MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

SRIKAKULAM -18/2013-14
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
February-2022

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

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ITE&C Department Govt. of Andhra Pradesh

RURAL DEVELOPMENT AND WATERSHED MONITORING DIVISION
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EXECUTIVE SUMMARY

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1. Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).
2. 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).
3. Current summary report gives details of Project – IWMP-18/2013-14, Srikakulam District of Andhra Pradesh. The total geographical area of the project is **5,236 ha**. It comprises of 11 micro watersheds.
4. In the project area 319 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
5. Water bodies have shown an increased by 16 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
6. Major percentage i.e. 30 % is covered by the agriculture, 11 % is covered by forest, 42 % is covered by scrubland and remaining by other land use classes.

STUDY AREA
PROJECT : POLLA -IWMP-18/2013-14
DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Seethampeta Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is **5,236 ha**. It comprises of 11 micro watersheds. Location Map of the study area is shown in Figure 1. Analysis is done for 2013-14 (T0) period (***Batch -1***) projects taking 2021-22 (T5) period satellite images, seen in Table 1 & 2,Fig 04.

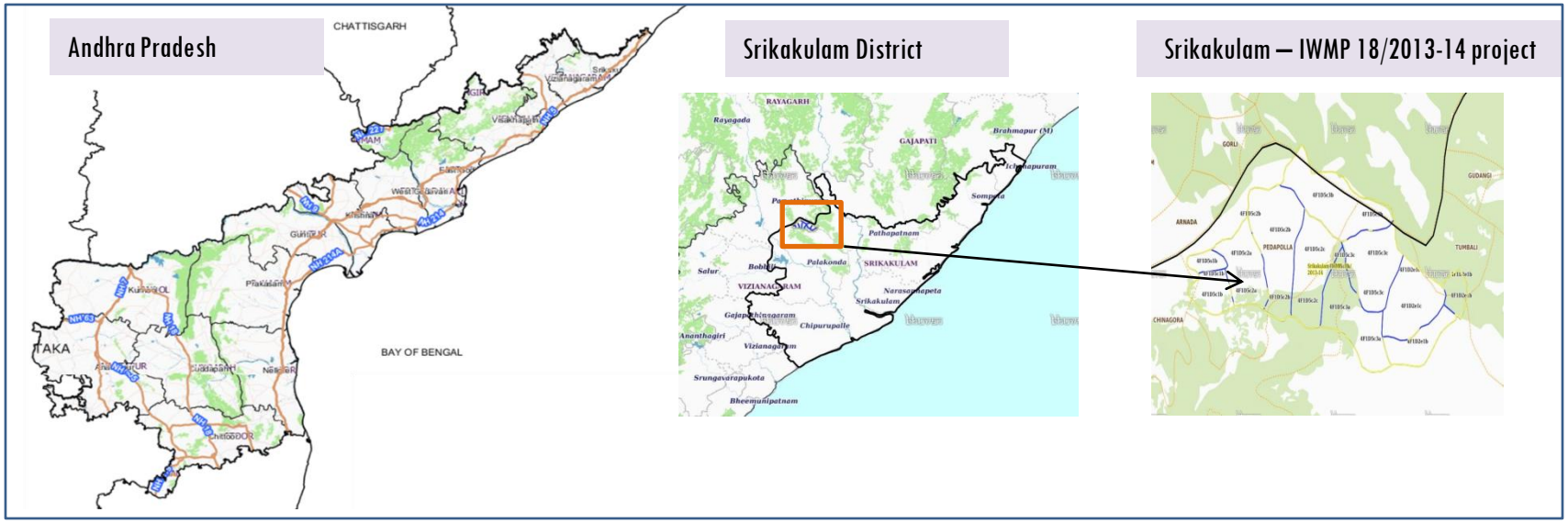


Fig.1. Location Map of Polla Watershed (IWMP-18/2013-14) in Srikakulam, A.P

- The Climate of the district is moderate and characterized by high humidity all through the year along with oppressive summer and good seasonal rainfall.
- The mean daily maximum temperature in the district is about 34 C in May and the mean daily minimum temperature is about 17.5 C in December/ January.
- The average annual rainfall of the district is 1067 mm, which ranges from nil rainfall in January and November 208 mm in September and October. The mean seasonal rainfall distribution is 745 mm in southwest monsoon (June- September).

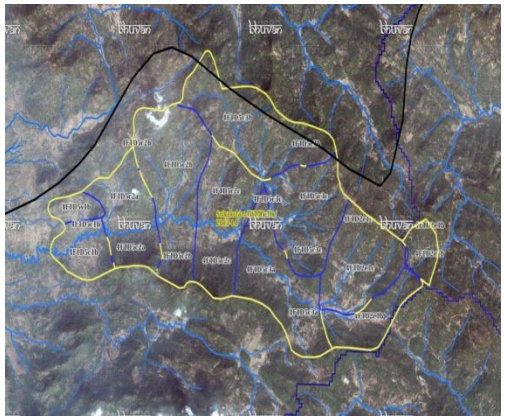
Table 1. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			26-Feb-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			26-Feb-22
SCENE2			
SCENE 3			
SCENE 4			

Table 2.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	319
4	Detailed Project Report		

Fig 2. Natural Color Composite overlaid with Project boundaries and high detail stream network



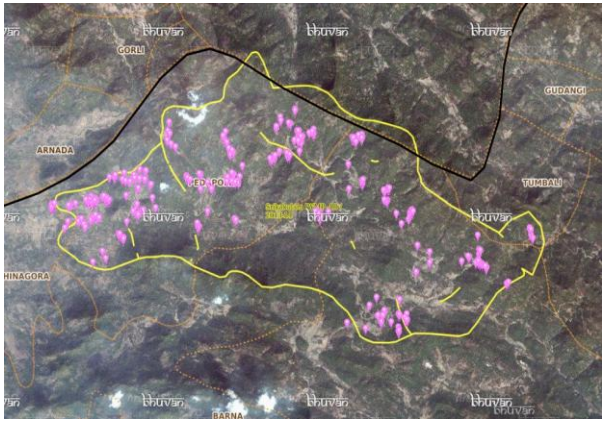
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

Fig 3. Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Table 3. Classification of the Activities

Sr. No	Activity	Number of Photographs uploaded in Drishti Mobile Application	Visible on satellite in Srishti Geoportal
1	Afforestation	11	11
2	Horticulture	0	0
3	Agriculture	57	57
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	54	54
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	13	13
11	Civil work-Check dams/Rock fill dam	100	96
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities-Plantation/Horticulture	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	22	22
18	Others	80	66
	TOTAL	**337**	**319**

03. MONITORING IN THE PROJECT AREA

3.1 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 (2013-14) and T5 is 2021-22 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, figure 05 & 06.

Fig 4. Polla Watershed (IWMP-18/2013-14) Natural Colour Composite (NCC)

