MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -48/2011-12
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-2022

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
Land Resources and Land Use Mapping and Monitoring Group, Remote Sensing Application Area, National Remote Sensing Centre, ISRO

DEPARTMENT OF LAND RESOURCES
Ministry of Rural Development Government of India

C O N T E N T S

- **E X E C U T I V E   S U M M A R Y**

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-48/2011-12, Prakasam District of   Andhra Pradesh.   The total geographical area of the project is **6,698** ha.   It comprises of 12 micro watersheds.

- In the project area 342 Drishti photos were uploaded showing 27 check dams, 2 Farm ponds/Percolation tanks, 31 entry point activities, 1 livelihood activities, 2 checks & plugins and 266 others.

- Water bodies have shown an increased by 22 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.

- Major percentage i.e. 36 % is covered by the Forest, 27% is covered by Agriculture, 28% covered by Scrub and remaining by other land use classes.

PROJECT : PRAKASAM - IWMP-48/2011-12
DISTRICT : PRAKASAM , STATE : ANDHRA PRADESH

- The study area falls in Bestavaripeta Mandal of Prakasam district of Andhra Pradesh state.   The total geographical area of the project is **6,698** ha. It comprises of 12micro watersheds. Location Map of the study area is shown in Figure below Analysis is done for 2011-12 (T0) period (*Batch -1*) projects taking 2019-20 (T5) period satellite images.

Andhra Pradesh | Prakasam District | Prakasam – IWMP48/2011-12 Project
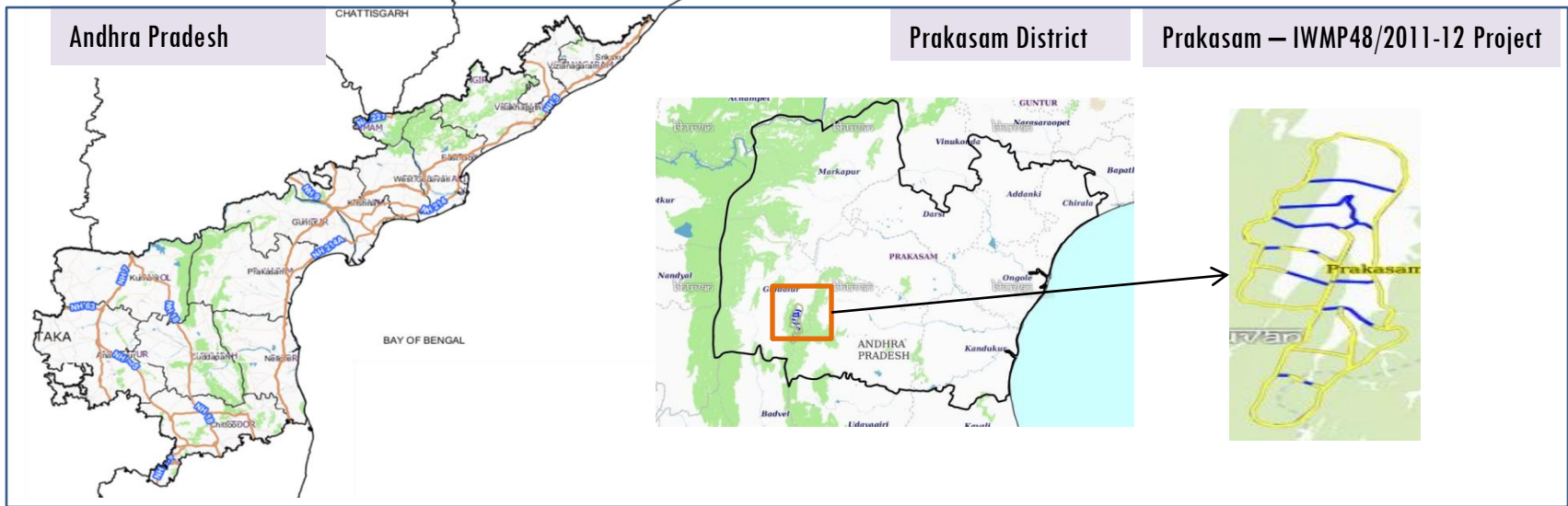
- Project area witnesses tropical wet and dry climate characterized by year round high temperatures. Prakasam has a record of reaching more than 46°C.

- 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.

