18 (T5) period satellite images.



- Project area witnesses tropical wet and dry climate characterized by year round high temperatures. Prakasam has a record of reaching more than 46°C.
- The average annual rainfall of the district is 798.6 mm, monthly rainfall ranges from nil in March to 182.9 mm in October. October is the wettest month of the year. Southwest monsoon contributes significant rainfall in southern part of the district and Northeast monsoon contributes more than 70% of the rainfall.
- December is the coldest month with normal mean maximum temperature of about 27.1°c and mean minimum temperature of 19.2°C. Temperature begins to rise after February. May is the hottest month with mean daily maximum temperature of about 36.1°C and the mean daily minimum temperature of about 27.7°C. During May and early June the maximum temperature rises occasionally to 46°C and with the onset of SW monsoon by about second week of June, temperature begins to drop rapidly.

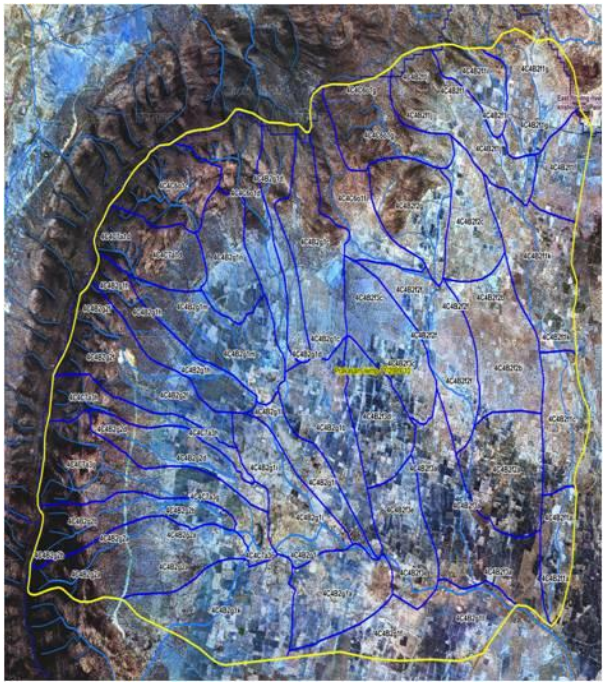
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			25-Oct-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			25-Oct-18
SCENE2			
SCENE 3			
SCENE 4			

Ancillary Data

	Category	Sub category	Status
1	Thematic maps		
	LULC (1: 10 000)		
		DRAIANGE	YES
		SETTLEMENT	YES
		ROADS/RAILS	No
	LULC (1: 50 000)		
		2005-06	
		2008-09	
2	Activity Plan Maps		
3	Drishti Photographs		
		Total	10
4	Detailed Project Report		

Natural Color Composite overlaid with Project boundaries and high detail stream network



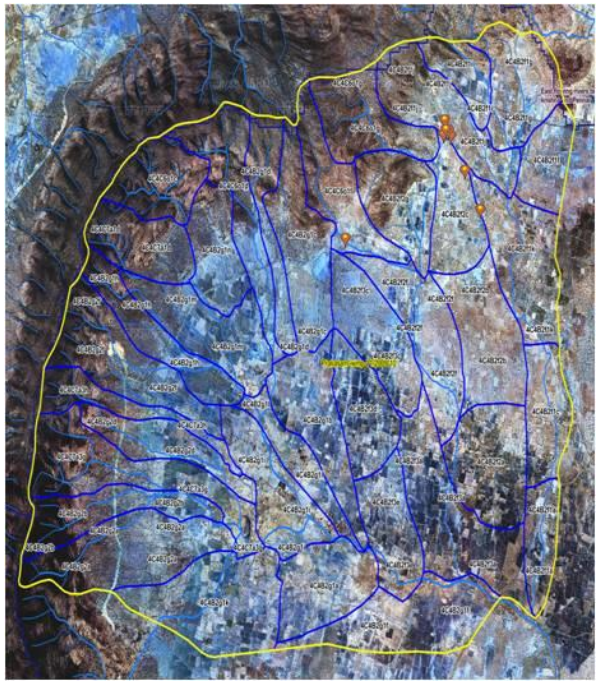
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	0	0
4	Block planting	1	1
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds /Dugout pit	*5*	*5*
11	Check dams	0	0
12	Rock fill dam	1	1
13	Percolation tanks / Ground water recharge structure	1	1
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	3	2
	TOTAL	**11**	**10**

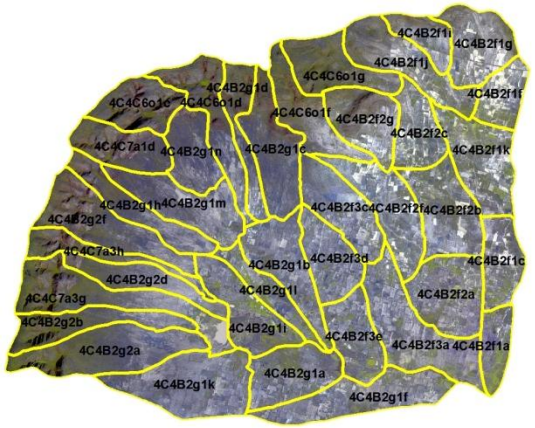
MONITORING IN THE PROJECT AREA

Site Wise Changes in the Project

- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

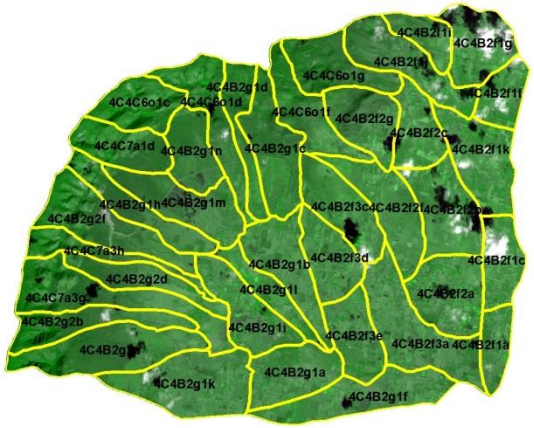
Natural Color Composite – 2009-10 to 2017-18