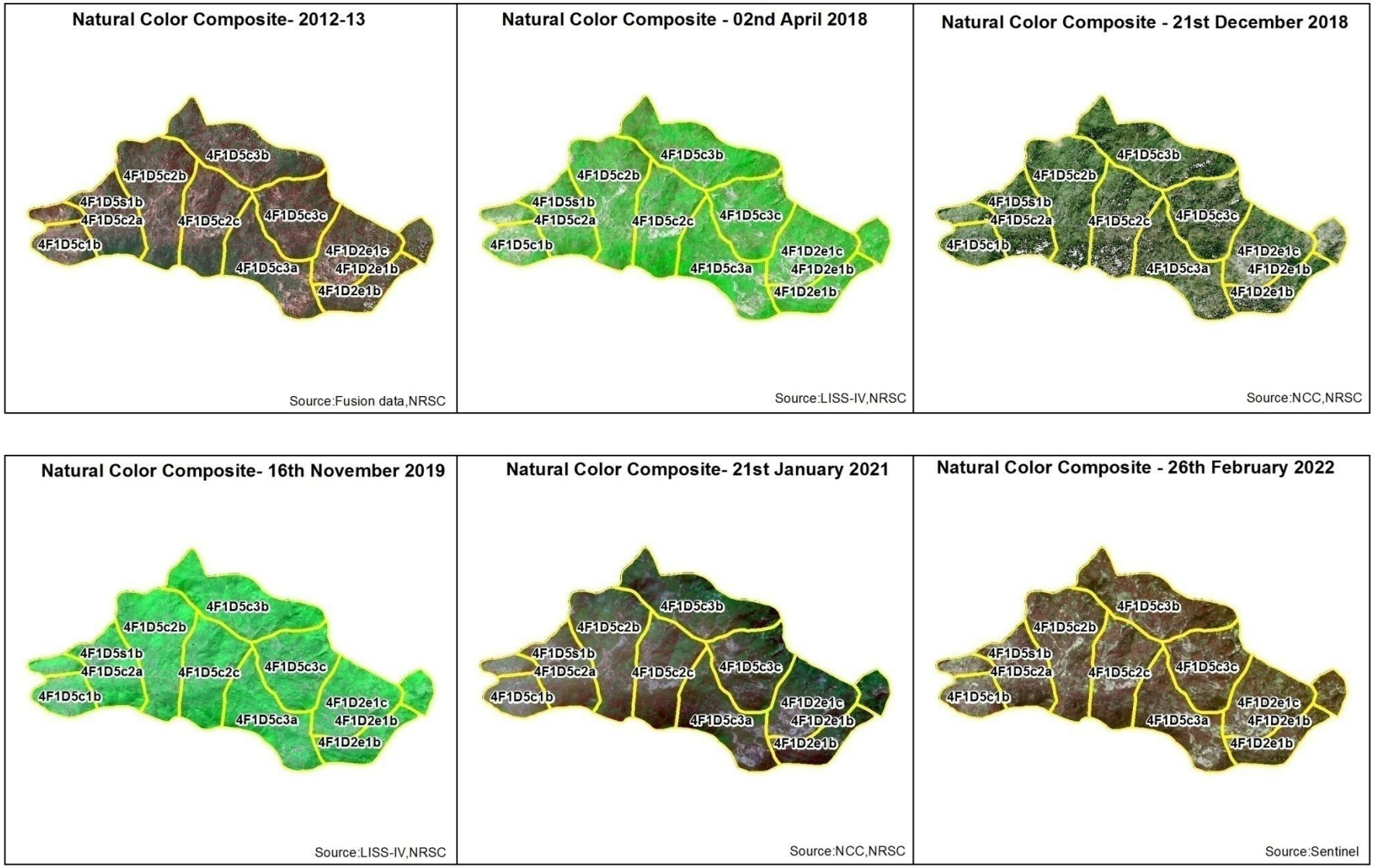
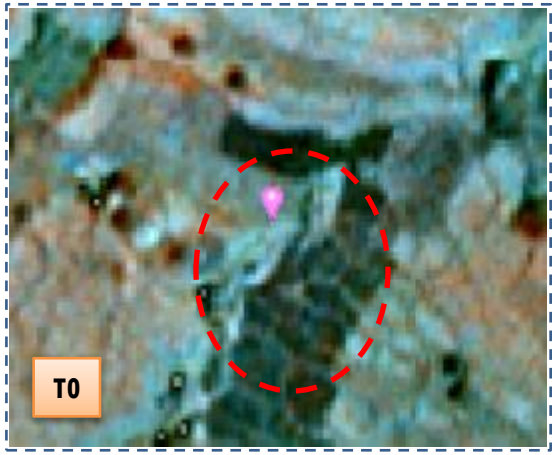
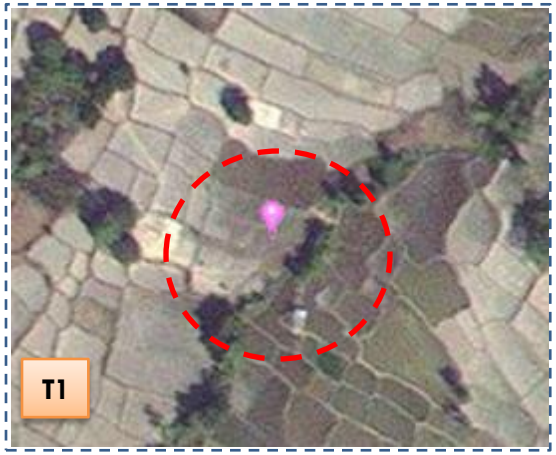


Fig 5. Polla Watershed (IWMP-18/2013-14) Monitoring of activities in Srikakulam District Andhra Pradesh



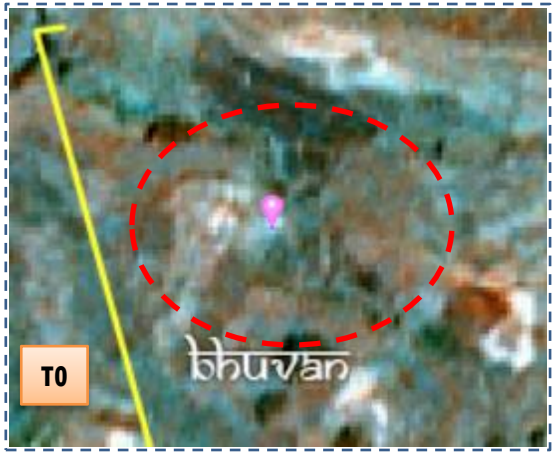
T0:2013-14



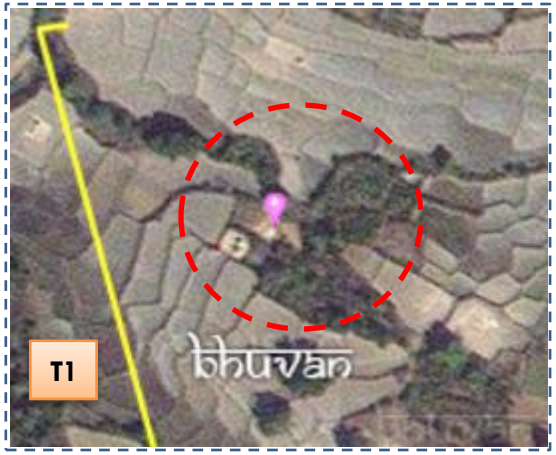
T1: 06 January 2017

Drishti Sl no. 1801818 MWS : 4F1D2e1c

Check dam



T0:2013-14

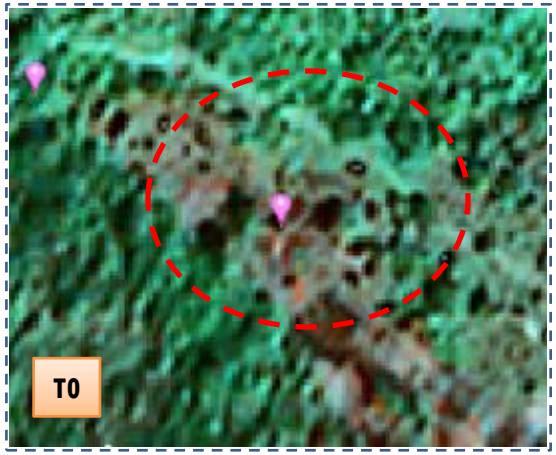


T1: 06 January 2017

Drishti Sl no. 2210088 MWS : 4F1D2e1b

Farm pond

Fig 6. Polla Watershed (IWMP-18/2013-14) Monitoring of activities in Srikakulam District Andhra Pradesh

