MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

VIZIANAGARAM -02/2013-14
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
February-2023

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

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-02/2013-14, Vizianagaram District of   Andhra Pradesh.   The total geographical area of the project is **5,052 ha.** It comprises of 12 micro watersheds.

4. In the project area 43 Drishti photos were uploaded showing 8 check dams/Rock fill dam, 5 entry point activities, 1 checks and plugins, 5 agriculture and 25 showing other activities.

5. Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 18 new farm ponds or dug out pits and 4 check dams and drainage treatments.

6. Major percentage i.e. 46 % is covered by the agriculture, 28 % is covered by scrubland, 19 % is covered by forest and remaining by other land use classes.

STUDY AREA
PROJECT : VIZIANAGARAM - IWMP-02/2013-14
DISTRICT : VIZIANAGARAM , STATE : ANDHRA PRADESH

- The study area falls in Salur Mandal of Vizianagaram district of Andhra Pradesh state. The total geographical area of the project is **5,052 ha**. It comprises of 12 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2013-14 (T0) period (*Batch -1*) projects taking 2021-22 (T5) period satellite images, seen in Table 1 & Table 2.
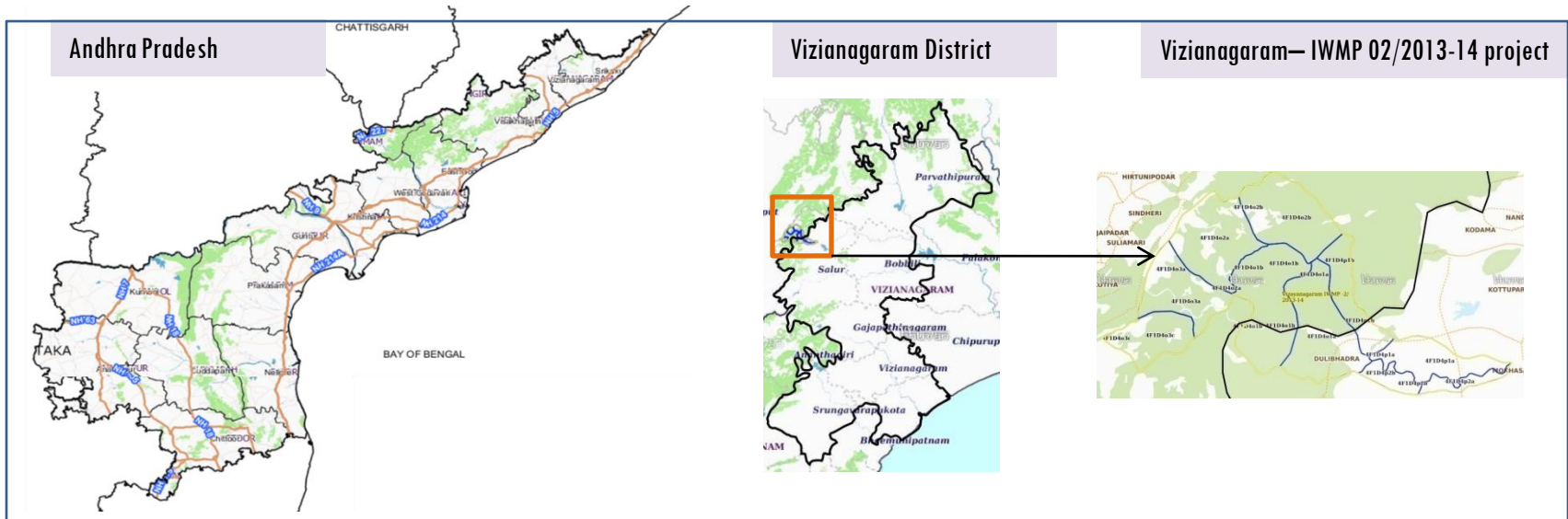

Fig.1. Location map of Thonam Watershed (IWMP-02/2013-14) in Vizianagaram District, A.P

•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			17-Mar-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			17-Mar-22
SCENE2			
SCENE 3			
SCENE 4			

Linear Image Self Scanner (LISS)

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	43
4	Detailed Project Report		

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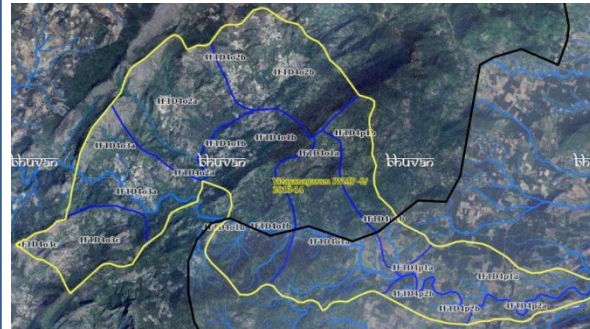
Legend

 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	Agriculture/Horticulture	6	5
2	Afforestation	0	0
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	0	0
6	Terrace	0	0
7	Checks & Plugs	1	1
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	0	0
10	Civil work-Check dams/Rock fill dam	8	8
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	0	0
15	Capacity Building Activities	0	0
16	Entry Point Activity	5	5
17	Others	28	25
	TOTAL	**48**	**43**