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Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2012-13	2019-20
LISS IV	2011-12		
SCENE 1			31-Mar-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			31-Mar-20
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	342
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
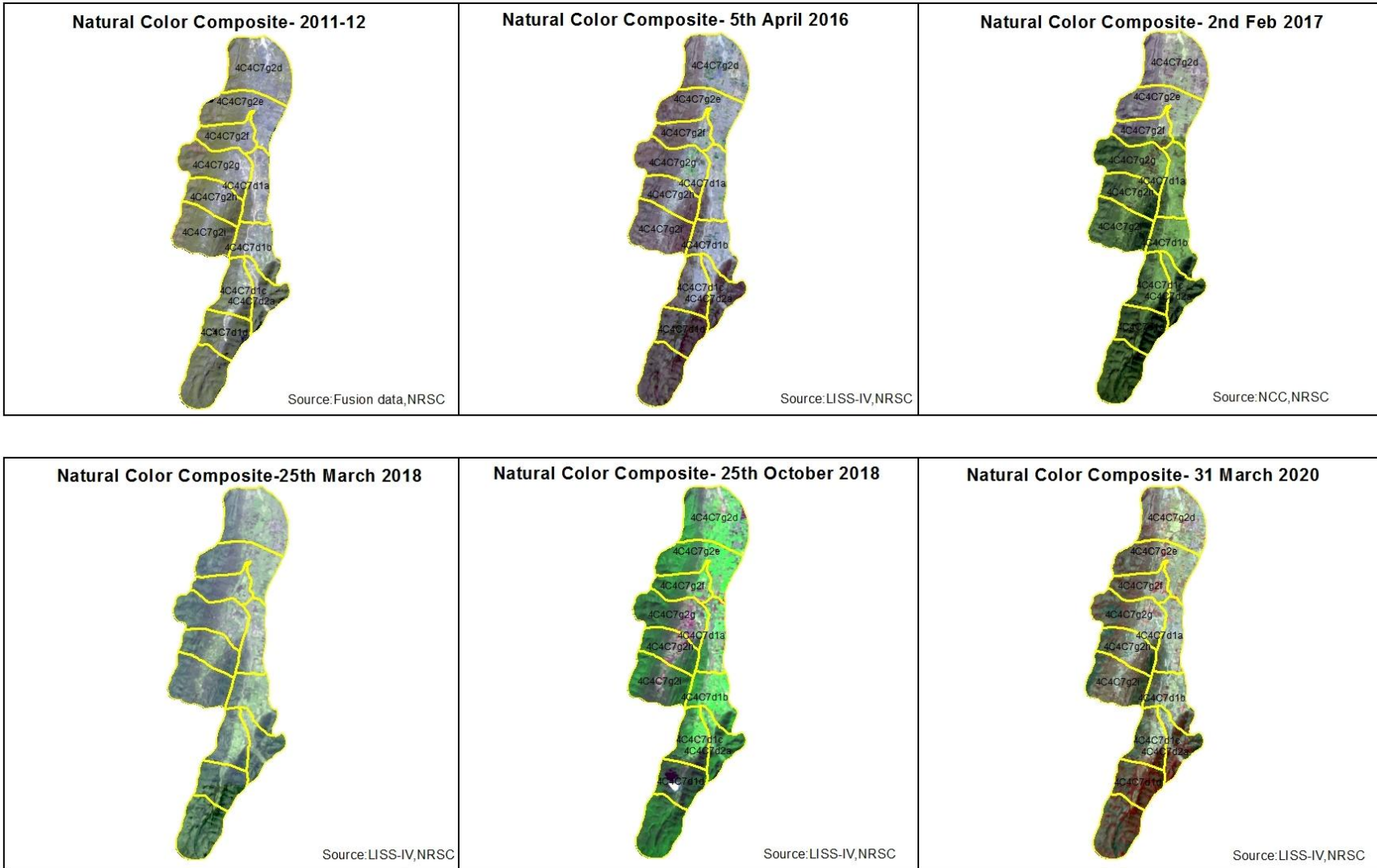
Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agriculture/Horticulture	13	13
2	Afforestation	0	0
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	0	0
6	Terrace	0	0
7	Checks & Plugs	2	2
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	2	2
10	Civil work-Check dams/Rock fill dam	27	27
11	Nallah Bunds/Drainage treatment	0	0
12	Percolation tanks / Ground water recharge structure	0	0
13	Production System and Micro-Enterprises	0	0
14	Livelihood Activities	1	1
15	Capacity Building Activities	0	0
16	Entry Point Activity	31	31
17	Others	278	266
	TOTAL	**354**	**342**

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 (2011-12) and T5 is 2019-20 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

Natural Color Composite- 2011-12

Source:Fusion data,NRSC

Natural Color Composite- 5th April 2016

Source:LISS-IV,NRSC

Natural Color Composite- 2nd Feb 2017

Source:NCC,NRSC

Natural Color Composite-25th March 2018

Source:LISS-IV,NRSC

Natural Color Composite- 25th October 2018

Source:LISS-IV,NRSC

Natural Color Composite- 31 March 2020

Source:LISS-IV,NRSC

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-48/2011-12
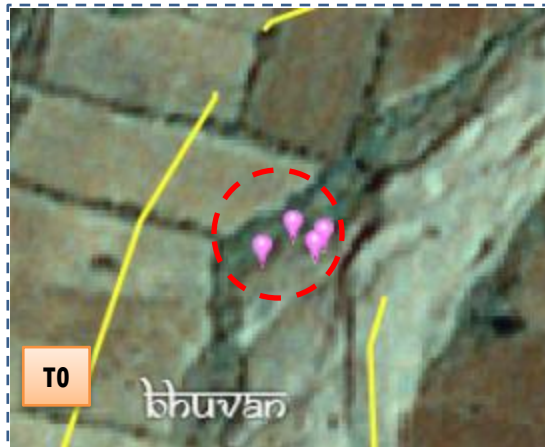

| T0:2011-12 | T1: 5th April 2016 | Drishti Sl no. 7019549 MWS :4C4C7g2e |

Check dam

| T0:2011-12 | T1: 5th April 2016 | Drishti Sl no. 7019551   MWS : 4C4C7g2e |

Check dam

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-48/2011-12
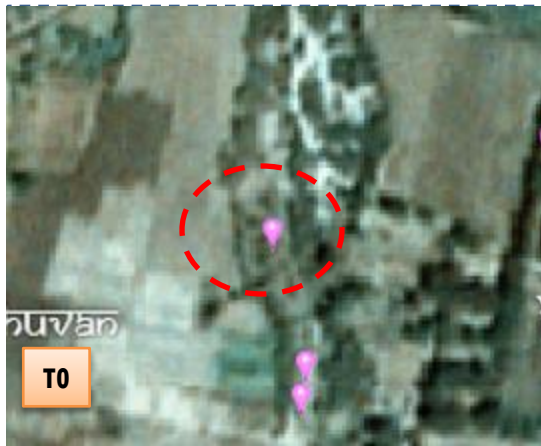