Natural Color Composite- 2009-10



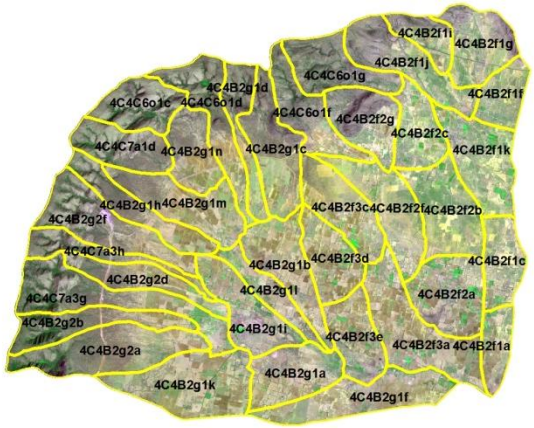
Source:Fusen data,NRSC

Natural Color Composite- 15th December 2013



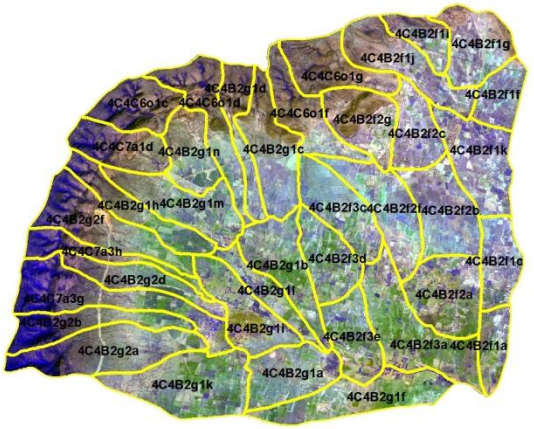
Source:Fusen data,NRSC

Natural Color Composite- 05th July 2015



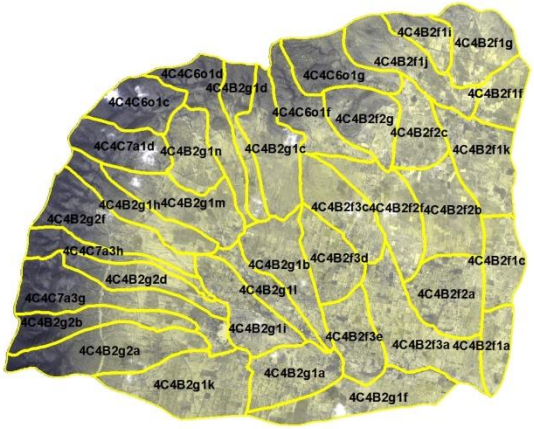
Source:LISS-IV,NRSC

Natural Color Composite- 18th October 2016



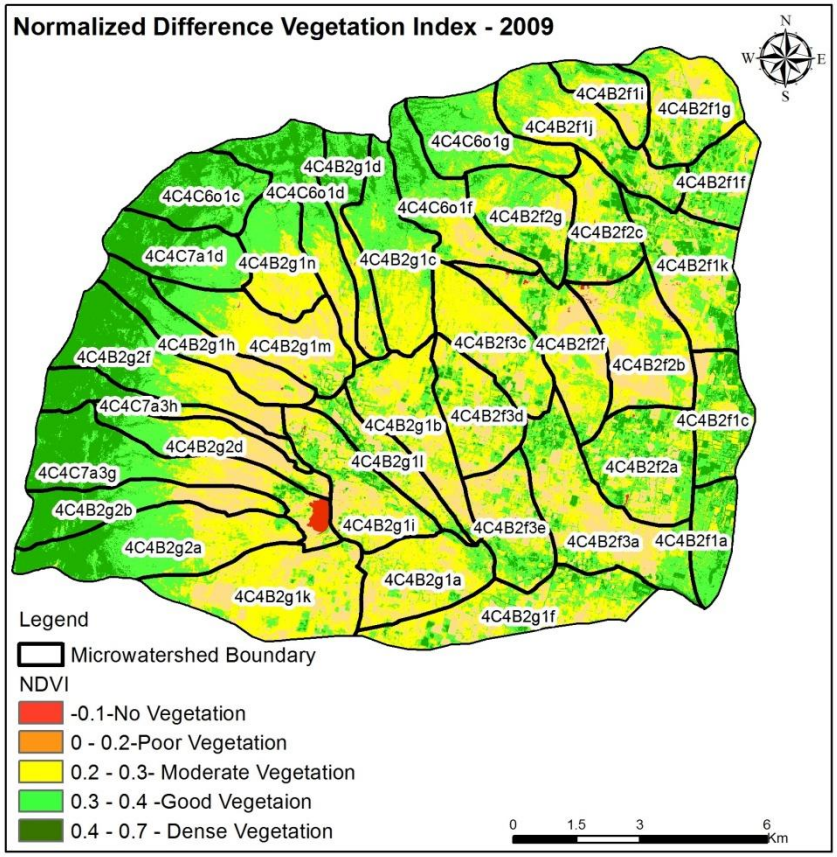
Source:LISS-IV,NRSC

Natural Color Composite- 25th October 2018

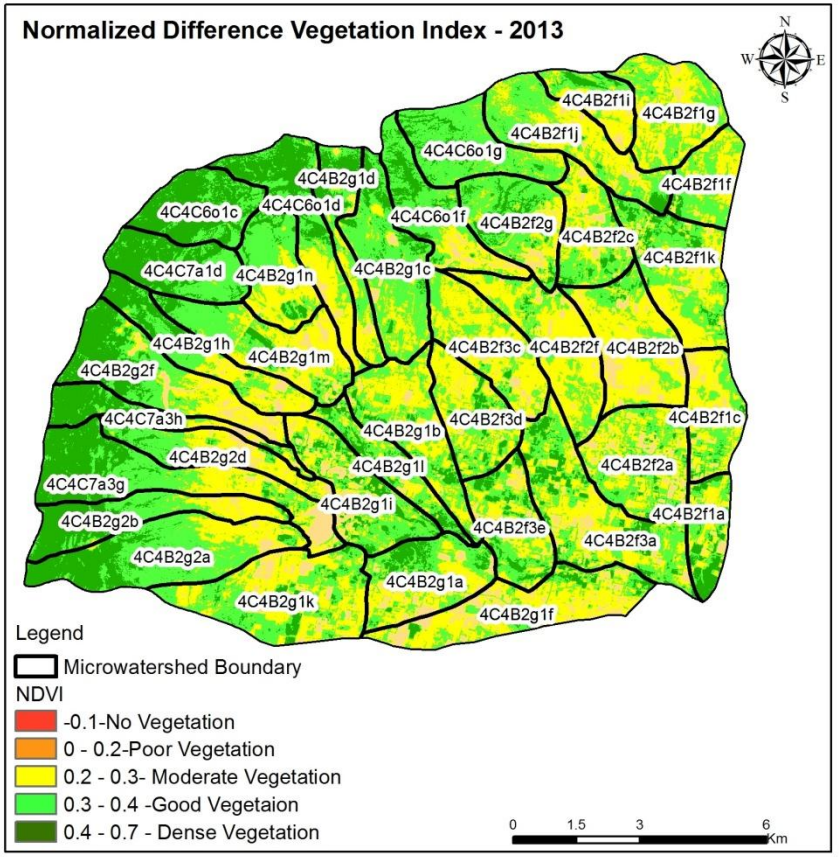


Source:LISS-IV,NRSC

Changes in Vegetation Cover

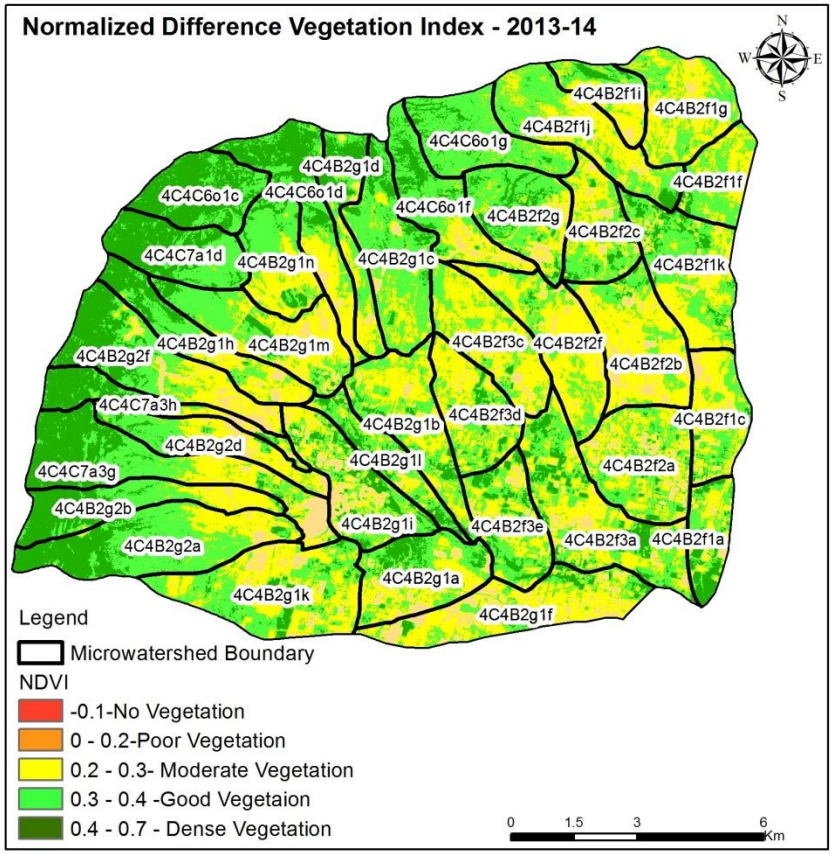


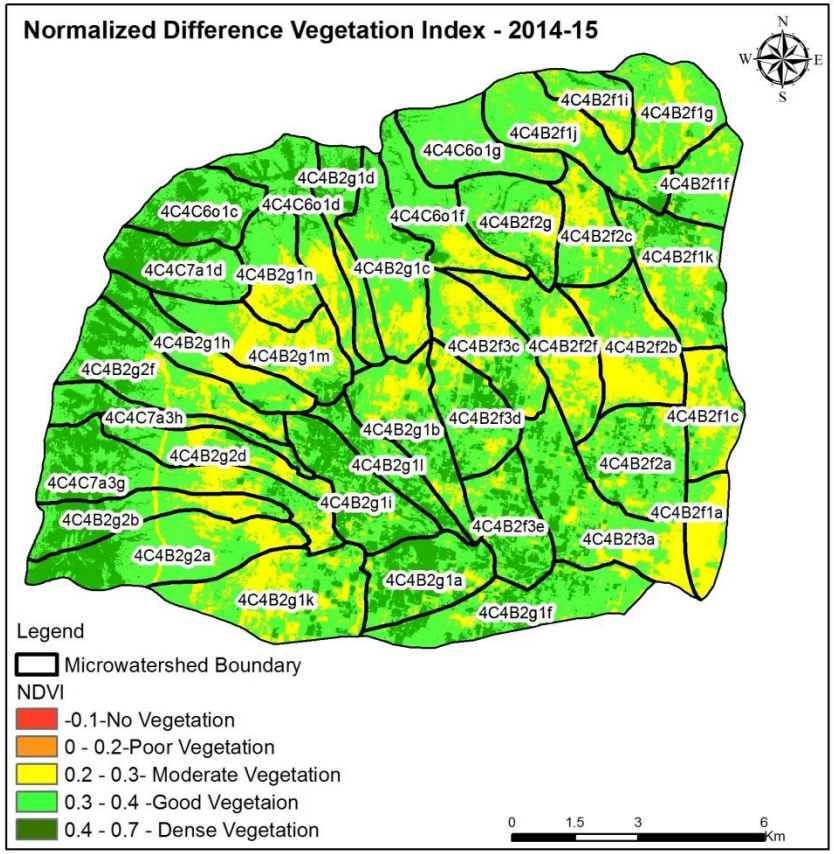
NDVI (2009-10)