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. Thonam (Micro) Watershed (IWMP-02/2013-14) Natural Colour Composite-2013-14 to 2021-22
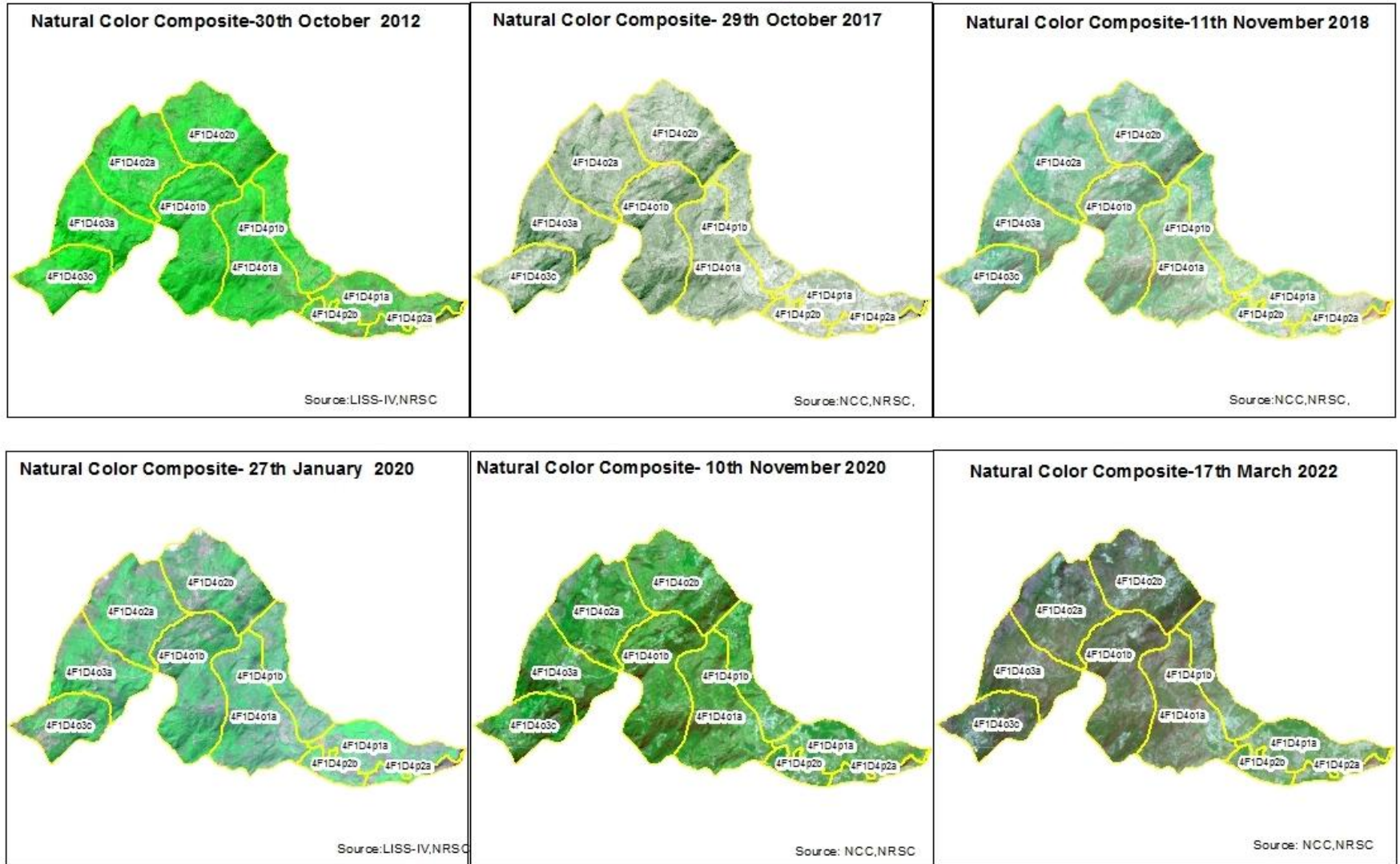
Fig 5. Thonam (Micro) Watershed (IWMP-02/2013-14) Monitoring of activities in Vizianagaram District Andhra Pradesh
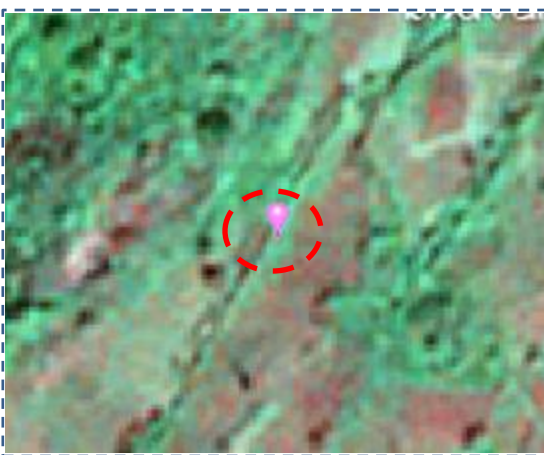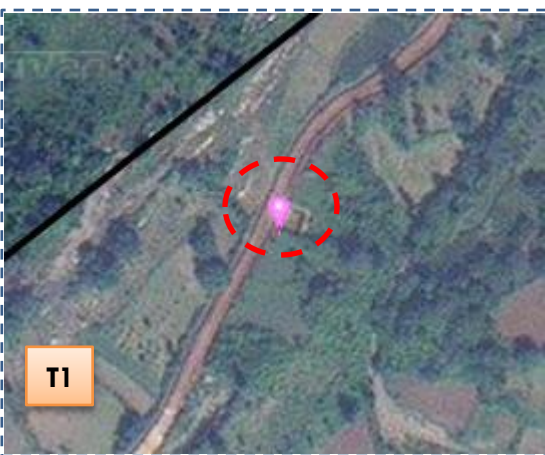

| T0:2009-10 | T1: 29 December 2017 | Drishti Sl no. 7031465   MWS :4F1D4p1α |

Entry point Activity

| T0:2009-10 | T1: 29 December 2017 | Drishti Sl no. 2486162   MWS :4F1D6x1α |

Farm pond

Fig 6. Thonam (Micro) Watershed (IWMP-02/2013-14) Monitoring of activities in Vizianagaram Dt Andhra Pradesh
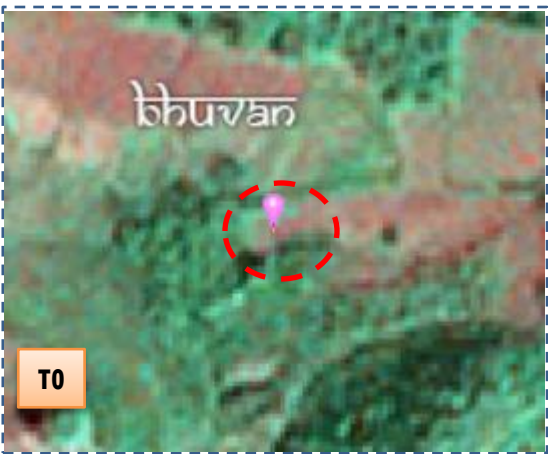

| T0: 2009-10 | T1: 29 December 2017 | Drishti Sl no. __2423189   MWS :4F1D4p2a |