| T0: 2011-12 | T1: 5th April 2016 | Drishti Sl no. 2456780   MWS :4C4C7g2d |

Farm pond

| T0: 2011-12 | T1: 5th April 2016 | Drishti Sl no. 2456901   MWS :4C4C7g2d |

Farm Pond

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 (2011-12) and row represents the post implementation period as T5 (2019-20) .
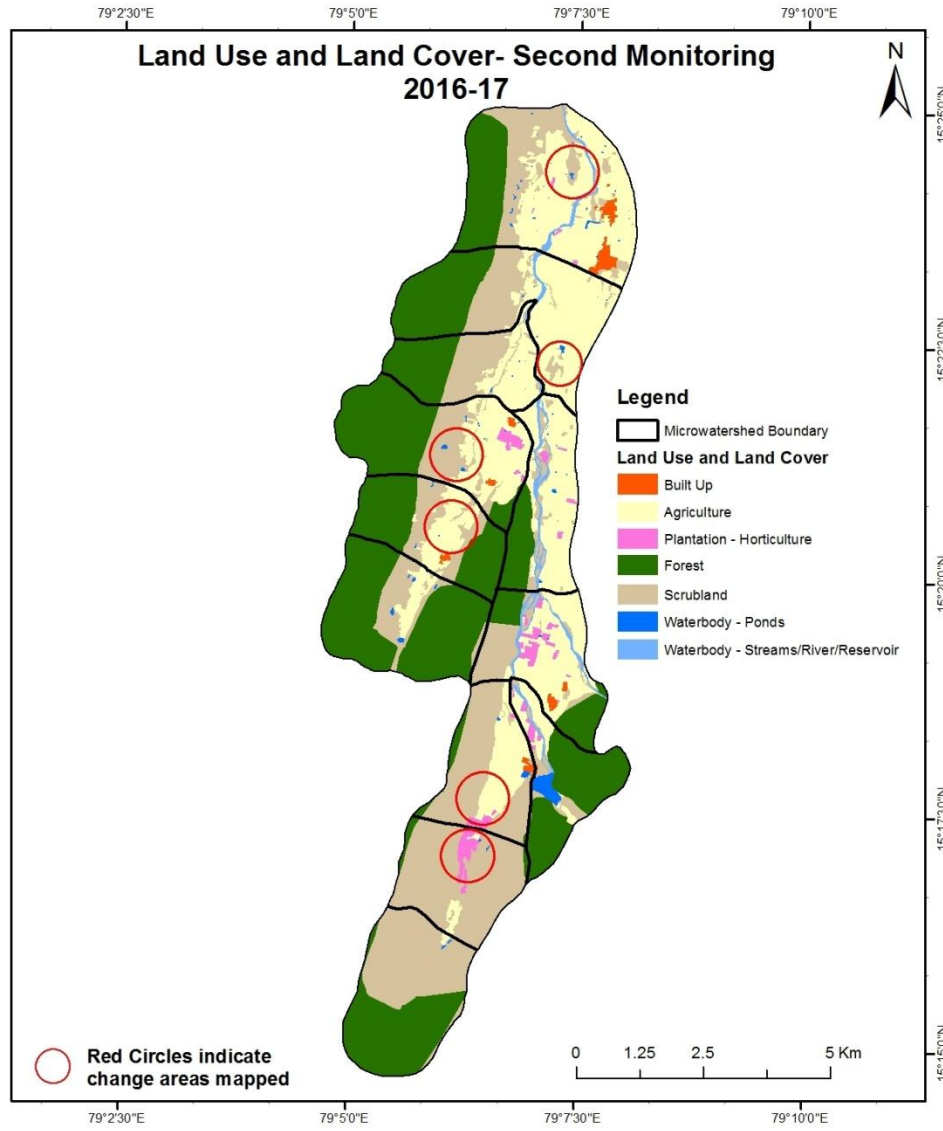
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)