NDVI (2013-14)

Changes in Vegetation Cover





Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-11/2009-10

T0:2009-10

T1: 26 February 2013

Drishti Sl no. 700843 MWS :4C4c6o1f

Percolation tank

T0:2009-10

T1: 26 February 2013

Drishti Sl no.700884 MWS : 4C4B2f2c

Rockfill dam

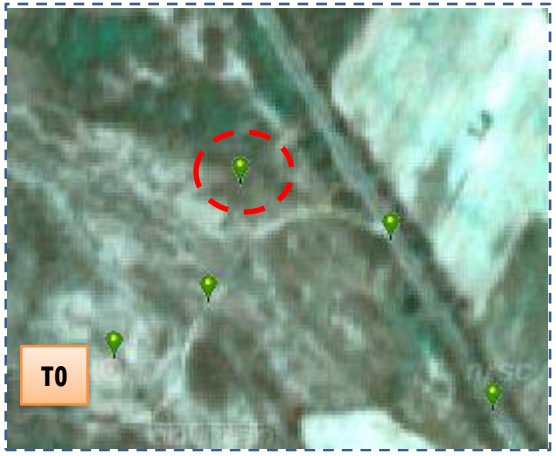
Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-11/2009-10

T0: 2009-10

T1: 26 February 2013

Drishti Sl no. 700895 MWS :4C3C1f

Plantation



T0: 2009-10

T1: 26 February 2013

Drishti Sl no. 700887 MWS :4C4B2f1j

Dug out pit

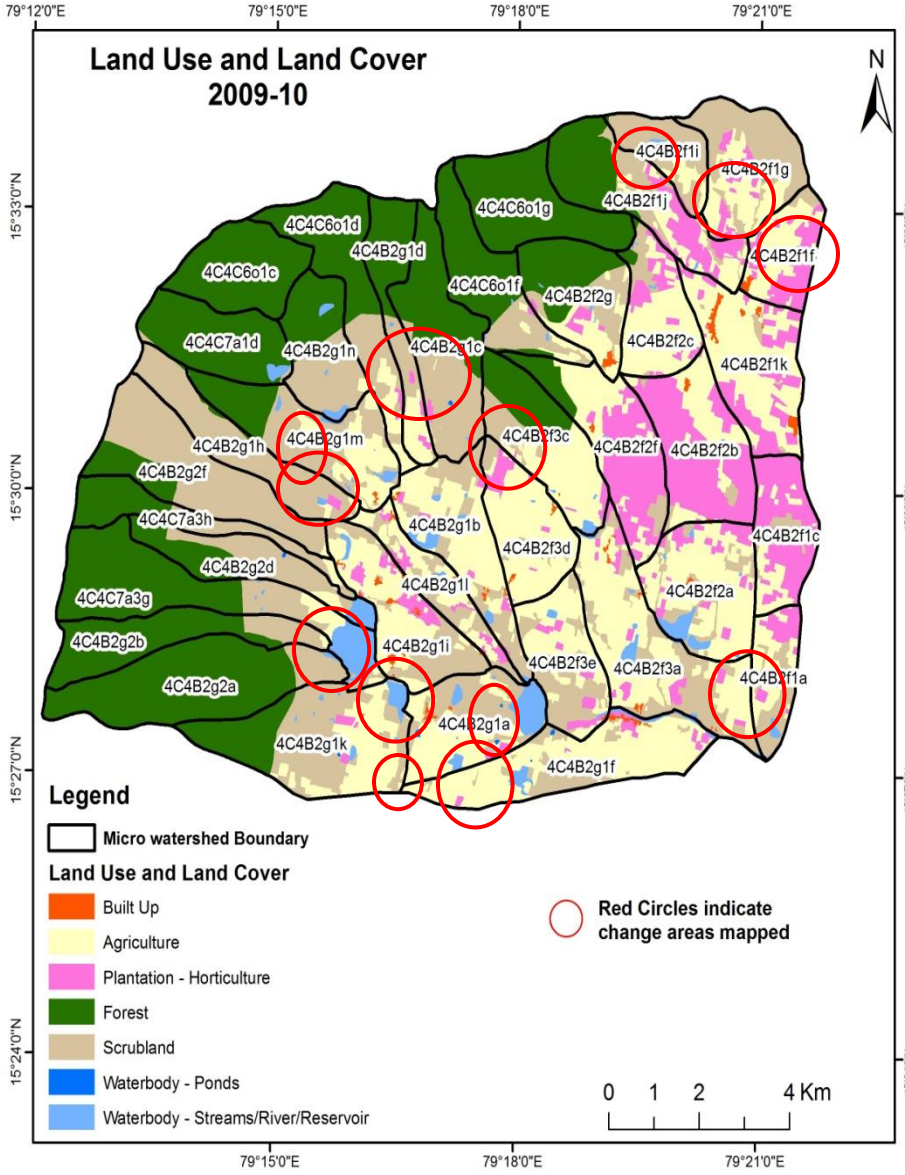
MONITORING IN THE PROJECT AREA

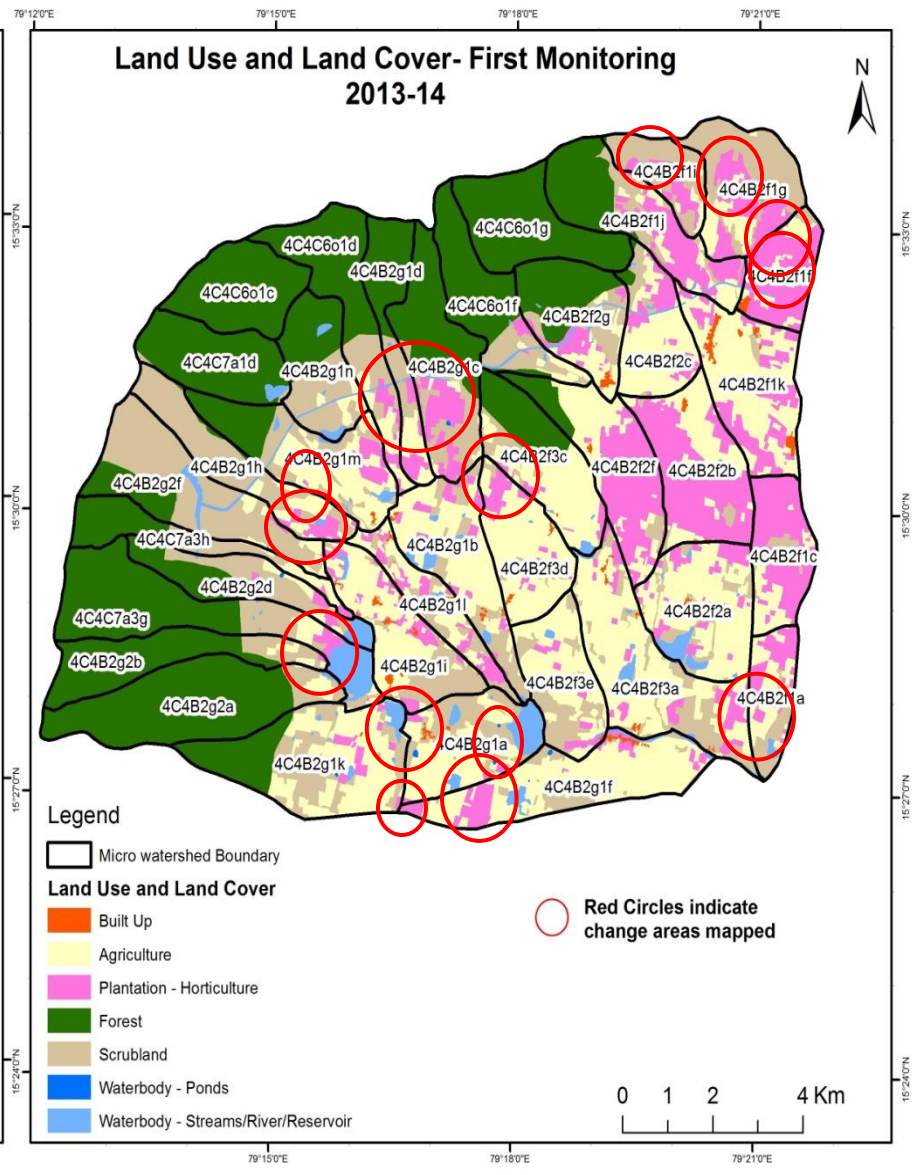
Land use and Land cover Changes in the Project