Horticulture

| T0: 2009-10 | T1: 29 December 2017 | Drishti Sl no. 7010775   MWS : 4F1D4p1b |

Percolation Tank

03. MONITORING IN THE PROJECT AREA

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. Thonam (Micro) Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)
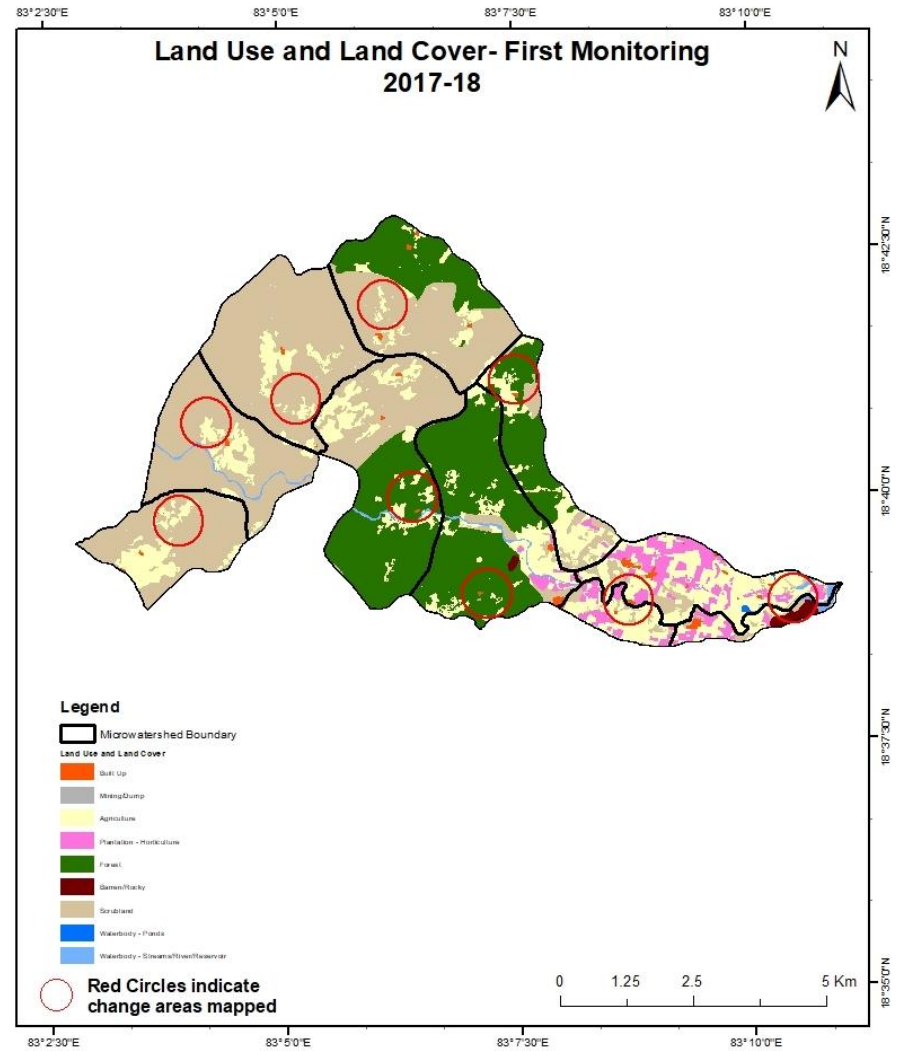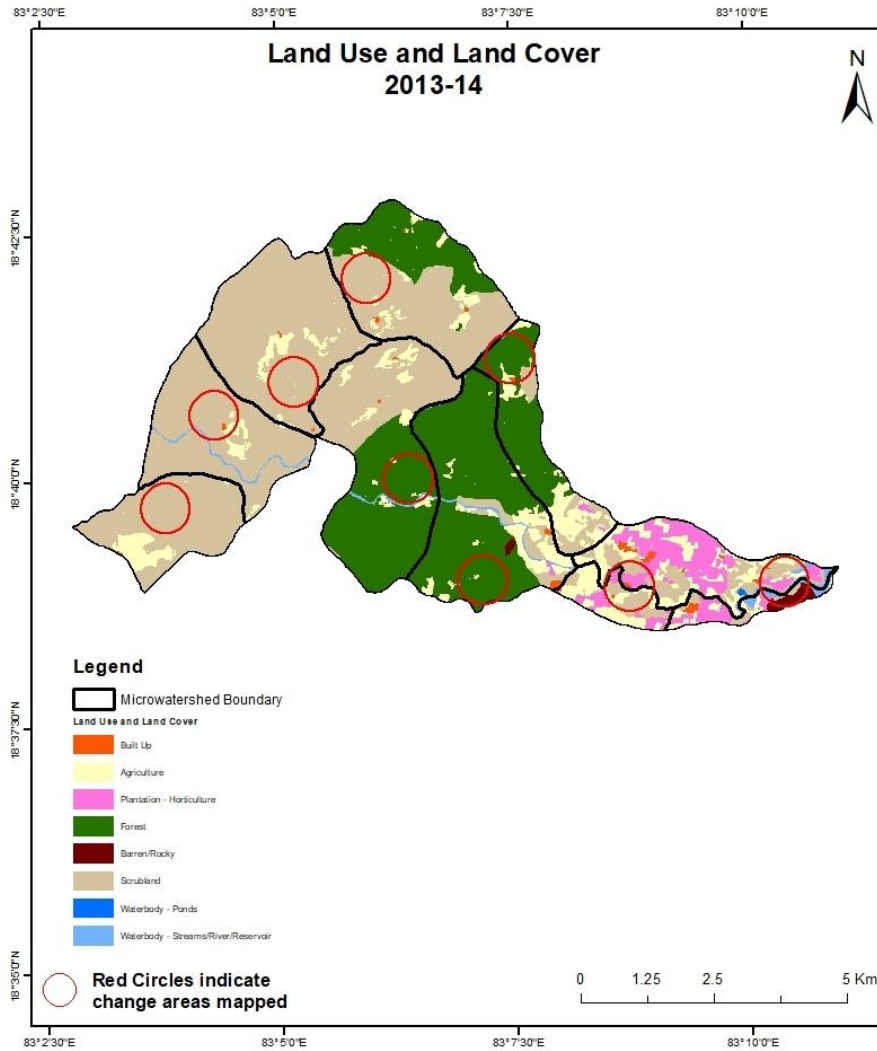
Scale: 1:10000