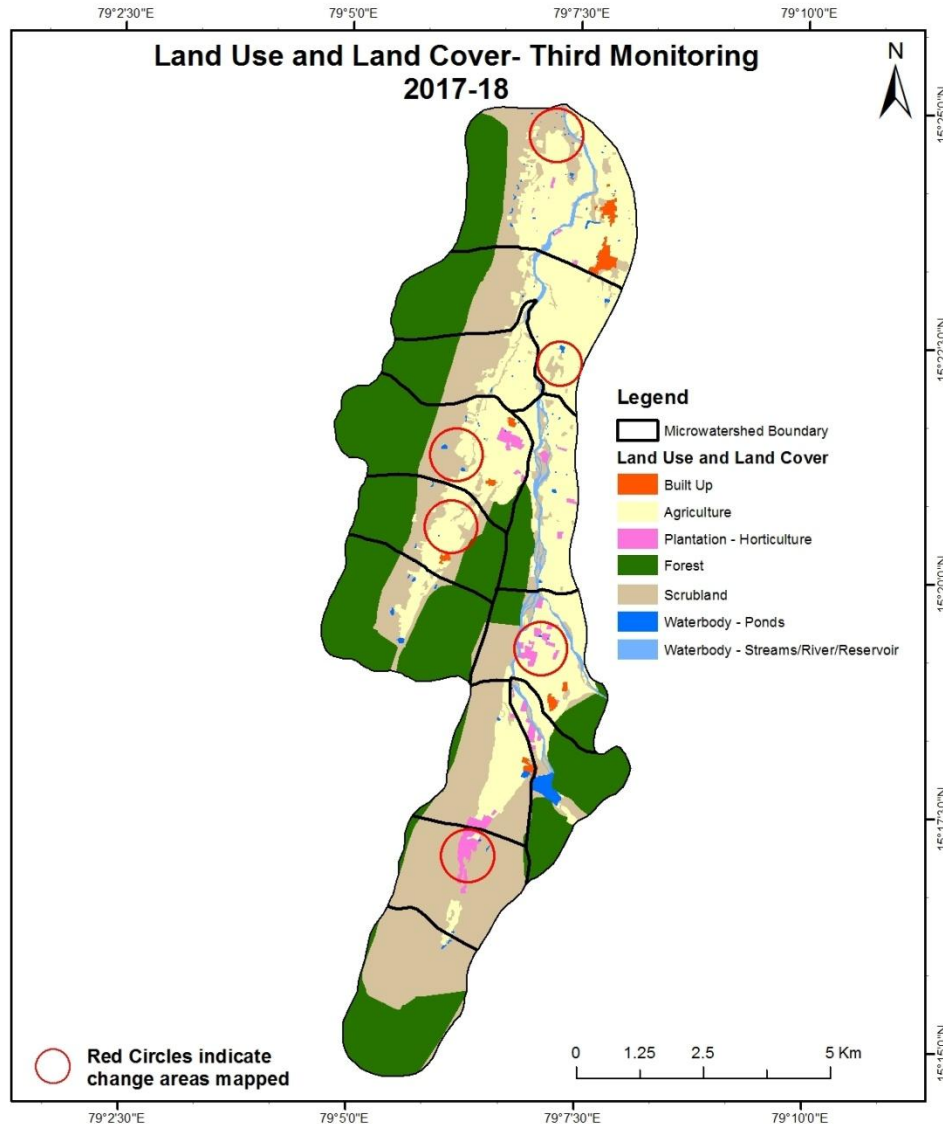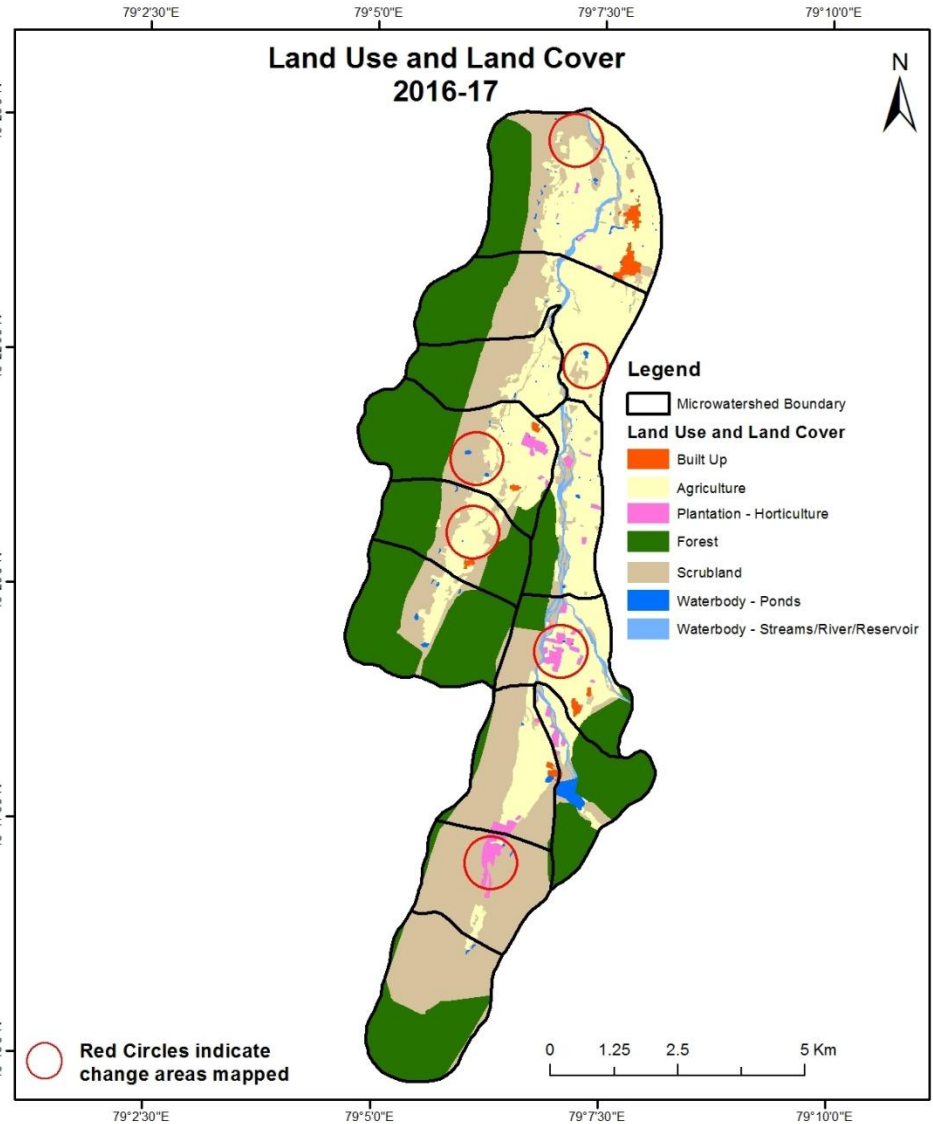
Scale: 1:10000
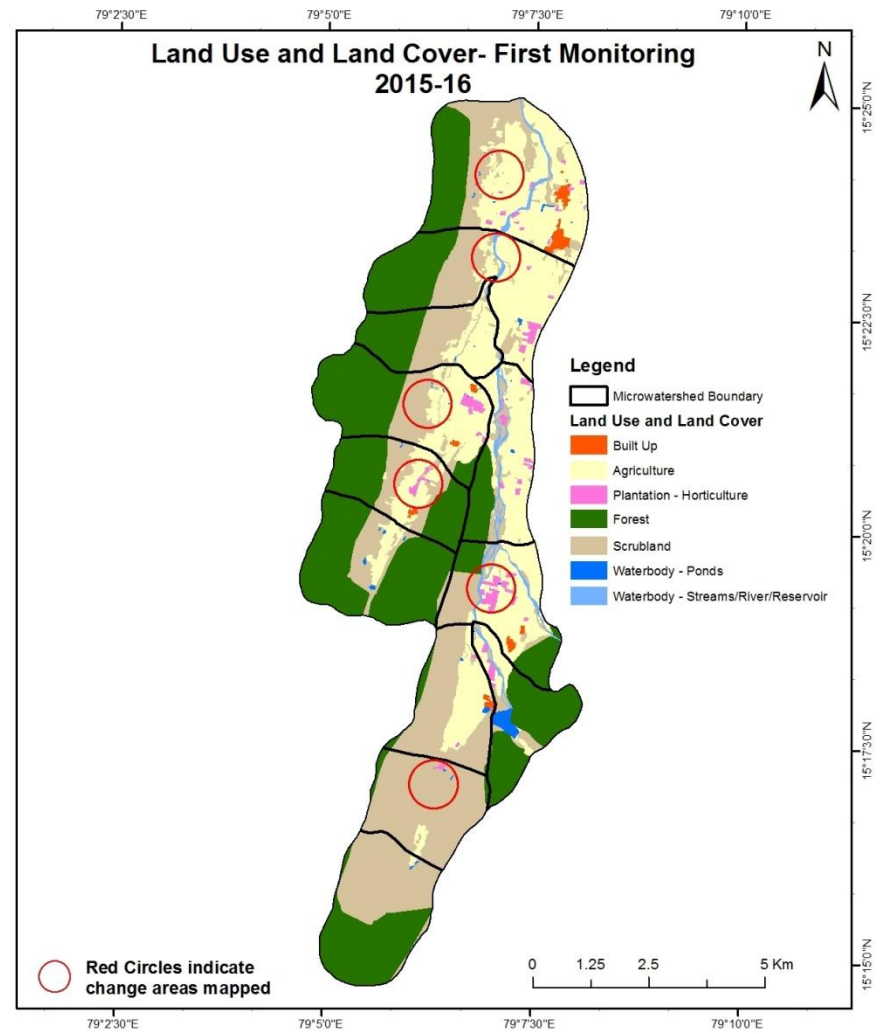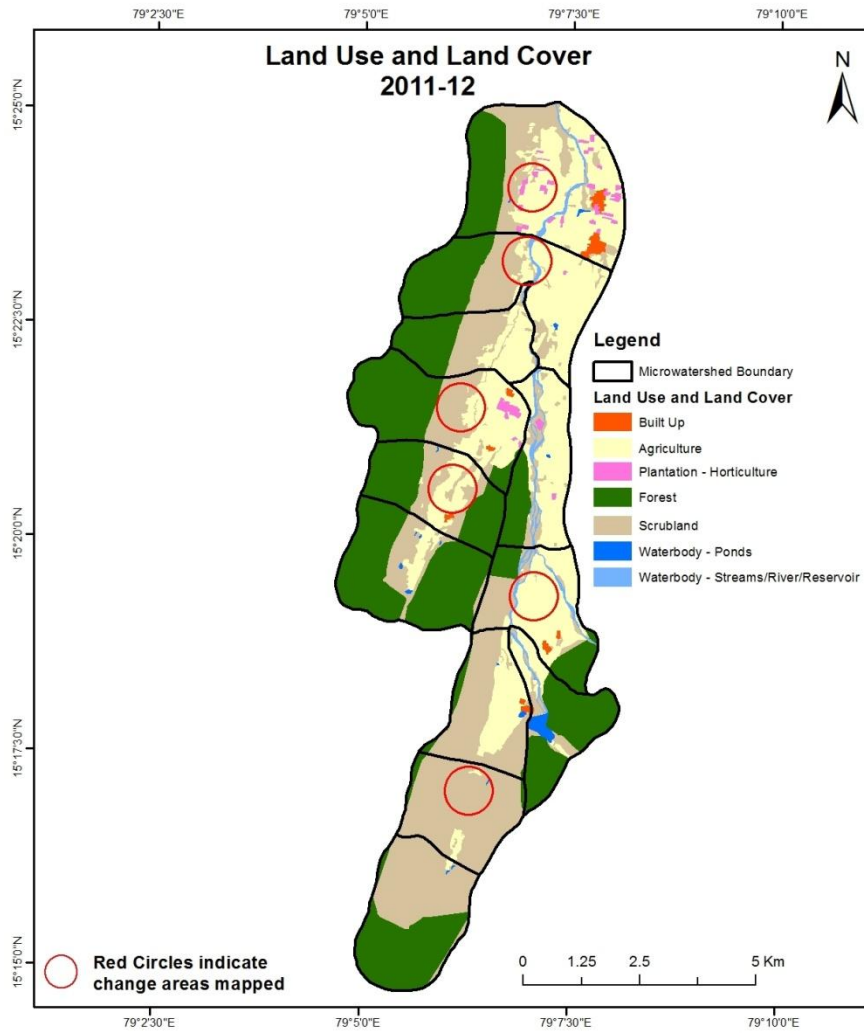
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)
Scale: 1:10000