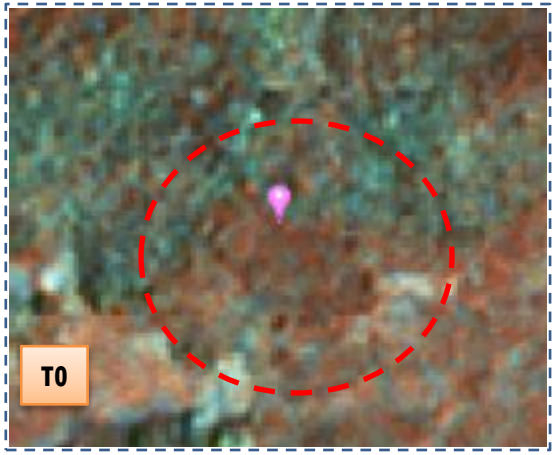


T0:2013-14

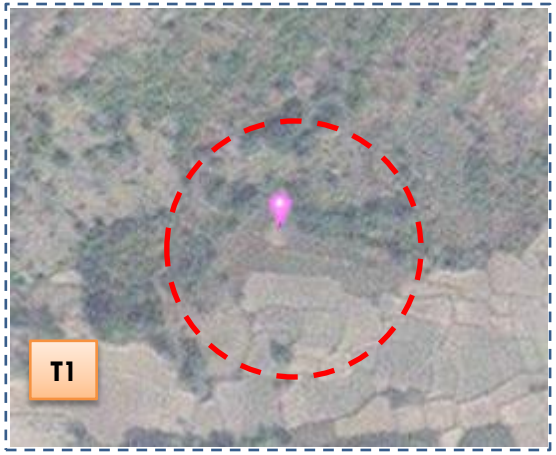
T1: 06 January 2017

Drishti Sl no. 2564076 MWS : 4F1D5c2b

Farm pond



T0:2013-14



T1: 06 January 2017

Drishti Sl no. 7009696 MWS : 4F1D5s1b

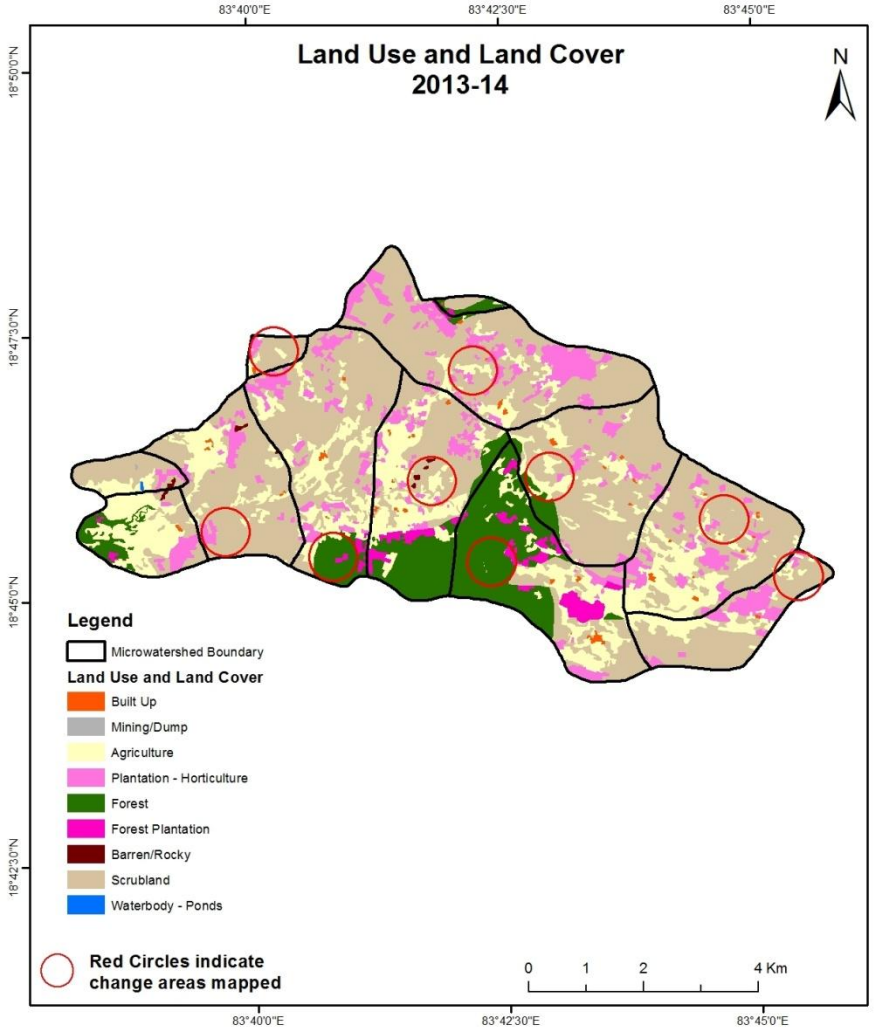
Mini percolation tank

3.2 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, seen in fig 07 to fig 11.
- 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, seen in fig 12 & 13 .
- The result obtained for the period T0 to T5 are given in the change matrix table, seen in table 04 to table 08.
- In matrix table column represents the T0 (2013-14) and row represents the T5 (2021-22)

Fig 7. Polla Watershed (IWMP-18/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000



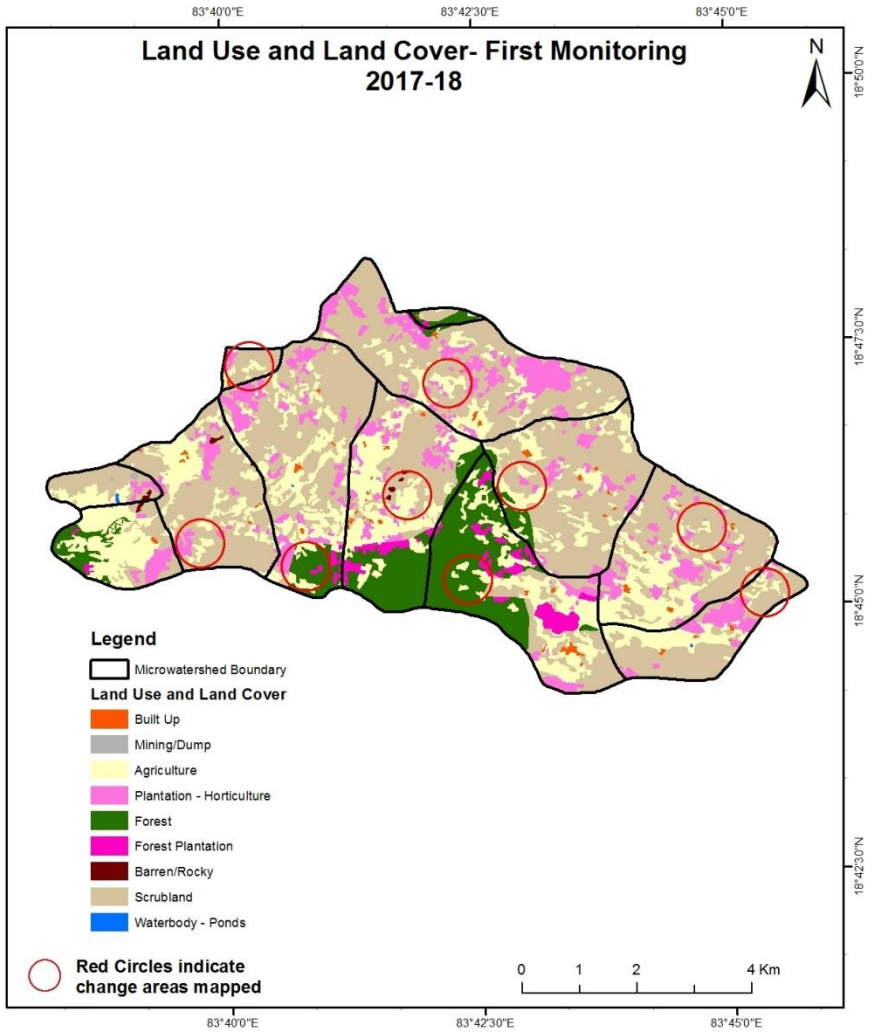
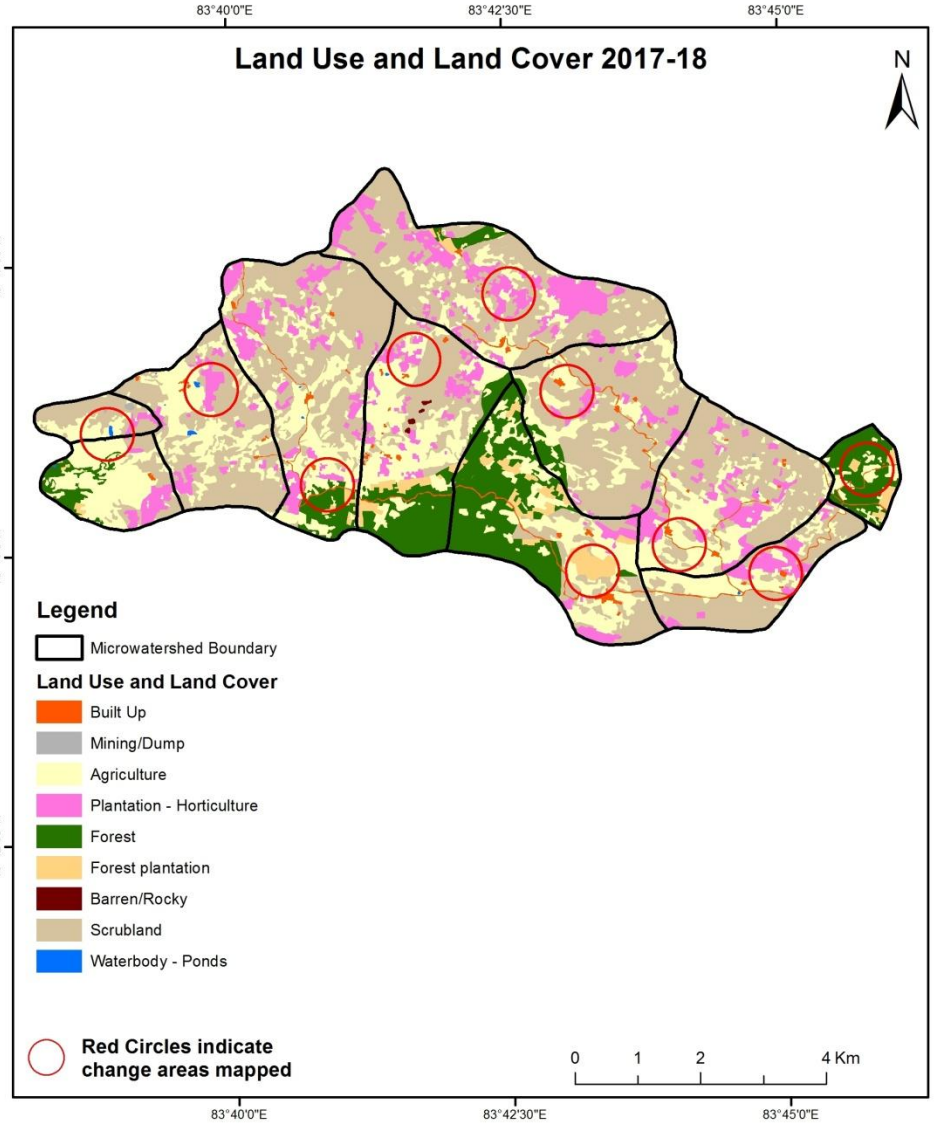