Fig 8. Thonam (Micro) Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)
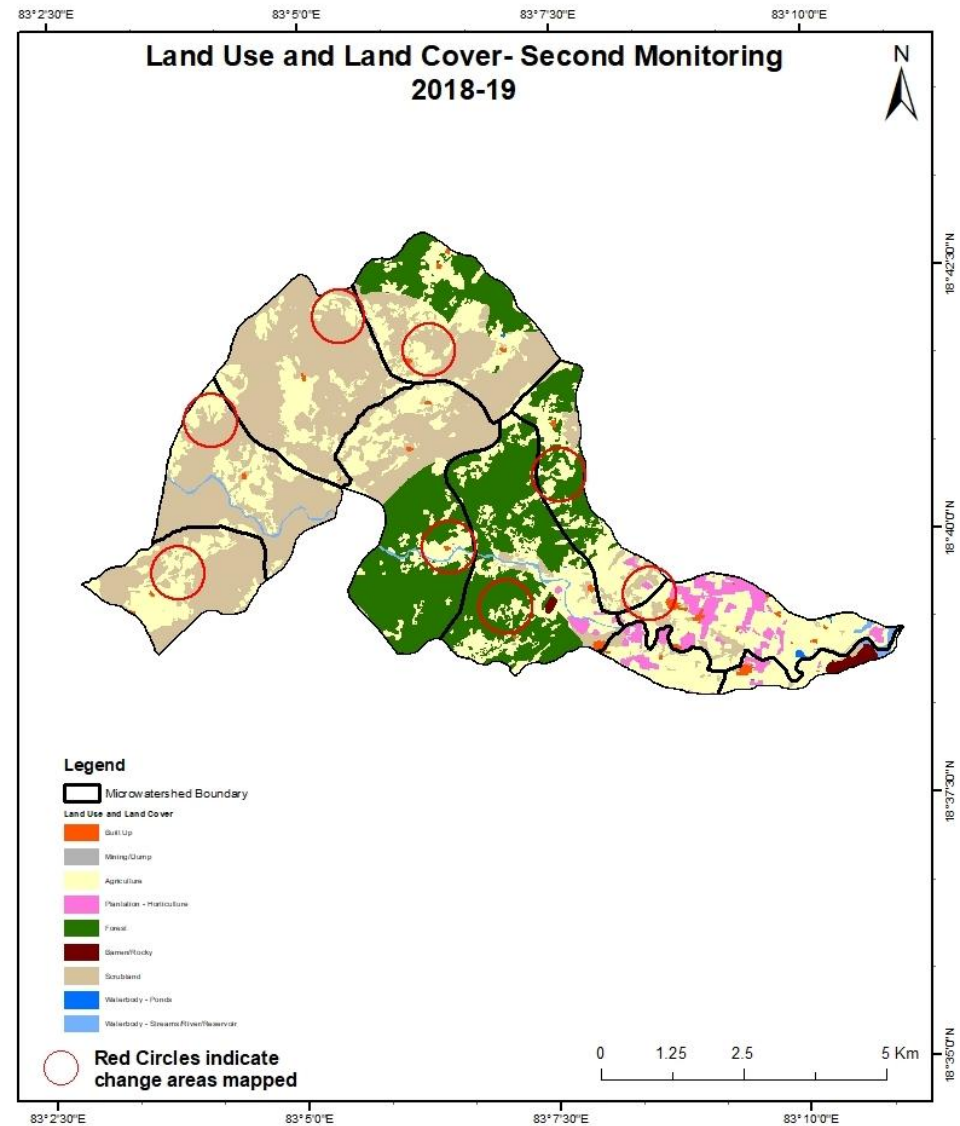## Scale: 1:10000