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 2016-17

N

Legend
- Microwatershed Boundary

Land Use and Land Cover
- Built Up
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

Red Circles indicate change areas mapped

0   1.25   2.5   5 Km

Land Use and Land Cover- Third Monitoring 2017-18

N

Legend
- Microwatershed Boundary

Land Use and Land Cover
- Built Up
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

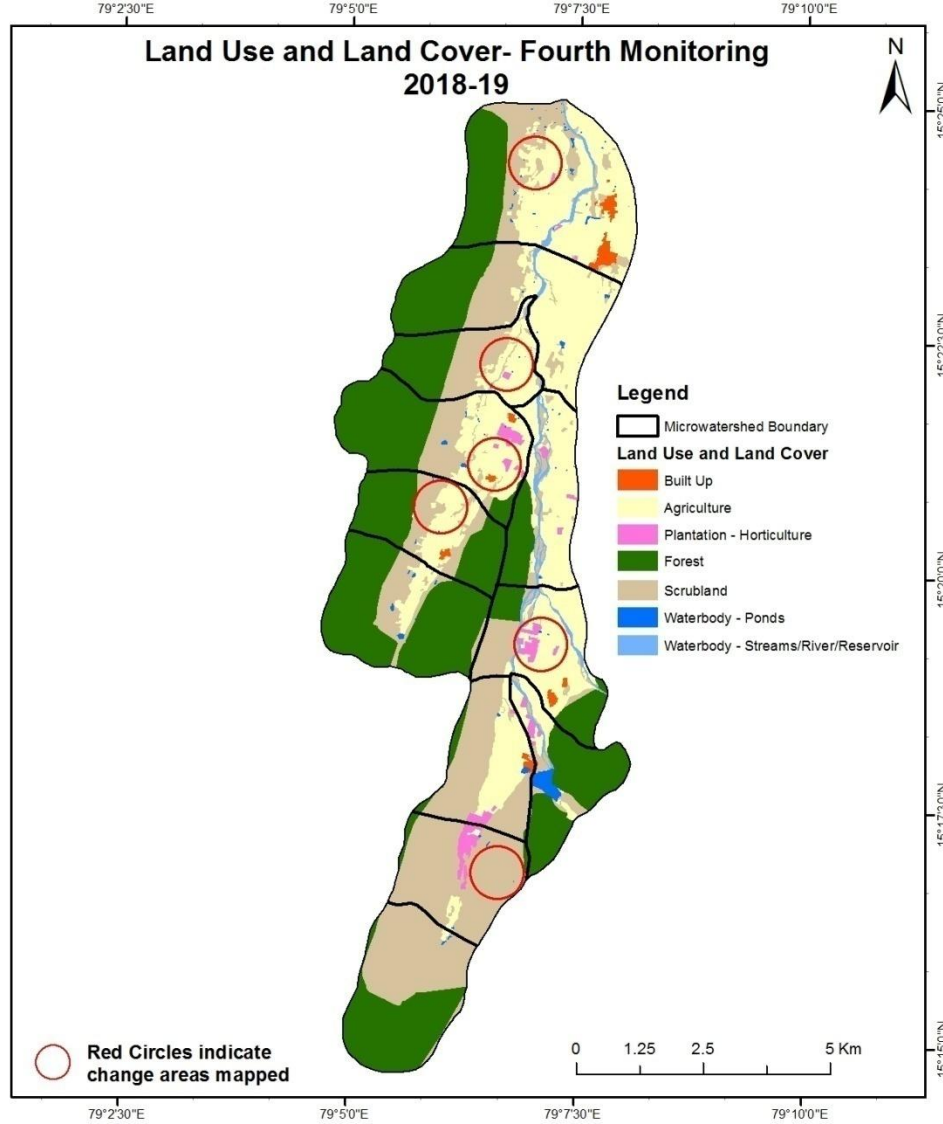Red Circles indicate change areas mapped
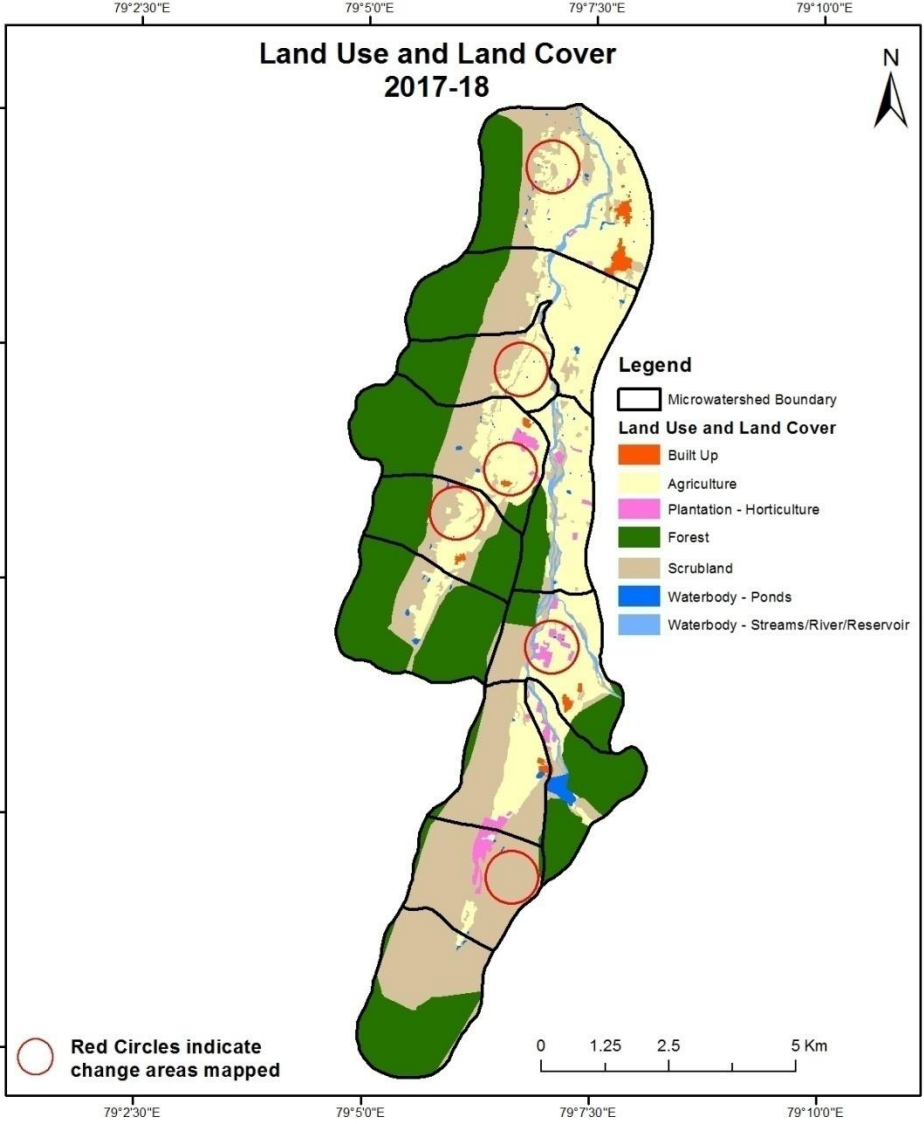
0   1.25   2.5   5 Km

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)
Scale: 1:10000

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Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