- Change in land use and land cover form T0 to T5 are analyzed in terms of built up, mining/dump, agriculture , plantation- horticulture, forest, barren rocky waterbody-streams/river/reservoir and waterbody –ponds.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.
- The result obtained for the period T0 to T5 are given in the change matrix table.
- In matrix table column represents the pre implementation period as T0 (2009-10) and row represents the post implementation period as T5 (2017-18) .

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

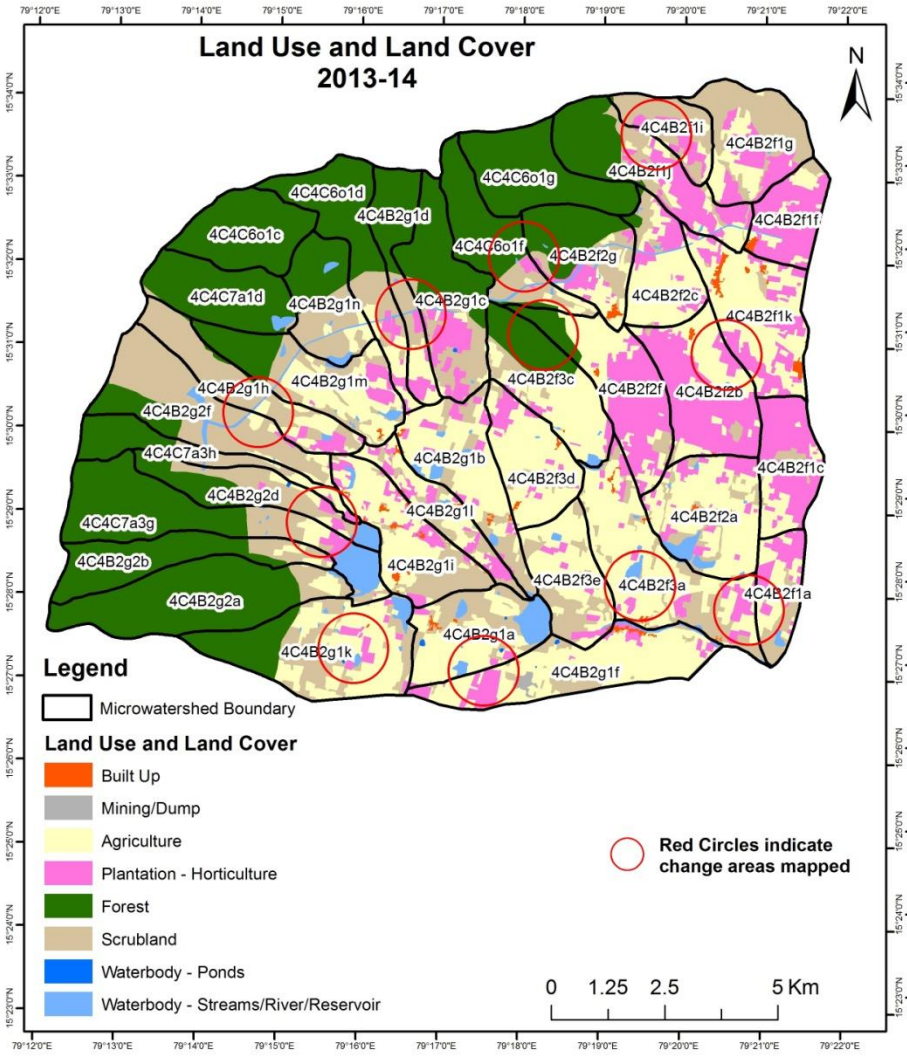
Scale: 1:10000

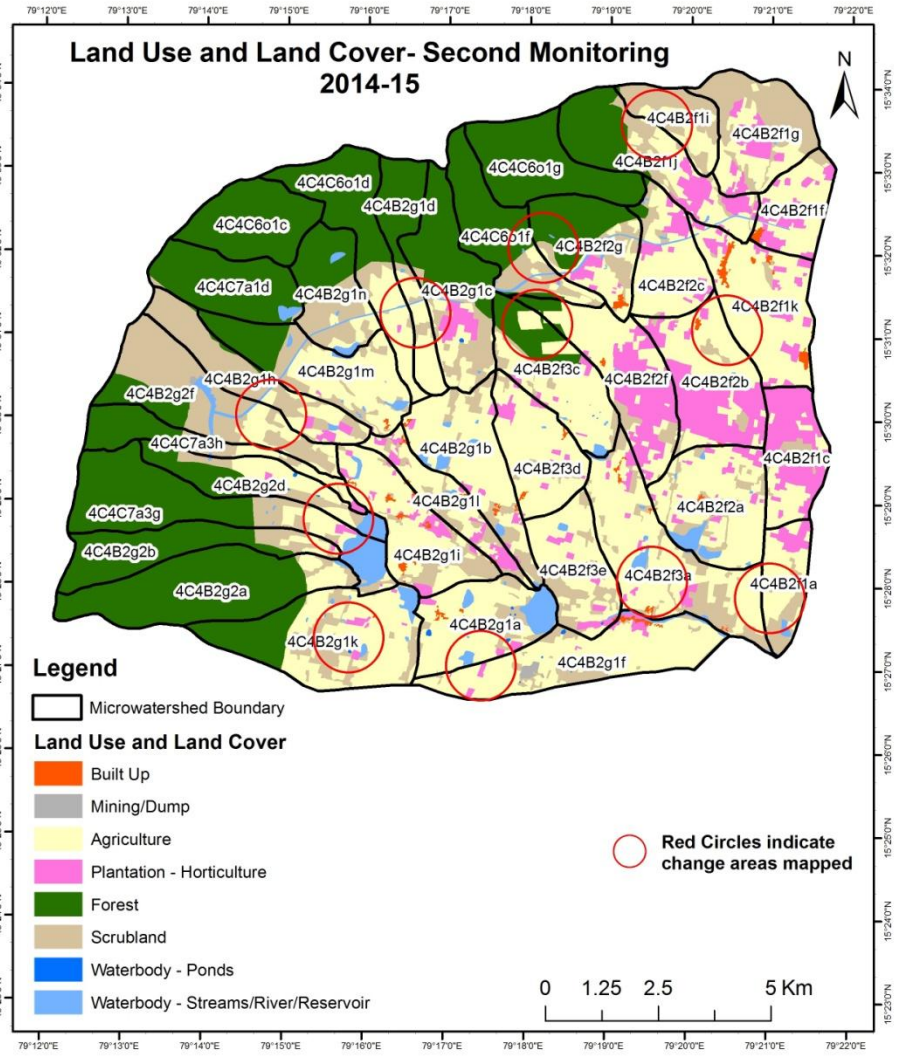




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

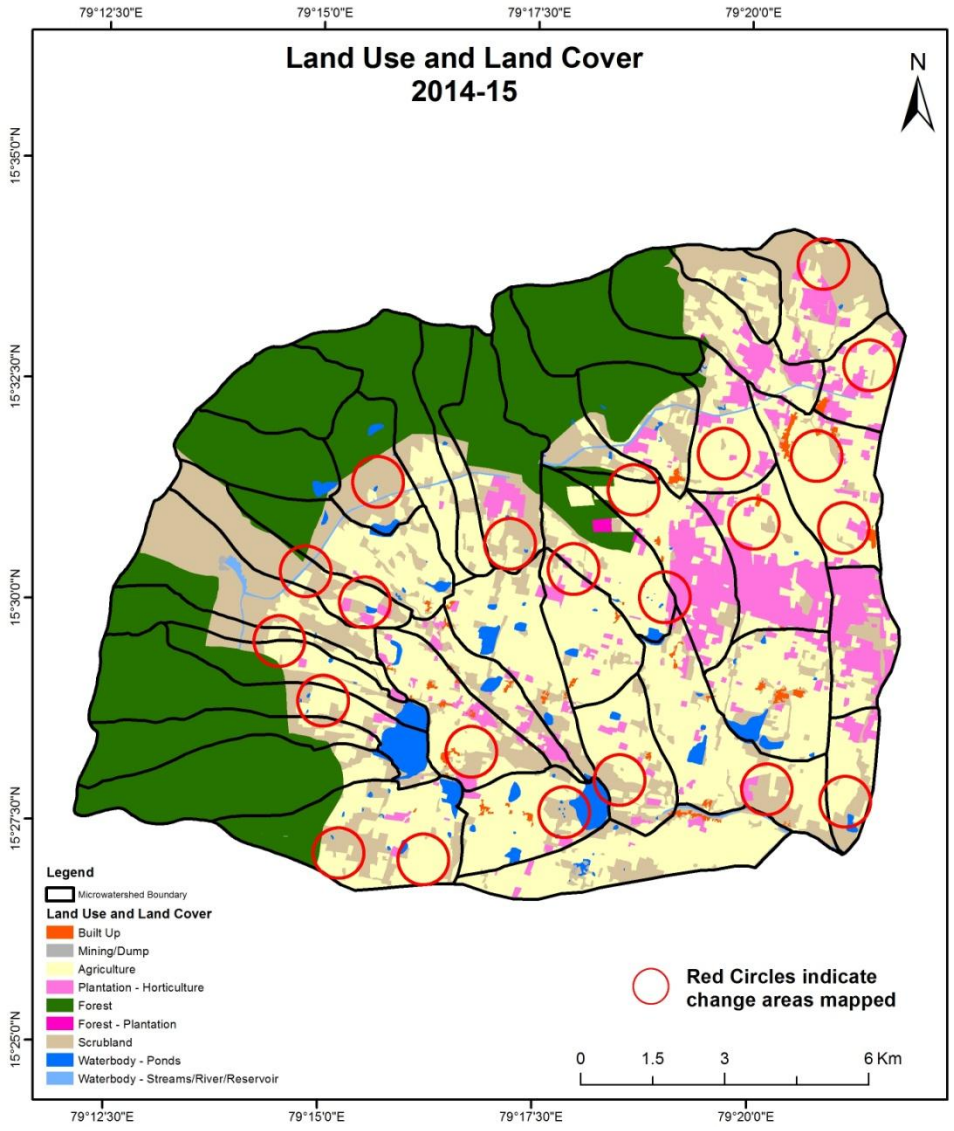
Scale: 1:10000

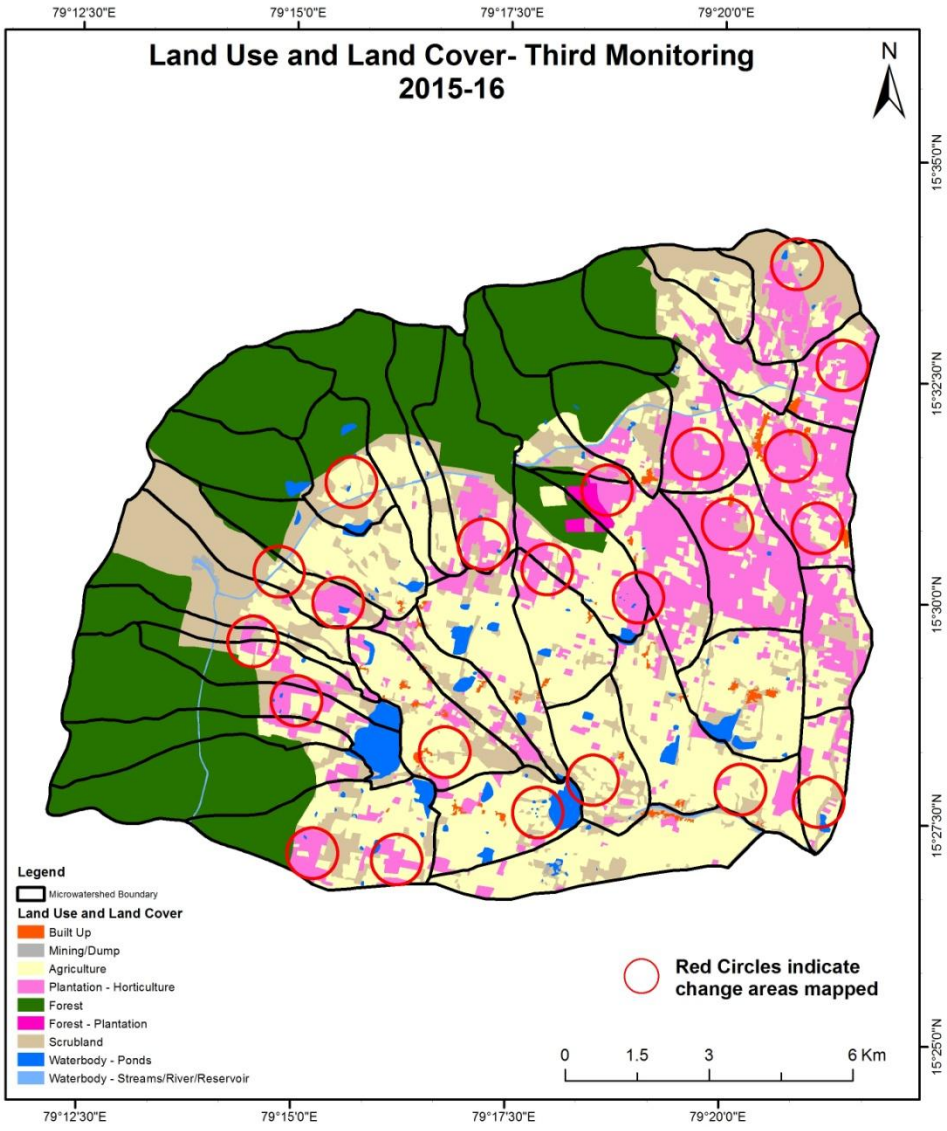




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