Fig 9. Thonam (Micro) Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000
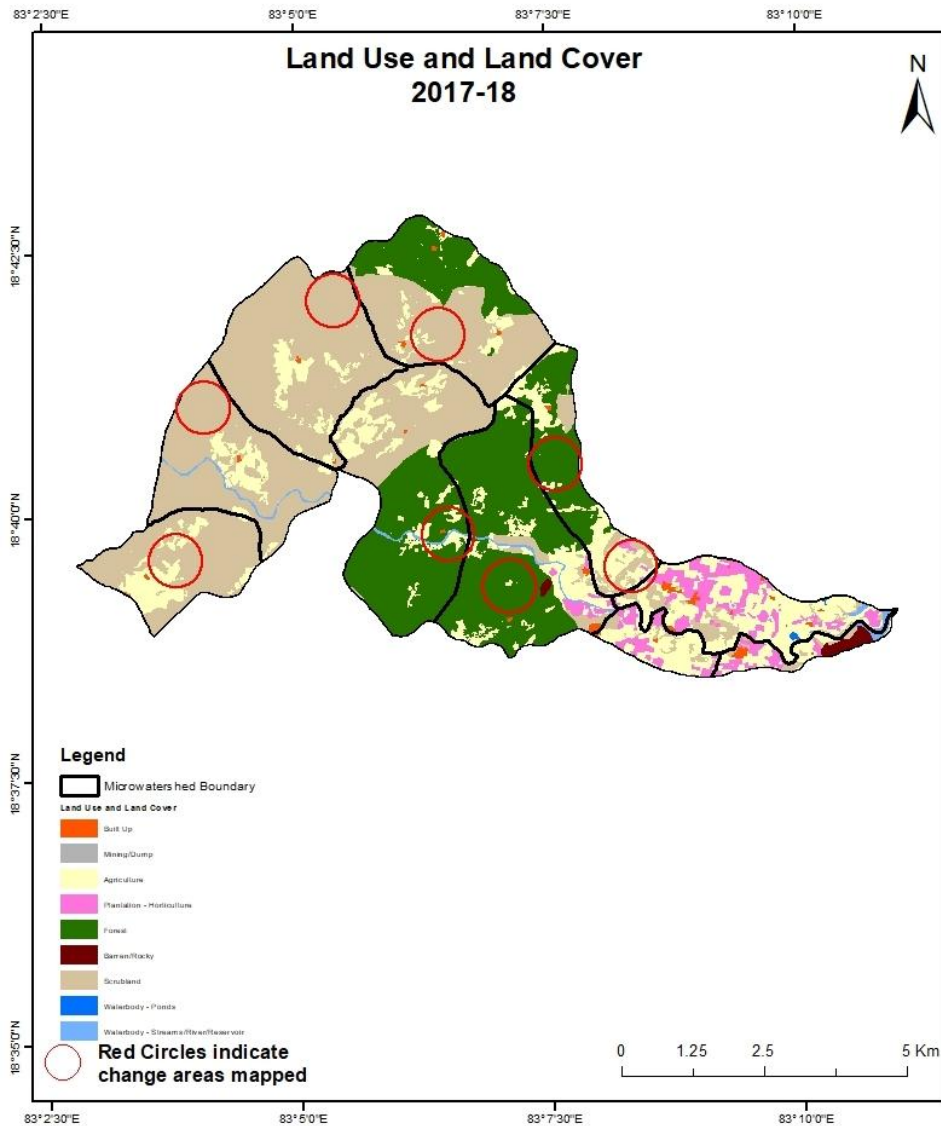
Fig 10. Thonam (Micro) Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000