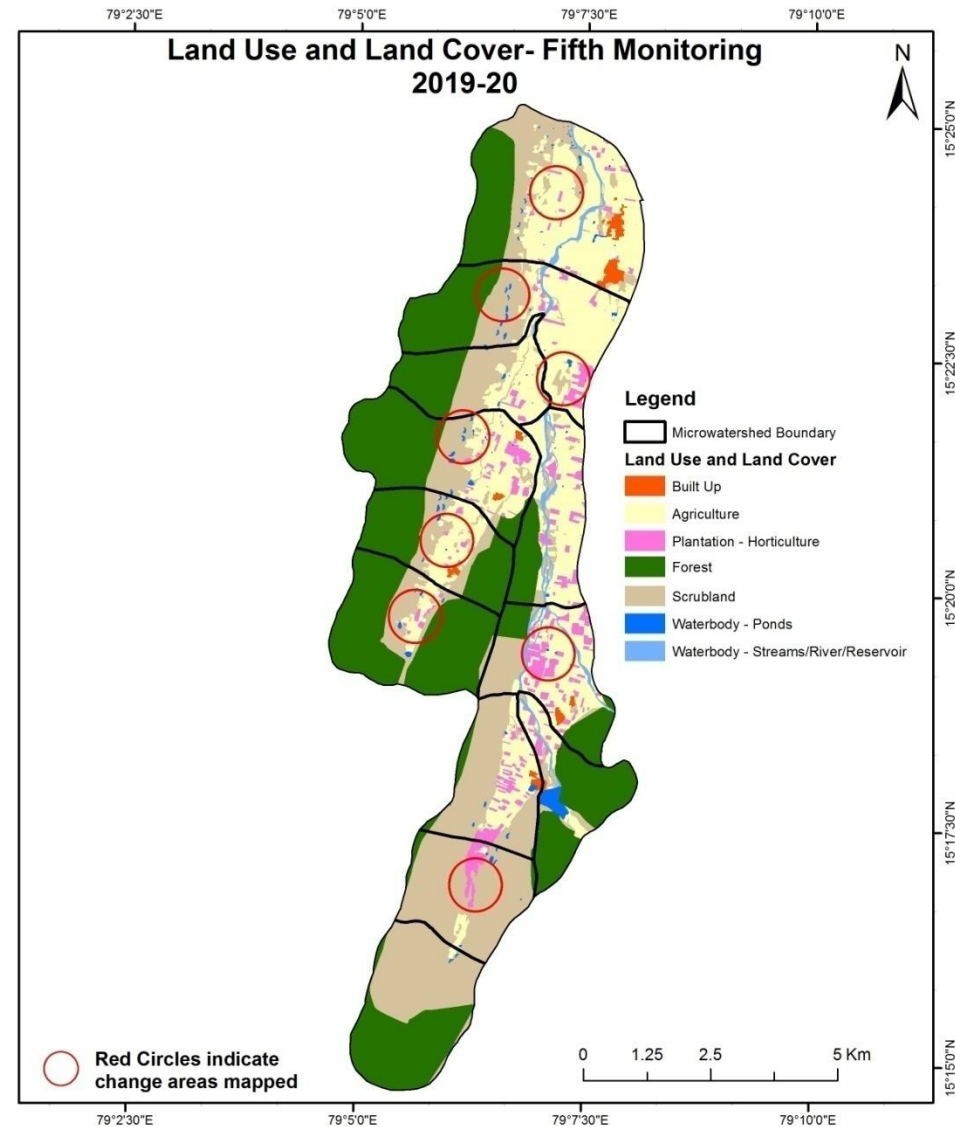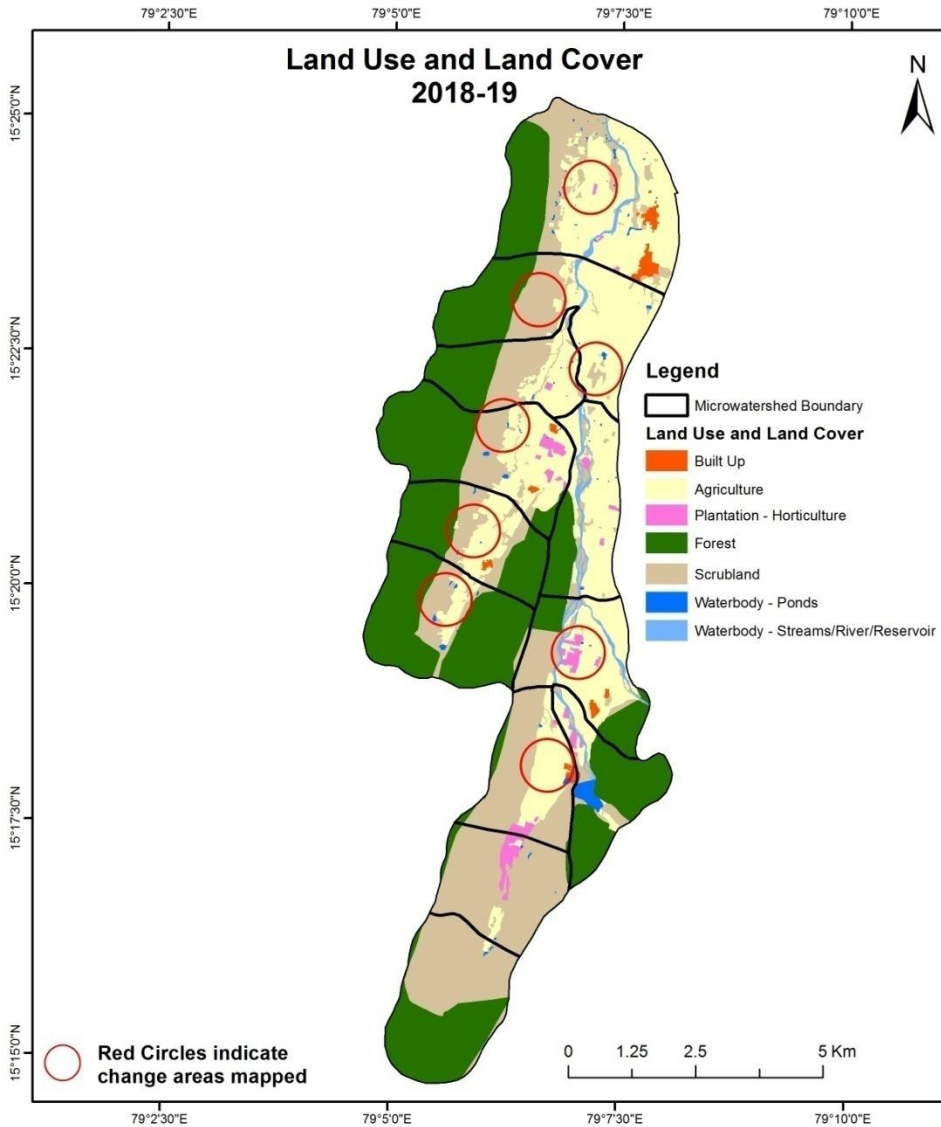# Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

T0: 2011-12 (79°7'4.65"E 15°19'27.896"N)
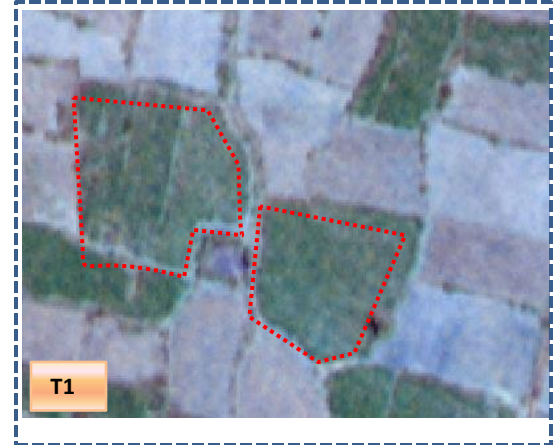
T1: 05 April 2016

Agriculture to Water body

T0: 2011-12 (79°7'32.88"E 15°22'45.522"N)

T1: 05 April 2016

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

Plantation to Agriculture

T0

T1

T0: 2011-12(79°7'42.842"E 15°24'39.869"N)

T1: 05 April 2016

Forest to Agriculture

T0

T1

T0: 2011-12(79°6'3.643"E 15°20'58.891"N)