Fig 8. Polla Watershed (IWMP-18/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



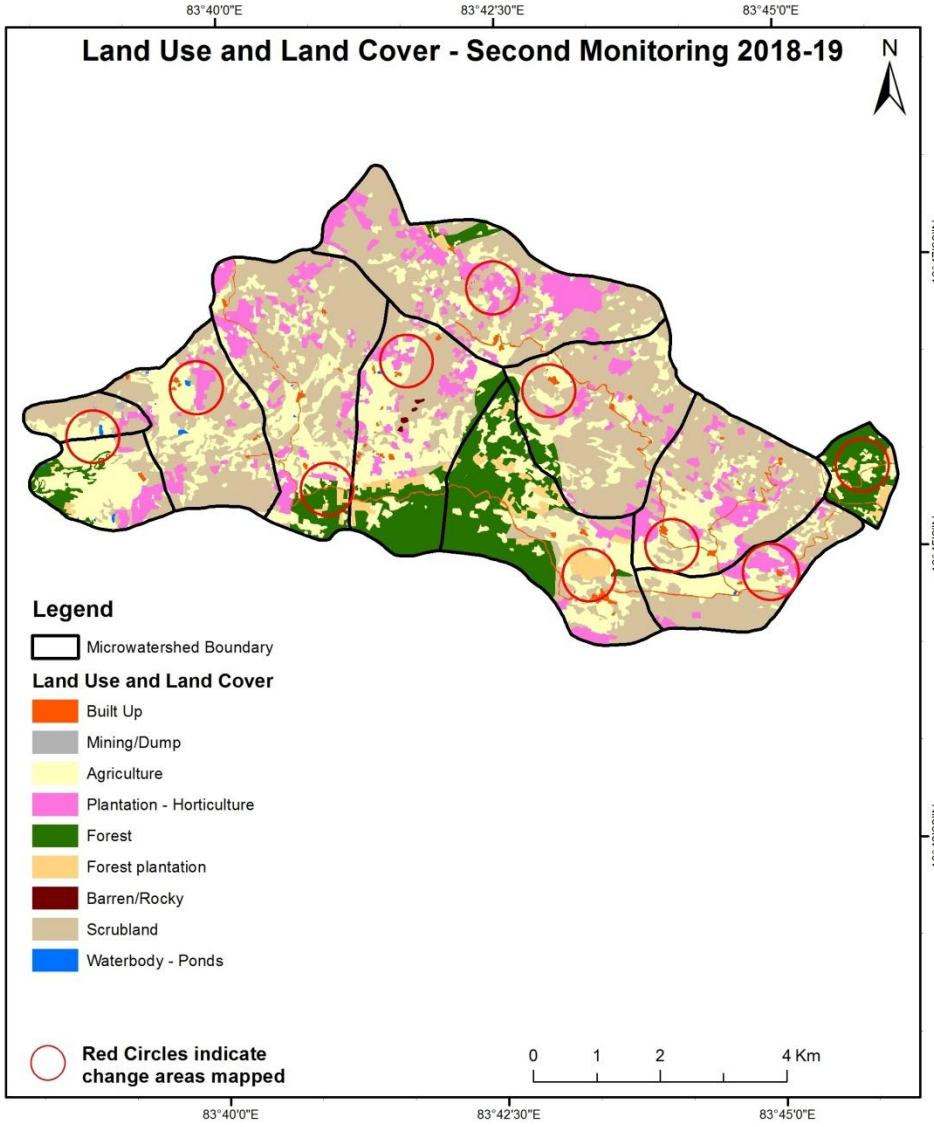
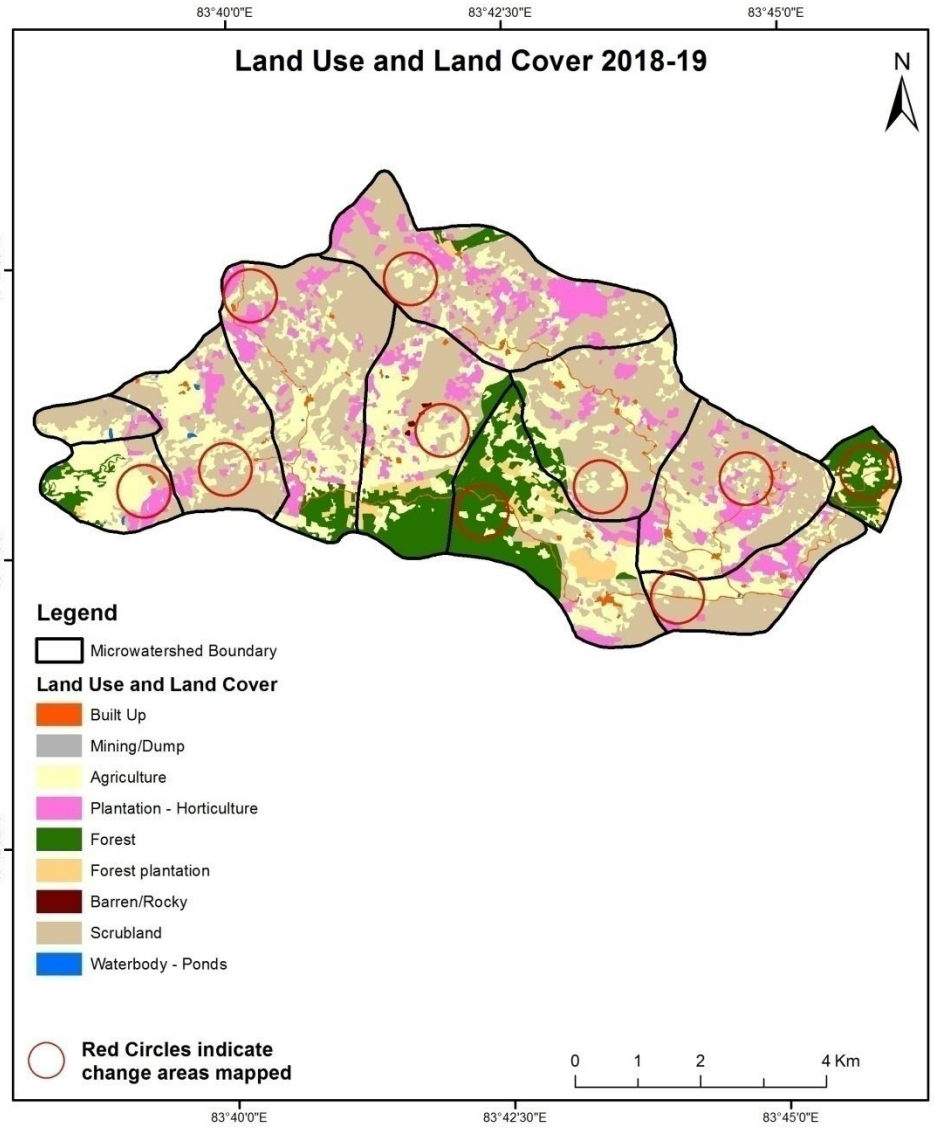