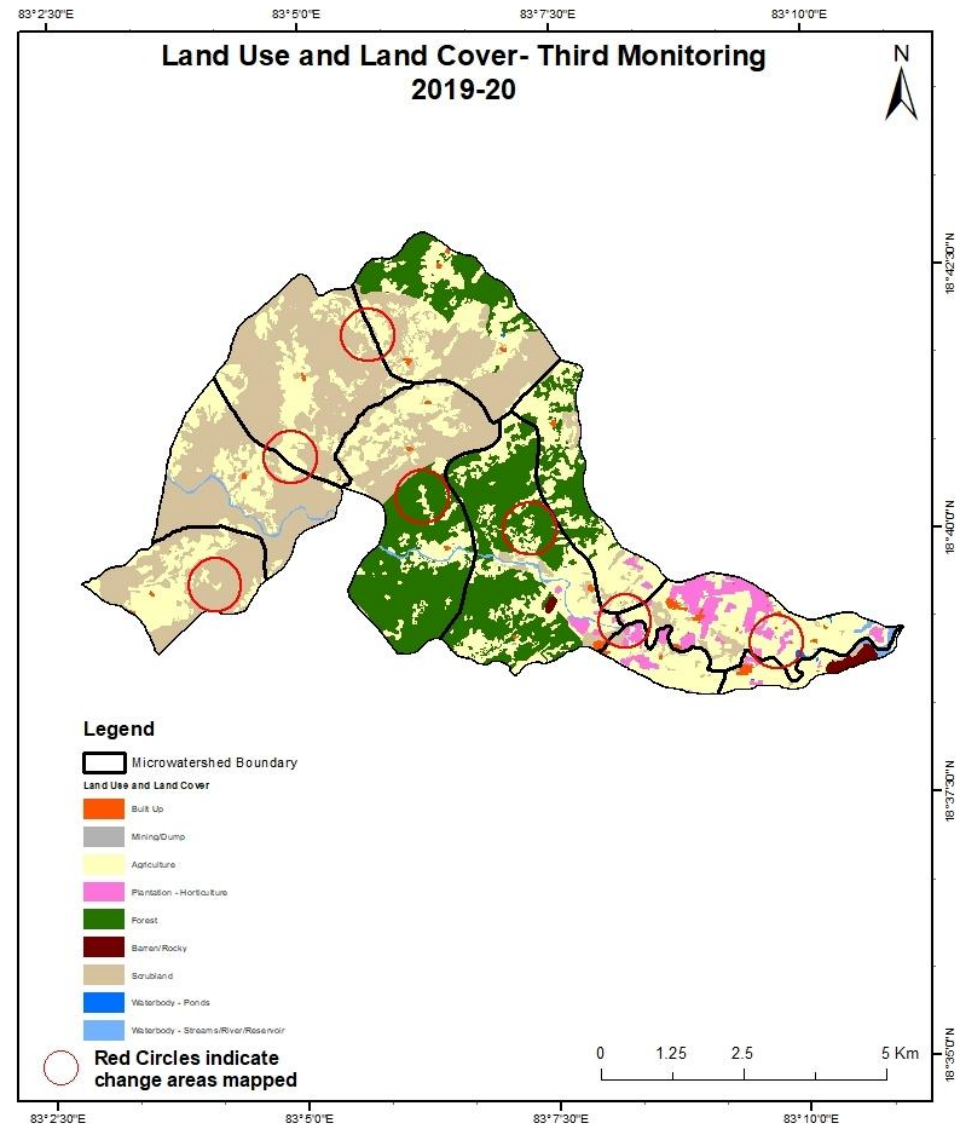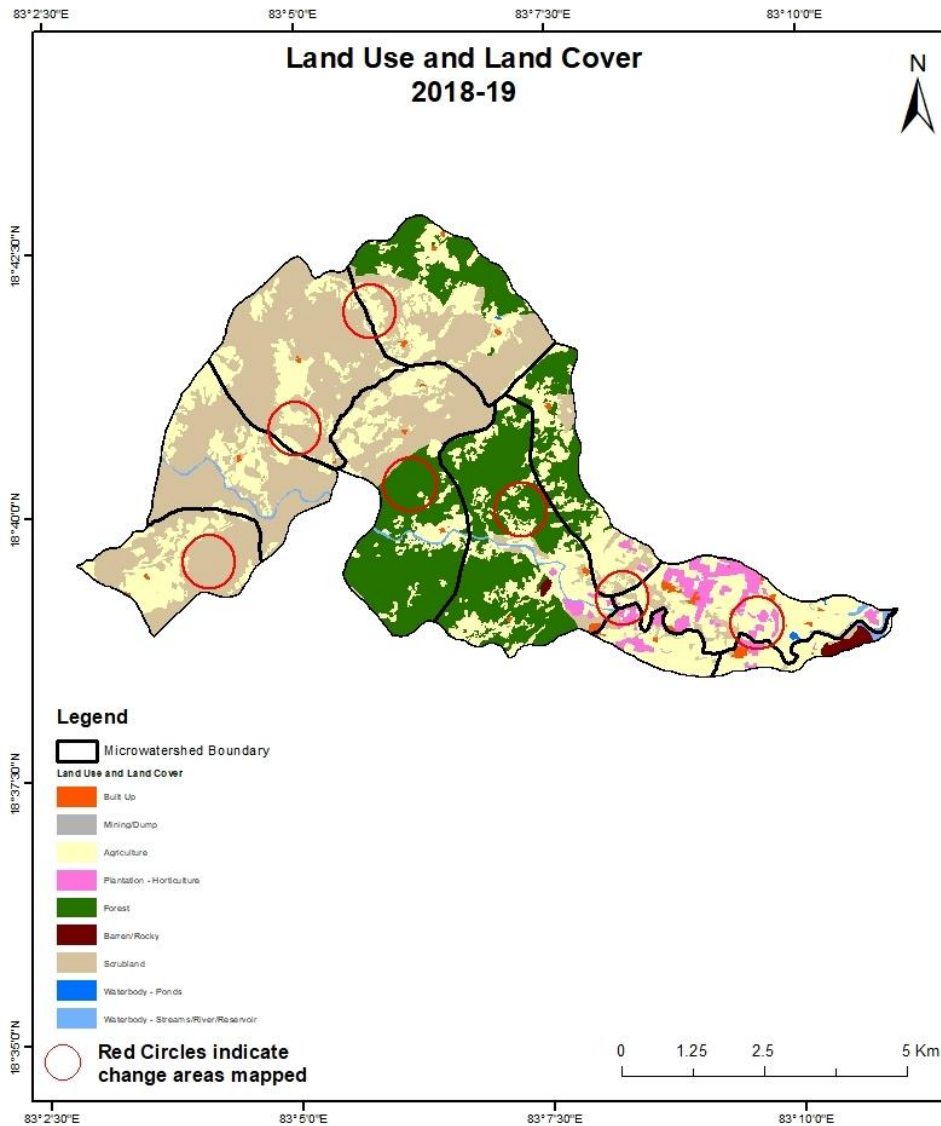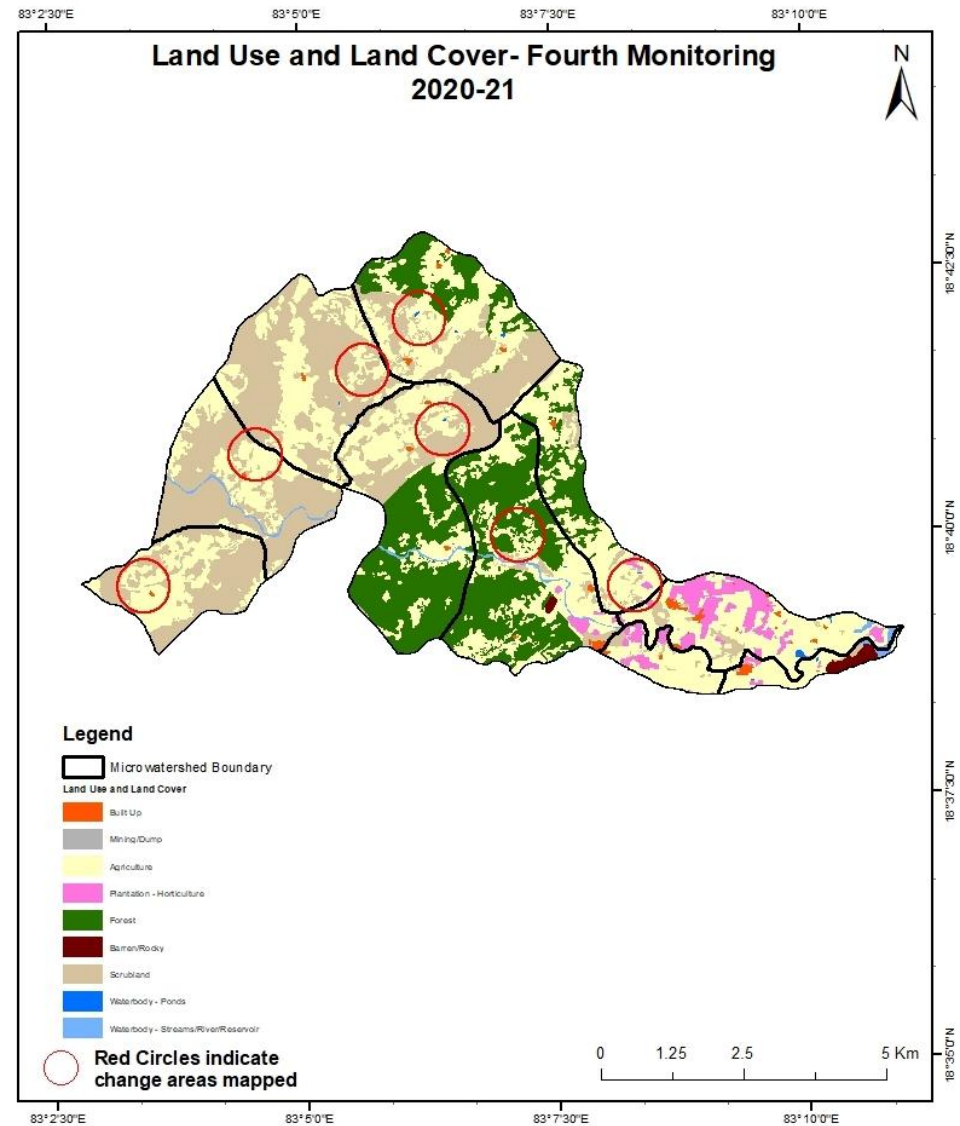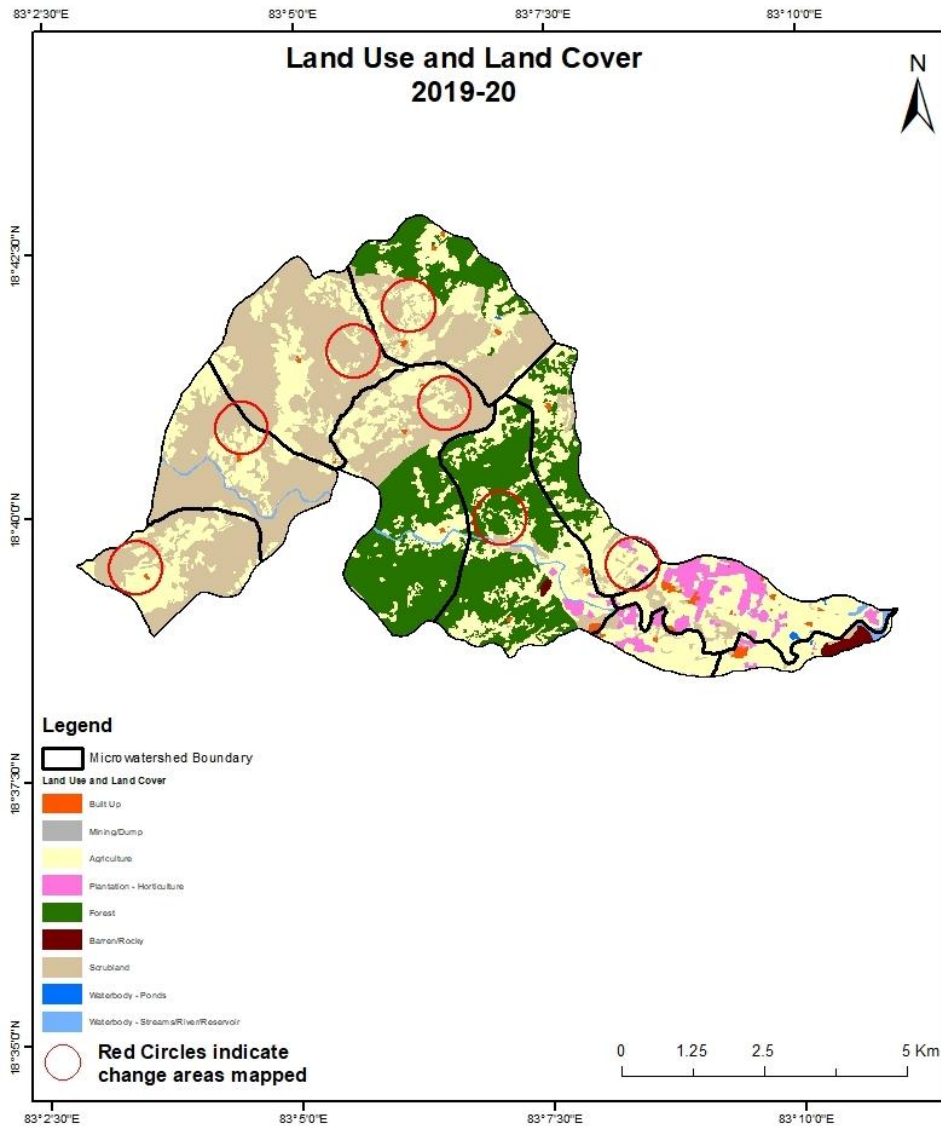
Fig 11. Thonam (Micro) Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