T1: 05 April 2016

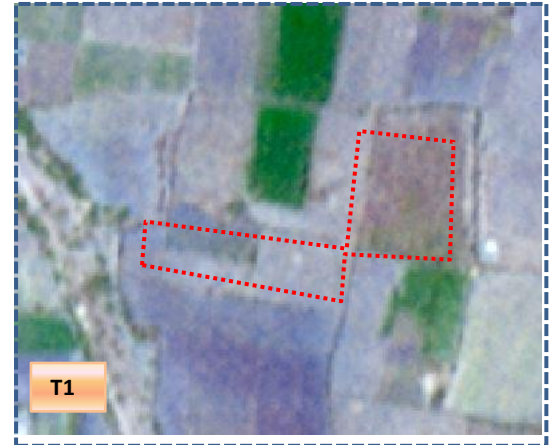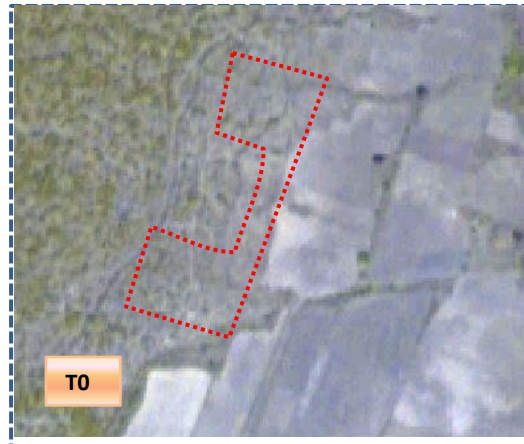# Table showing change matrix depicting Land cover transitions during study period-2011-12 to 2015-16

Land cover T0	Monitoring period (T1) Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	42.67										42.67
Mining/dump											
Agriculture	3.85		1810.79	62.37						3.65	1880.66
Plantation Horticulture			32.22	26.93						0.04	59.18
Forest			2.39		2451.93						2454.32
Forest Plantation											
Barren Rocky											
Scrub	0.23		37.93	7.74				2078.71		0.34	2124.95
Waterbody- Streams/River			1.04						105.88	0.05	106.97
Waterbody – Ponds			0.43							29.67	30.10
Grand Total	46.75		1884.80	97.03	2451.93			2078.71	105.88	33.74	6698.85

Units in Hectares

- 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 69 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T1.

- In T1 70 ha of the agriculture area has increased from plantations, 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-2015-16 to 2016-17

Land cover / T1	Monitoring period (T2) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Units in Hectares Grand Total
Built up	46.75										**46.75**
Mining/dump											
Agriculture	0.48		1876.16	6.15						2.02	**1884.80**
Plantation Horticulture			42.88	54.07						0.09	**97.03**
Forest					2451.93						**2451.93**
Forest Plantation											
Barren Rocky											
Scrub	0.33		22.97	38.13				2014.57		2.71	**2078.71**
Waterbody-Streams/River				0.22					105.66		**105.88**
Waterbody – Ponds										33.74	**33.74**
Grand Total	**47.55**		**1942.00**	**98.57**	**2451.93**			**2014.57**	**105.66**	**38.56**	**6698.85**

- 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 08 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T2.
- In T2 65 ha of the agriculture area has increased from plantations and scrubland 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-2016-17 to 2017-18

Land cover / T2	Monitoring period (T3) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	47.55										47.55
Mining/dump											
Agriculture			1940.52					0.53		0.95	1942.00
Plantation Horticulture			6.19	92.38							98.57
Forest					2451.93						2451.93
Forest Plantation											
Barren Rocky											
Scrub			12.94					2000.98		0.65	2014.57
Waterbody-Streams/River									105.66		105.66
Waterbody – Ponds										38.56	38.56
Grand Total	47.55		1959.66	92.38	2451.93			2001.51	105.66	40.15	6698.85

Units in Hectares

• 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 0.9 ha of the agriculture area has decreased and it is converted into scrubland and water body in T3.

• In T3 19 ha of the agriculture area has increased from plantations and scrubland 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-2017-18 to 2018-19

T3 \ Monitoring period (T4)	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	47.55										47.55
Mining/dump											
Agriculture	0.21		1949.20	10.05						0.19	1959.66
Plantation Horticulture			9.24	83.14							92.38
Forest					2451.86					0.06	2451.93
Forest Plantation											
Barren Rocky											
Scrub	0.54		16.51					1982.76		1.70	2001.51
Waterbody-Streams/River									105.66		105.66
Waterbody – Ponds			1.24							38.92	40.15
Grand Total	48.30		1976.19	93.20	2451.86			1982.76	105.66	40.88	6698.85

Units in Hectares

• 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 10 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.

• In T4 25 ha of the agriculture area has increased from plantations, scrubland and water body 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-2018-19 to 2019-20

Land cover / T4	Monitoring period (T5) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total (Units in Hectares)
Built up	48.11		0.08	0.12							48.30
Mining/dump											
Agriculture	5.39		1743.10	202.29				25.23		0.17	1976.19
Plantation Horticulture			6.76	86.44							93.20
Forest			0.08	0.15	2451.64						2451.86
Forest Plantation											
Barren Rocky											
Scrub	3.12	0.57	61.19	3.33				1901.70		12.84	1982.76
Waterbody-Streams/River									105.66		105.66
Waterbody – Ponds			0.30							40.58	40.88
Grand Total	56.62	0.57	1811.50	292.34	2451.64			1926.93	105.66	53.60	6698.85

• 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 207 ha of the agriculture area has decreased and it is converted into Built-up, plantations, scrubland and water body in T5.

•In T5 67 ha of the agriculture area has increased from built-up, plantations, forest, scrubland and water body 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 increase of 22 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.

4. There is an increase of 4, 57, 17 & 16 Hectares from T0 to T1, T1-T2, T2-T3 & T3-T4 respectively and there is a decrease of 164 ha from T4 to T5 and overall decrease of 69 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.

5. There is an **increase of 233 ha of the Plantation/Horticulture** area has been increased between 2011-12 (T0) & 2019-20 (T5) years.

6. There is a decrease of 198 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.

7. Farm ponds (2) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (2) verified from the portal.