Fig 9. Polla Watershed (IWMP-18/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000



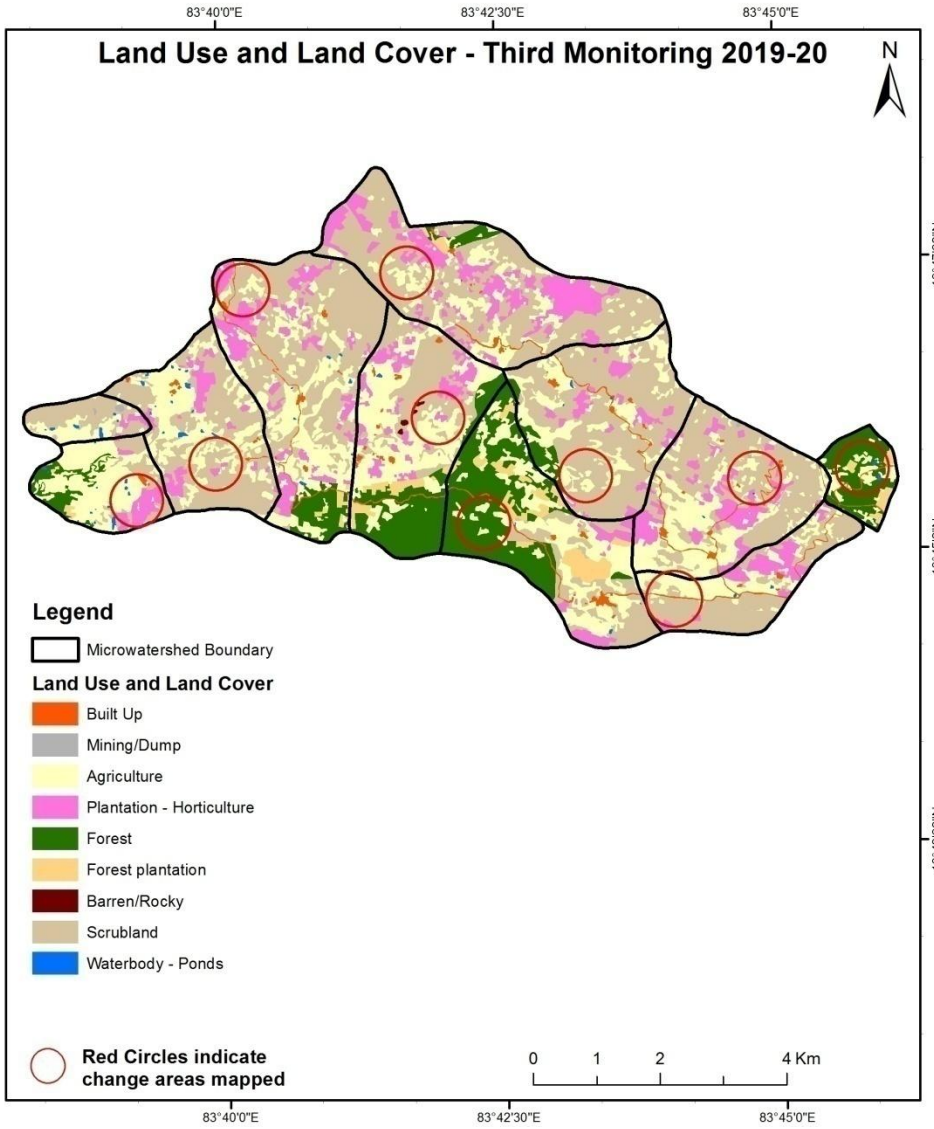
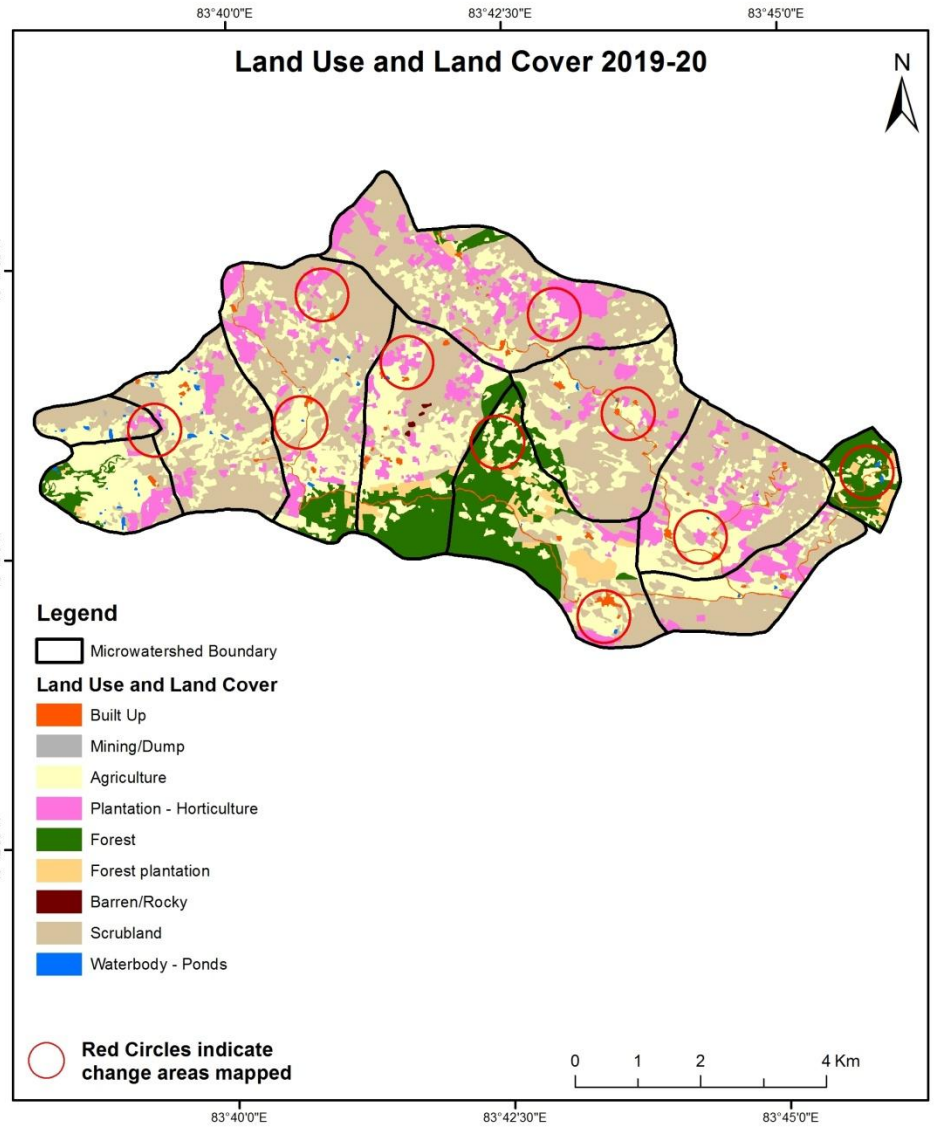