Fig 12. Thonam (Micro) Watershed (IWMP-02/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

T0: 2013-14(83°7'42.294"E 18°39'6.828"N)

T1: 29th October 2017

Agriculture to Plantation

T0: 2013-14 (83°8'13.646"E 18°38'59.889"N)
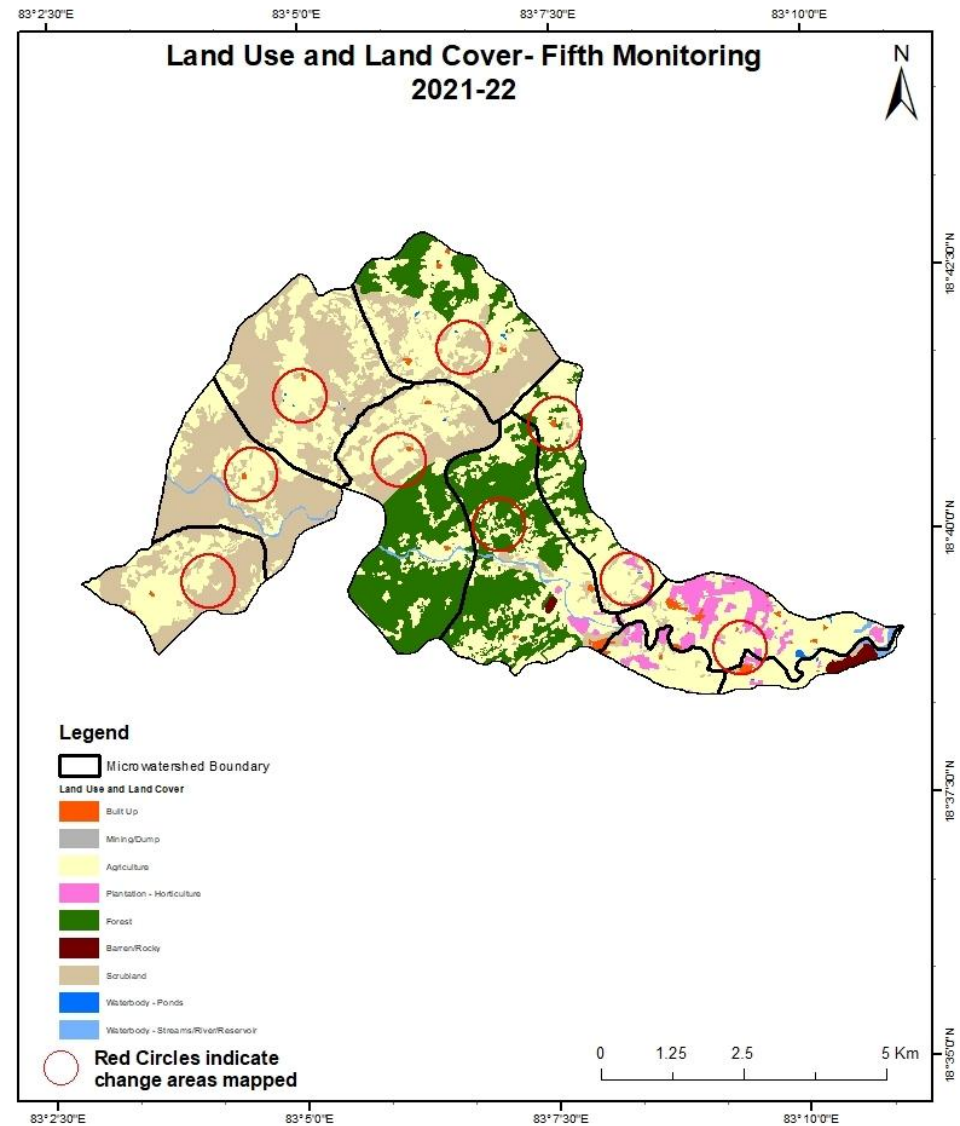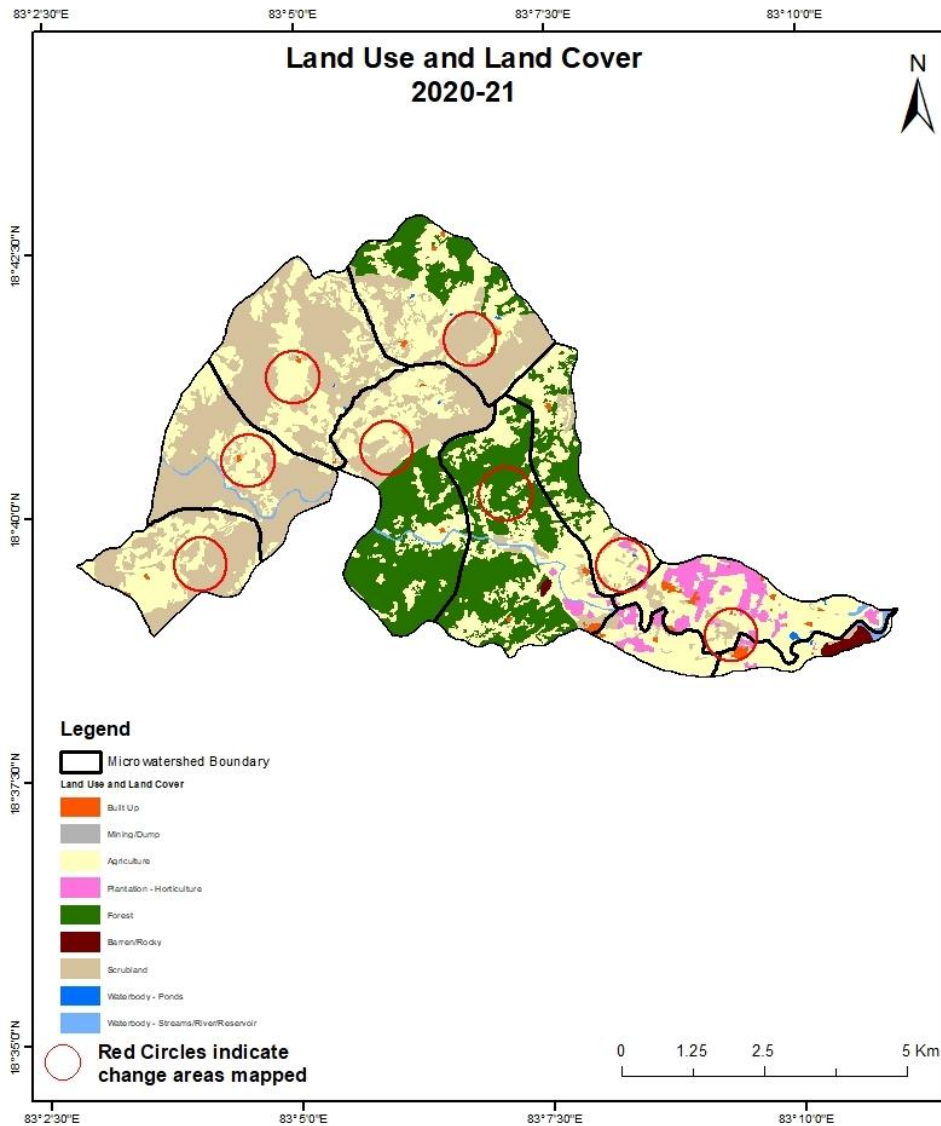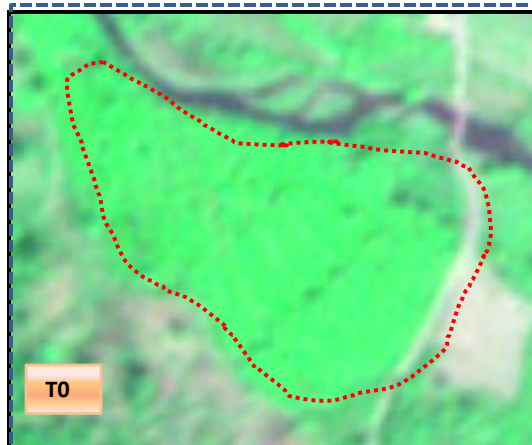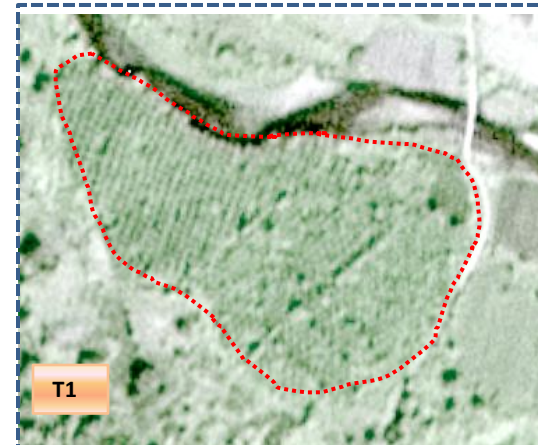
T1: 29th October 2017