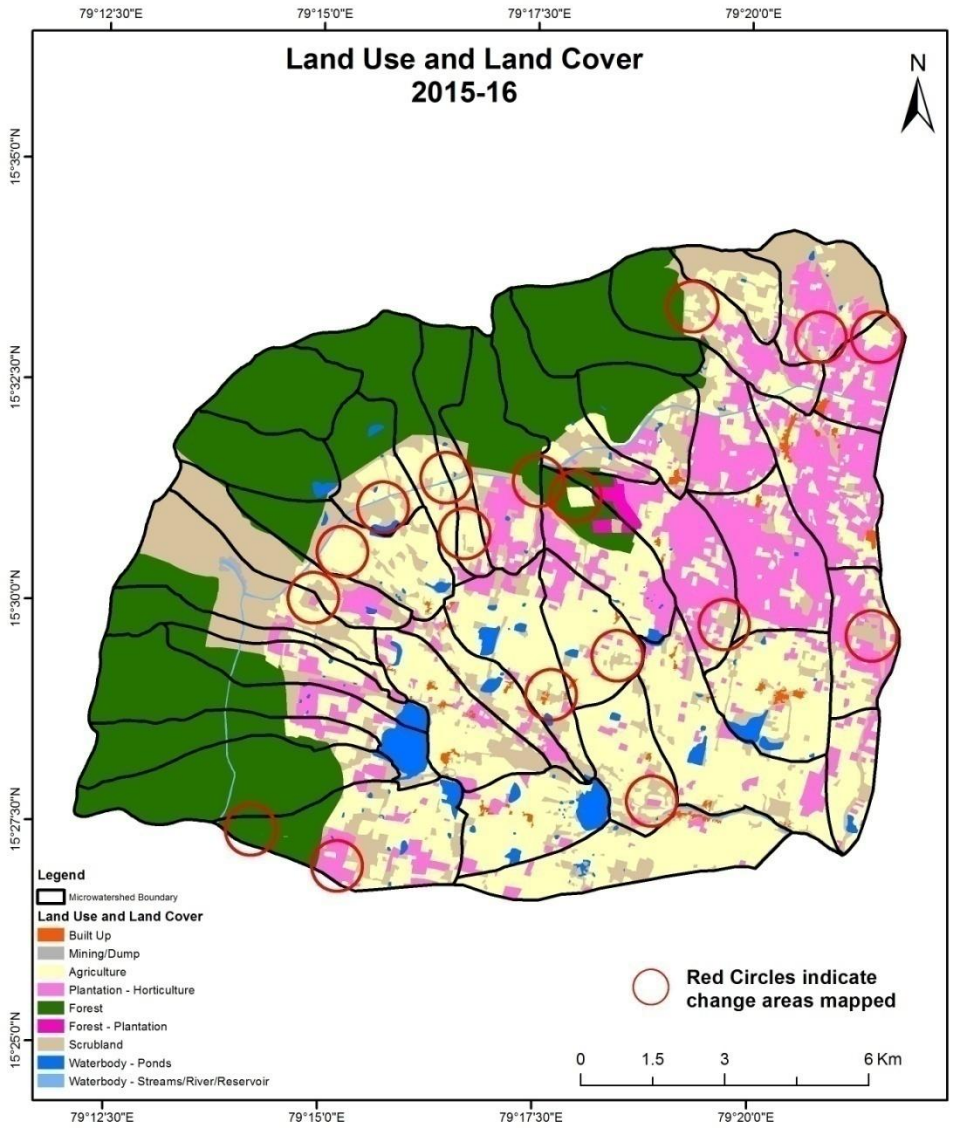
Scale: 1:10000

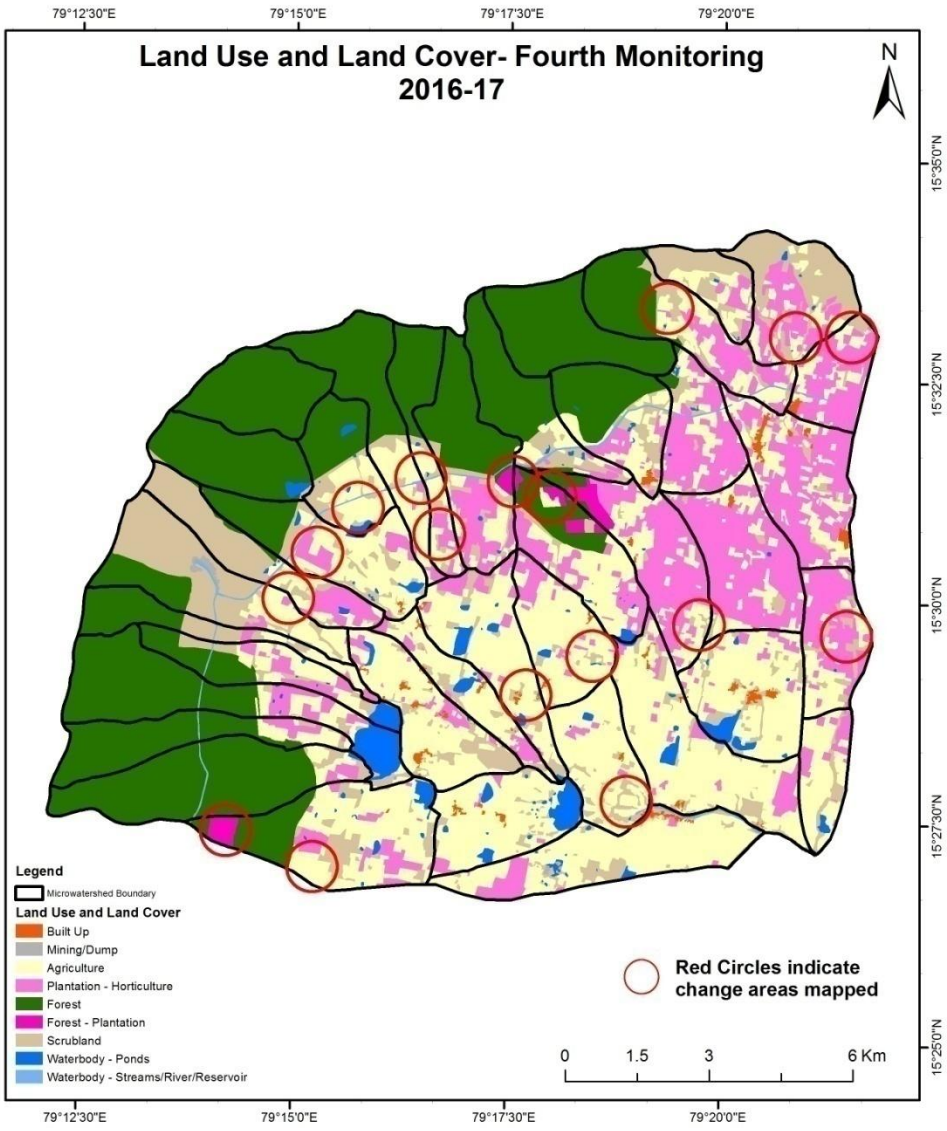




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

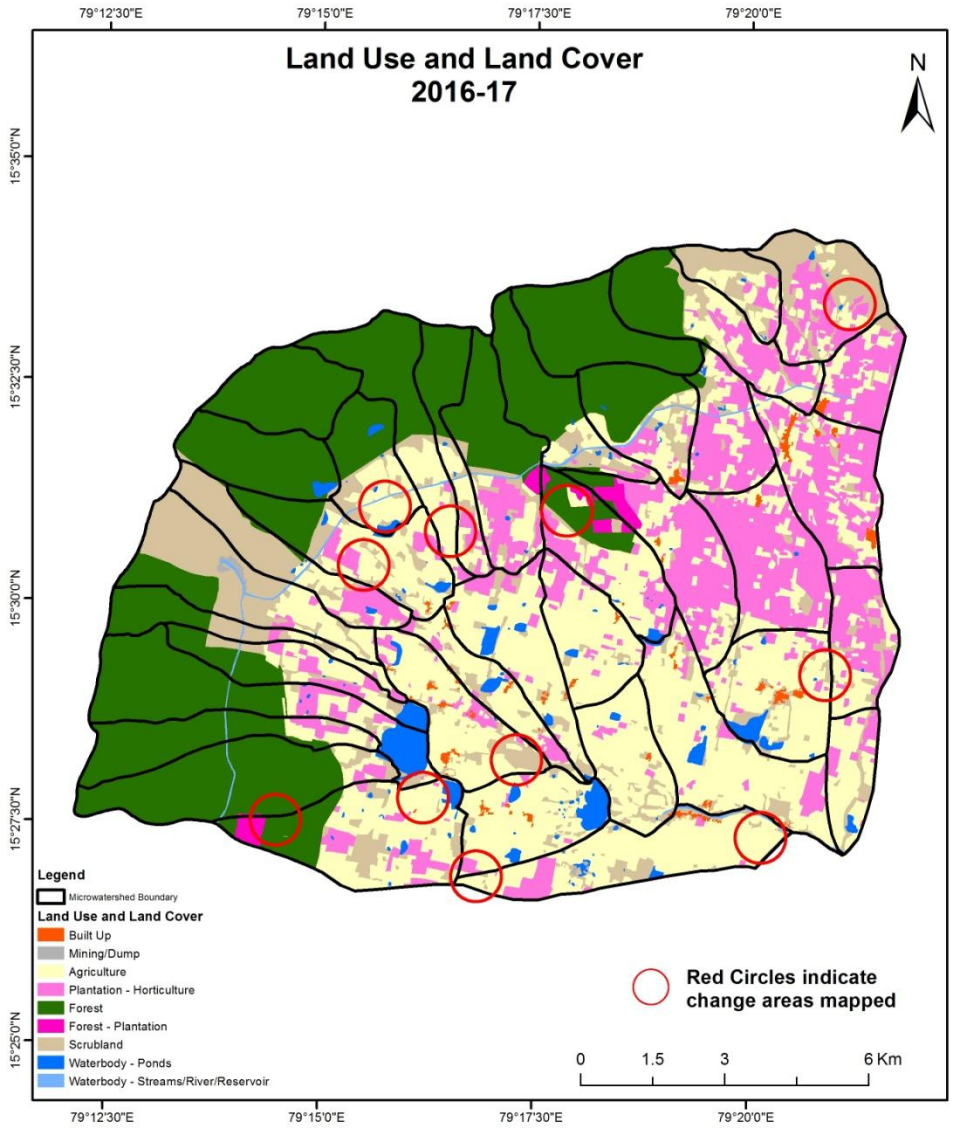
Scale: 1:10000

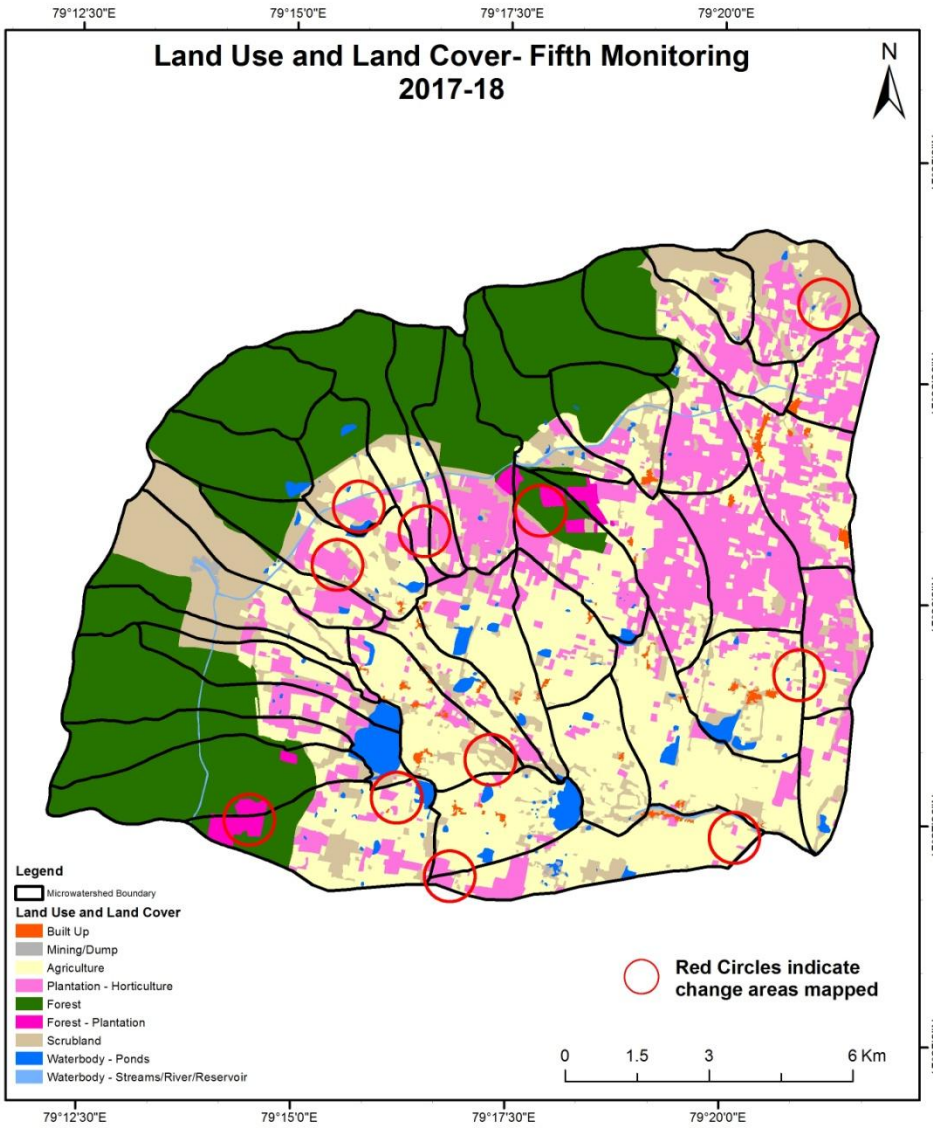




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000





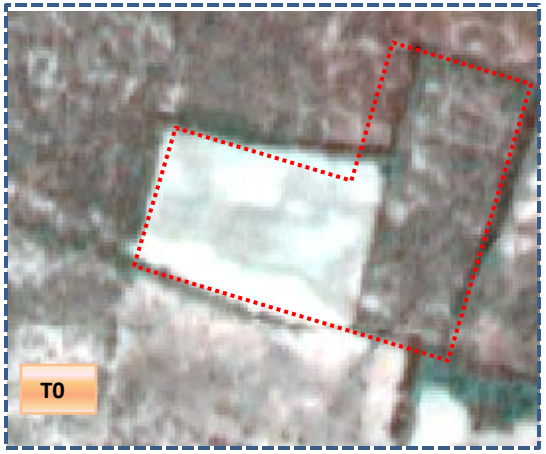
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