Fig 10. Polla Watershed (IWMP-18/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000



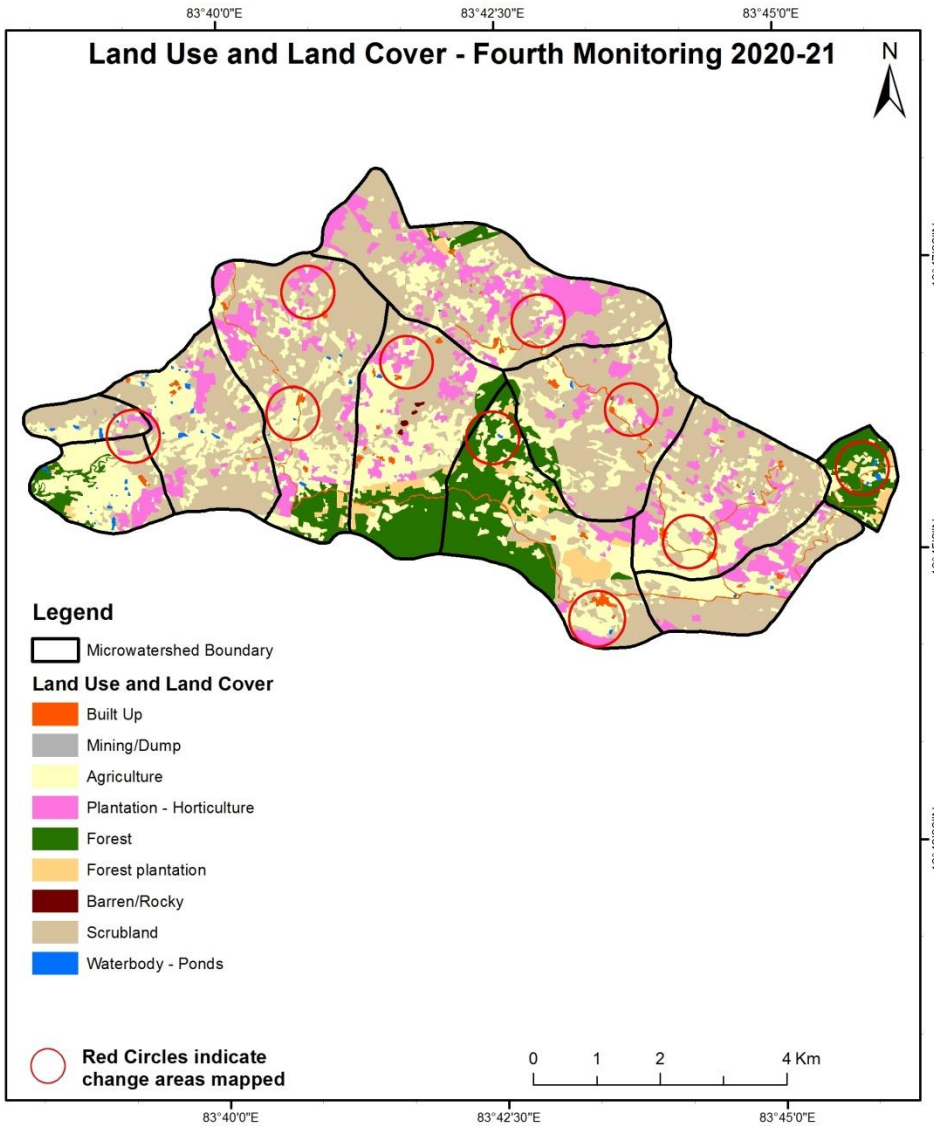
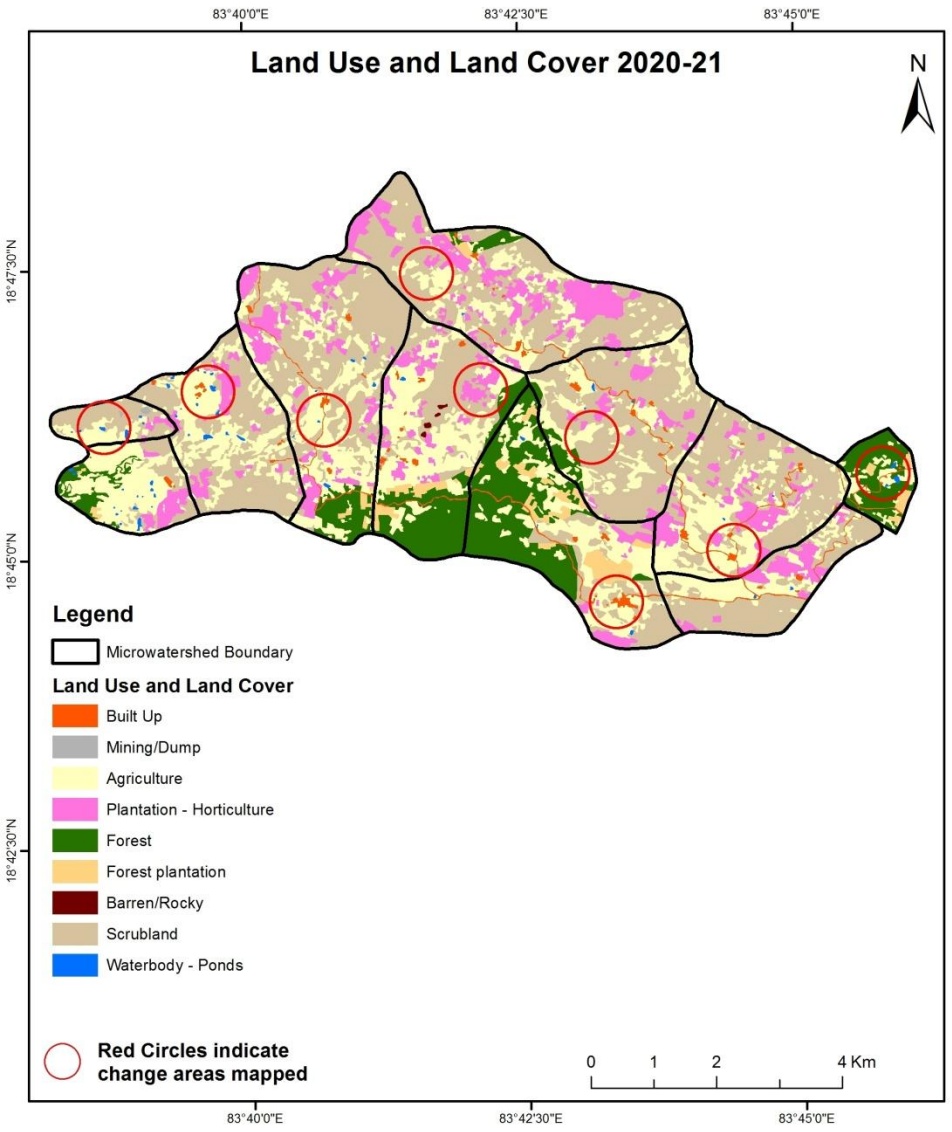


Fig 11. Polla Watershed (IWMP-18/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000



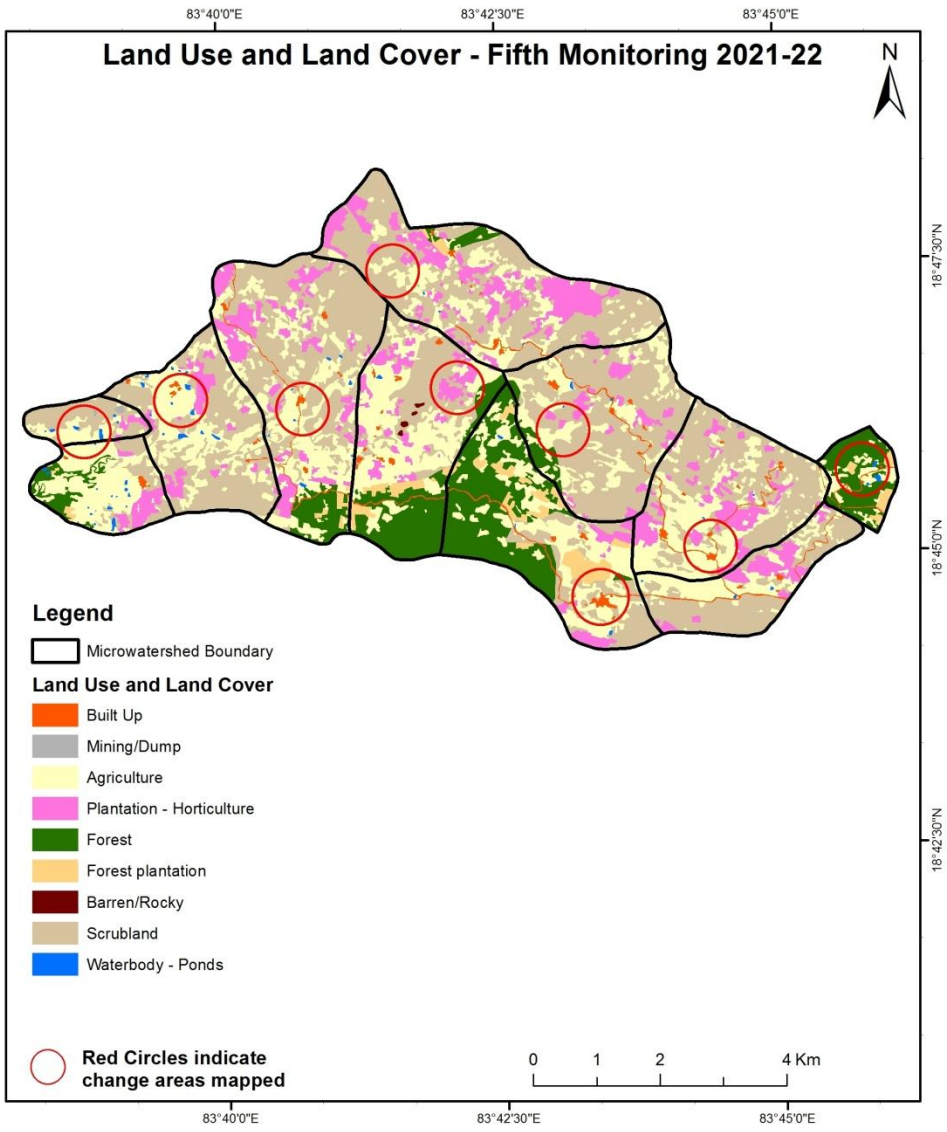
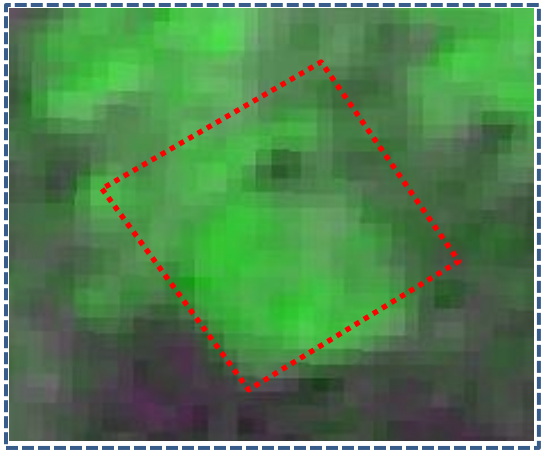
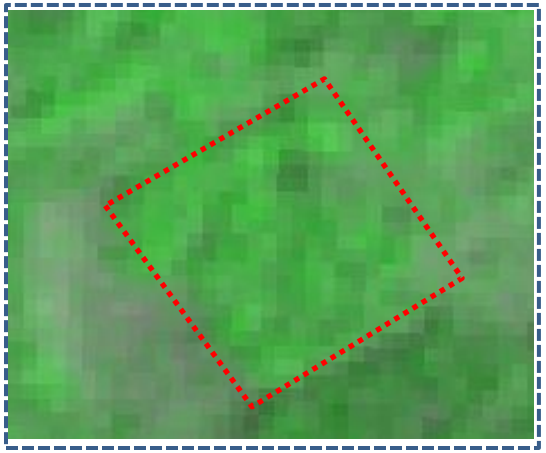


Fig 12. Polla Watershed (IWMP-18/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

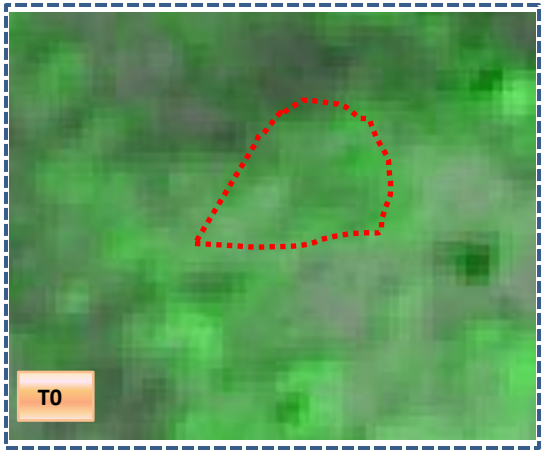


T0: 2013-14 (83°39'55.952"E 18°45'44.055"N)

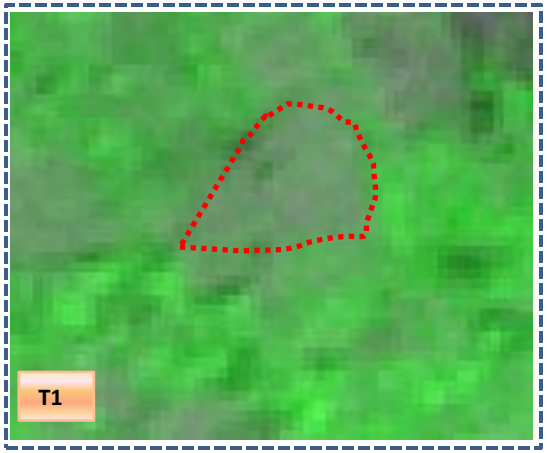


T1: 26 March 2017

Plantation to Agriculture



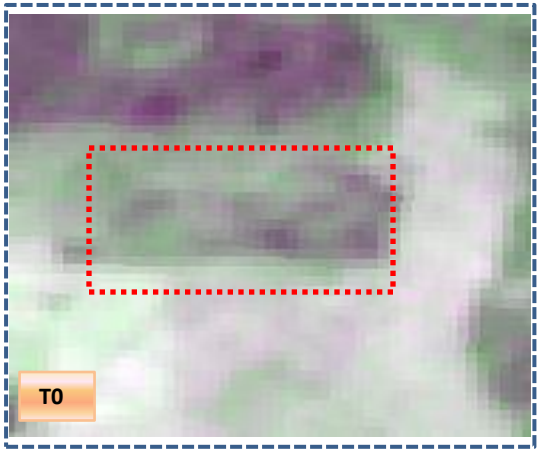
T0: 2011-12 (83°41'49.544"E 18°47'17.953"N)

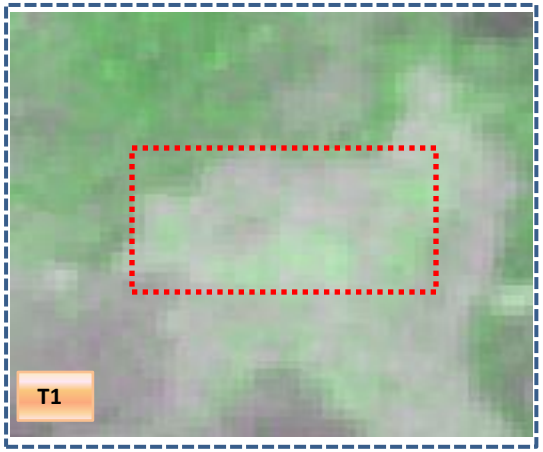


T1: 26 March 2017

Fig 13. Polla Watershed (IWMP-18/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