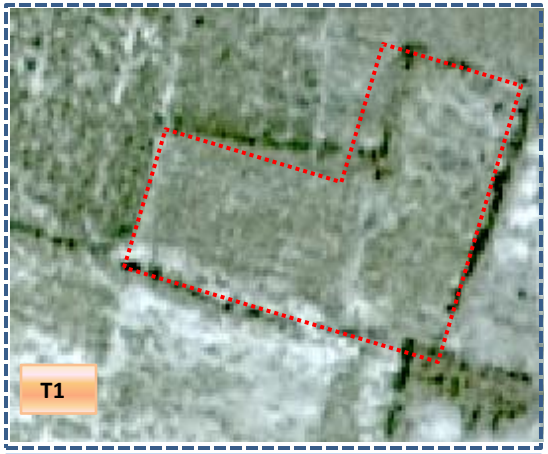
T0: 2009-10

T1: 26 Feb 2013

Agriculture to Plantation



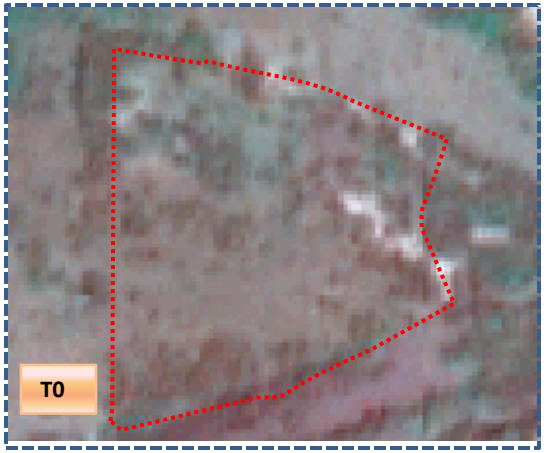
T0: 2009-10



T1: 26 Feb 2013

Land Use and Land Cover changes for Pre and Post treatment dates

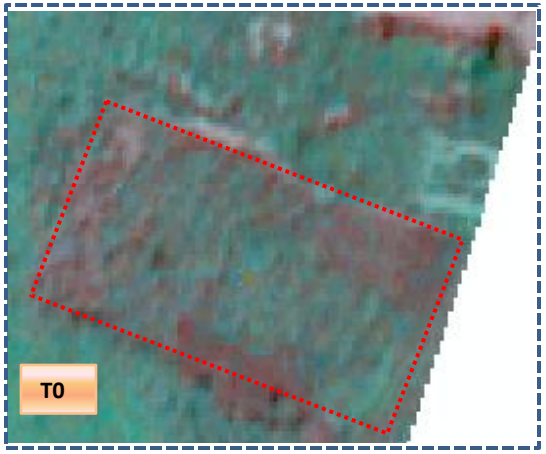
Scrub to Agriculture



T0: 2009-10

T1: 26 Feb 2013

Scrub to Agriculture

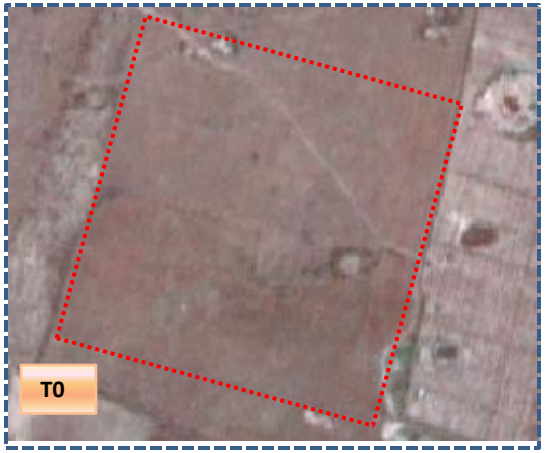


T0: 2009-10

T1: 26 Feb 2013

Land Use and Land Cover changes for Pre and Post treatment dates

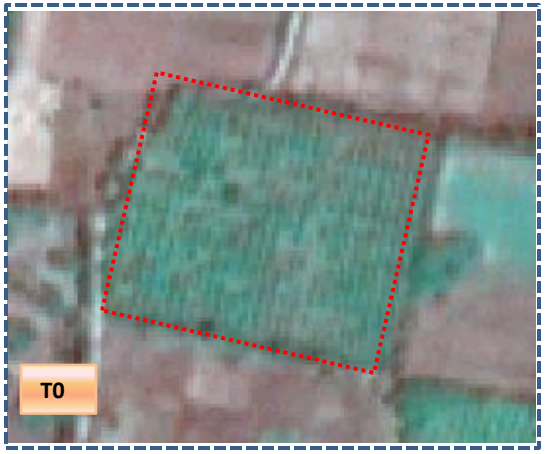
Agriculture to Plantation



T0: 2009-10

T1: 26 Feb 2013

Plantation to Agriculture

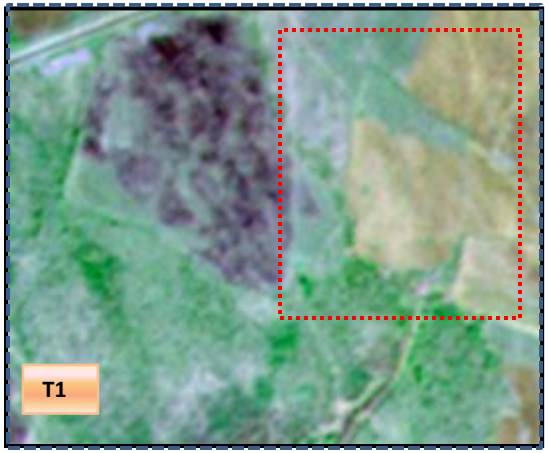


T0: 2009-10

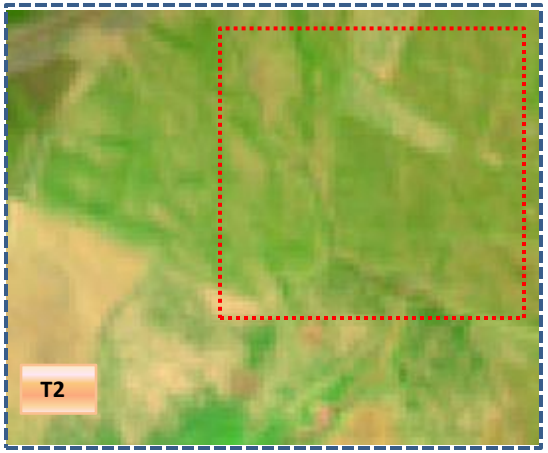
T1: 26 Feb 2013

Land Use and Land Cover changes for Pre and Post treatment dates

Fallow to Agriculture



T1: 2013



T2: 26 October 2014

Fallow to Agriculture

T1: 2013

T2: 26 October 2014

Table showing change matrix depicting Land cover transitions during study period-2009-10 to 2013-14

Land cover	Monitoring period (T1)										Units in Hectares
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	101.63										**101.63**
Mining/dump		3.04									**3.04**
Agriculture	4.45		4668.33	688.30				6.13	15.12		**5382.34**
Plantation Horticulture	0.44		136.26	1706.67					1.28		**1844.66**
Forest			1.99		5620.81	0.48					**5623.28**
Forest Plantation											
Barren Rocky											
Scrub	1.75		793.58	251.76				4035.41	42.98		**5125.48**
Waterbody-Streams/River									22.40		**22.40**
Waterbody – Ponds			7.18	4.23						424.93	**436.34**
Grand Total	**108.27**	**3.04**	**5607.35**	**2650.96**	**5620.81**	**0.48**		**4041.54**	**81.79**	**424.93**	**18539.18**

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T0 714 ha of agriculture are decreased and it is converted into built-up, plantation, scrub and water body and in T1.
- In T1 939 ha of agriculture are increased from plantation, forest scrubland and water body of T0.
- The additional agriculture are coming from waterbody in T1 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2013-14 to 2014-15

Land cover	Monitoring period (T2)										Units in Hectares
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	108.27										**108.27**
Mining/dump		3.04									**3.04**
Agriculture	0.65		5581.89	14.52				9.74		0.55	**5607.35**
Plantation Horticulture			1123.97	1526.74						0.25	**2650.96**
Forest			64.25		5543.93	12.62					**5620.81**
Forest Plantation						0.48					**0.48**
Barren Rocky											
Scrub	0.15	3.88	625.55					3410.87		1.09	**4041.54**
Waterbody-Streams/River									81.79		**81.79**
Waterbody – Ponds										424.93	**424.93**
Grand Total	**109.07**	**6.92**	**7395.67**	**1541.27**	**5543.93**	**13.10**		**3420.61**	**81.79**	**426.82**	**18539.18**

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T1 25 ha of agriculture are decreased and it is converted into built-up, plantation, scrubland and water body in T2.
- In T2 1813 ha of agriculture are increased from plantation, scrub land and forest of T1.
- The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2014-15 to 2015-16

Land cover	Monitoring period (T3)										Units in Hectares
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	109.07										**109.07**
Mining/dump		6.92									**6.92**
Agriculture	0.33		5718.69	1632.29		43.68				0.68	**7395.67**
Plantation Horticulture			140.55	1400.72							**1541.27**
Forest			12.50		5518.82				12.61		**5543.93**
Forest Plantation			2.00			11.10					**13.10**
Barren Rocky											