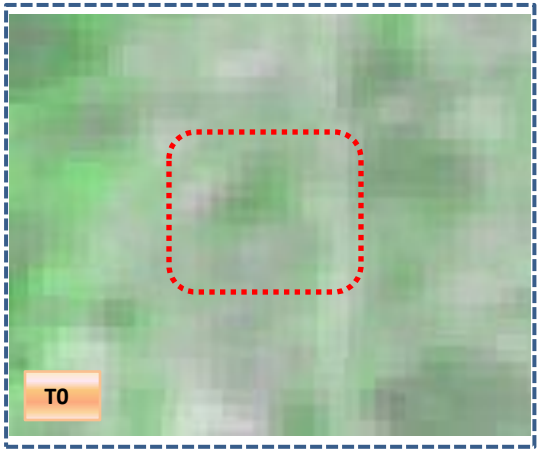


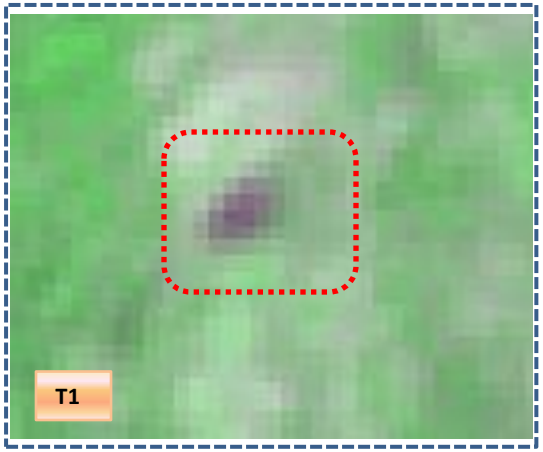


T0: 2013-14 (83°38'45.82"E 18°46'7.159"N)

T1: 26 March 2017

Agriculture to Waterbody





T0: 2013-14 (83°39'24.83"E 18°46'18.167"N)

T1: 26 March 2017

Table 4. showing change matrix depicting Land cover transitions for Polla Watershed (IWMP-18/2013-14) during study period-2013-14 to 2017-18

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	22.91										**22.91**
Mining/dump		0.43									**0.43**
Agriculture	15.25		1007.58	34.87						1.32	**1059.01**
Plantation Horticulture	2.60		20.32	596.82							**619.74**
Forest	11.29		85.59		601.90					0.29	**699.07**
Forest Plantation	1.23		0.54			120.42					**122.19**
Barren Rocky							2.86				**2.86**
Scrub	23.77	2.28	333.40					2349.04		1.19	**2709.69**
Waterbody-Streams/River											
Waterbody – Ponds										0.90	**0.90**
Grand Total	**77.06**	**2.72**	**1447.42**	**631.69**	**601.90**	**120.42**	**2.86**	**2349.04**		**3.70**	**5236.81**

Interpretation: The example of "Agriculture" Land cover for the period 2013-14 to 2017-18

1. In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents the changes in between the classes.

2. In T0 51 ha of the agriculture area has decreased and it is converted into Built-up (15 ha), plantation/horticulture (34 ha) and water body (1.2 ha) in T1.

3. In T1 439 ha of the agriculture area has increased from plantations/horticulture (20 ha), forest (85 ha) and scrubland (333 ha) of T0. The additional agriculture are coming from waterbody in T1 represents seasonal agriculture.

Table 5. showing change matrix depicting Land cover transitions for Polla Watershed (IWMP-18/2013-14) during study period-2017-18 to 2018-19

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	77.06										**77.06**
Mining/dump		2.72									**2.72**
Agriculture	0.86		1445.99							0.57	**1447.42**
Plantation Horticulture	0.09		1.71	629.89							**631.69**
Forest			3.12		598.78						**601.90**
Forest Plantation			0.11			120.31					**120.42**
Barren Rocky							2.86				**2.86**
Scrub	1.47		15.28					2331.90		0.39	**2349.04**
Waterbody-Streams/River											
Waterbody – Ponds										3.70	**3.70**
Grand Total	**79.49**	**2.72**	**1466.20**	**629.89**	**598.78**	**120.31**	**2.86**	**2331.90**		**4.66**	**5236.81**

4. In T1 1.4 ha of the agriculture area has decreased and it is converted into Built-up (0.8 ha) and water body (0.5 ha) in T2.

5. In T2 20.2 ha of the agriculture area has increased from plantations/horticulture (1.7 ha), forest (3.1 ha) and scrubland (15 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions during study period-2018-19 to 2019-20

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	79.49										**79.49**
Mining/dump		2.72									**2.72**
Agriculture	2.59		1455.22	1.49						6.90	**1466.20**
Plantation Horticulture			3.79	626.10							**629.89**
Forest	0.30		7.50		589.64					1.34	**598.78**
Forest Plantation	0.04					120.28					**120.31**
Barren Rocky							2.86				**2.86**
Scrub	1.41		50.50					2278.23		1.76	**2331.90**
Waterbody-Streams/River											
Waterbody – Ponds										4.66	**4.66**
Grand Total	**83.83**	**2.72**	**1517.01**	**627.59**	**589.64**	**120.28**	**2.86**	**2278.23**		**14.66**	**5236.81**

6. In T2 10.9 ha of the agriculture area has decreased and it is converted into Built-up (2.5 ha), plantations/horticulture (1.4 ha) and water body (6.9 ha) in T3.

7. In T3 61 ha of the agriculture area has increased from Built-up (3.7 ha), forest (7.5 ha) and scrubland (50.5 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions during study period-2019-20 to 2020-21

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	83.83										83.83
Mining/dump		2.72									2.72
Agriculture	0.23		1515.77							1.01	1517.01
Plantation Horticulture	0.02		1.62	625.95							627.59
Forest			0.80		588.37					0.47	589.64
Forest Plantation						120.20				0.07	120.28
Barren Rocky							2.86				2.86
Scrub			22.71					2255.12		0.39	2278.23
Waterbody-Streams/River											
Waterbody – Ponds										14.66	14.66
Grand Total	84.08	2.72	1540.91	625.95	588.37	120.20	2.86	2255.12		16.60	5236.81

8. In T3 1.2 ha of the agriculture area has decreased and it is converted into built-up and water body (1.01 ha) in T4.

9. In T4 25 ha of the agriculture area has increased from plantations /horticulture (1.6 ha), forest (0.8 ha) scrubland (22 ha) of T3.

Table 8. showing change matrix depicting Land cover transitions during study period-2020-21 to 2021-22

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	84.08										84.08
Mining/dump		2.72									2.72
Agriculture	0.89		1539.78							0.23	1540.91
Plantation Horticulture			0.16	625.79							625.95
Forest			2.95		585.42						588.37
Forest Plantation						120.20					120.20
Barren Rocky							2.86				2.86
Scrub	0.06		21.34					2233.60		0.13	2255.12
Waterbody-Streams/River											
Waterbody – Ponds										16.60	16.60
Grand Total	85.03	2.72	1564.23	625.79	585.42	120.20	2.86	2233.60		16.96	5236.81

10. In T4 1.1 ha of the agriculture area has decreased and it is converted into built-up (0.8 ha) and water body (0.23 ha) in T5.

11. In T5 24.4 ha of the agriculture area has increased from plantations/horticulture (0.16 ha), forest (2.9 ha) scrubland (21.3 ha) of T4.

Conclusion

1. The Land Use/Land Cover 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.
2. There is an increase of 16 Hectares in Reservoir / Tanks area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
3. There is an increase of 388, 18, 50, 23 & 23 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 505 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. About **06 ha of the plantation/horticulture area has been increased** in during the monitoring period of 2013-14 (T0) to 2021-22 (T5) years.
5. There is a decrease of 476 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
6. Farm ponds (13) is visible on IWMP (Integrated Watershed Management Programme) Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (13) verified from the portal.

Abbreviations

- IWMP -Integrated Watershed Management Programme
- LU/LC-Land Use/Land Cover
- DRISHTI- a mobile based android application
- SHRISTI- a web GIS interface on Bhuvan
- LISS – Linear Image Self Scanner
- PAN - Panchromatic Image
- FCC – False Colour Composite
- NCC – Natural Colour Composite
- NRSC – National Remote Sensing Centre
- DoLR – Department of Land Records