Scrub		6.84	474.14	130.30				2804.36	0.70	4.26	**3420.61**
Waterbody-Streams/River									81.79		**81.79**
Waterbody – Ponds			5.28							421.54	**426.82**
Grand Total	**109.40**	**13.76**	**6353.16**	**3163.30**	**5518.82**	**54.78**		**2804.36**	**95.10**	**426.48**	**18539.18**

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T2 1676 ha of agriculture are decreased and it is converted into built-up, plantation, forest plantation and water body area in T3.
- In T3 634 ha of agriculture are increased from scrub land, plantation, forest and water body of T2.
- The additional agriculture are coming from waterbody in T3 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2015-16 to 2016-17

Land cover	Monitoring period (T4)										Units in Hectares
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	109.40										**109.40**
Mining/dump		13.76									**13.76**
Agriculture	0.08		6032.63	303.64		11.30				5.51	**6353.16**
Plantation Horticulture	0.39		265.46	2896.49						0.96	**3163.30**
Forest			5.64		5455.79	56.16			1.23		**5518.82**
Forest Plantation			0.48			54.30					**54.78**
Barren Rocky											
Scrub	0.62	1.73	332.91	51.52				2409.72	0.93	6.92	**2804.36**
Waterbody-Streams/River									95.10		**95.10**
Waterbody – Ponds			12.96							413.52	**426.48**
Grand Total	**110.48**	**15.50**	**6650.10**	**3251.65**	**5455.79**	**121.76**		**2409.72**	**97.27**	**426.91**	**18539.18**

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T3 320 ha of agriculture are decreased and it is converted into Built-up, plantation, forest and water body in T4.
- In T4 617 ha of agriculture are increased from scrub land, plantation, forest and waterbody of T3.
- The additional agriculture are coming from waterbody in T4 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2016-17 to 2017-18

Land cover	Monitoring period (T5)										Units in Hectares
T4	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	110.48										**110.48**
Mining/dump		15.50									**15.50**
Agriculture			6272.30	368.53		9.27					**6650.10**
Plantation Horticulture	0.33		265.42	2985.90							**3251.65**
Forest					5407.14	48.65					**5455.79**
Forest Plantation			8.89			112.88					**121.76**
Barren Rocky											
Scrub	0.86	3.59	77.21	16.68				2311.28		0.09	**2409.72**
Waterbody-Streams/River									97.27		**97.27**
Waterbody – Ponds										426.91	**426.91**
Grand Total	**111.68**	**19.09**	**6623.81**	**3371.11**	**5407.14**	**170.80**		**2311.28**	**97.27**	**427.00**	**18539.18**

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T4 377 ha of agriculture are decreased and it is converted into plantation, forest and water body in T5.
- In T5 351 ha of agriculture are increased from scrub land, plantation and forest of T4.
- The additional agriculture are coming from waterbody in T5 represents seasonal agriculture.

Conclusion

1. DPR of the project is uploaded on to Bhuvan Portal.
2. The LULC shows that there is an increase in Crop land, Built up area, Reservoir / Tanks & decrease in Scrubland as presented in the change matrix for different years.
3. There is an decrease of 65 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
4. There is an increase of 39, 202, 124, 165 & 47 Hectares From T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 1241 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a increase of 1526 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 2814 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (28) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (37) verified from the portal.