Fig 13. Thonam (Micro) Watershed (IWMP-02/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates
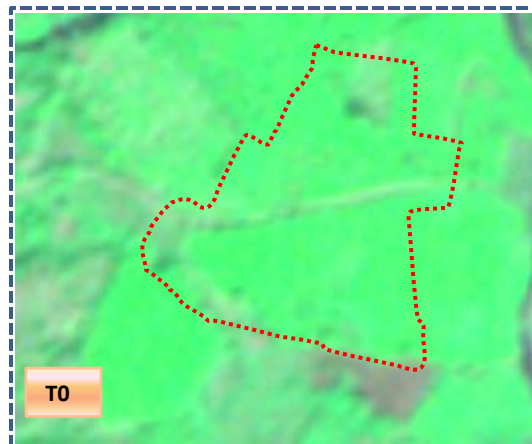
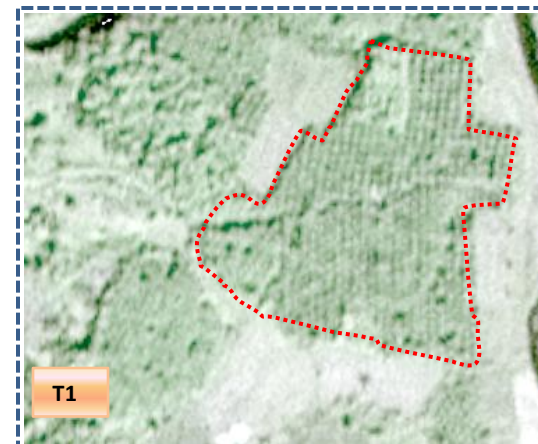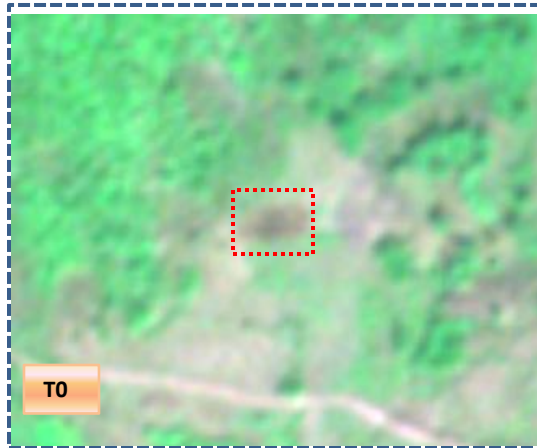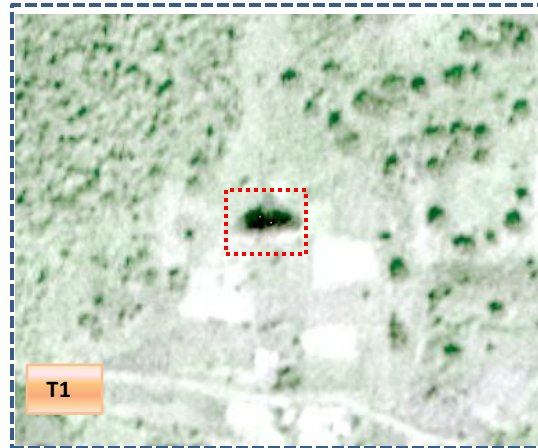Agriculture to water body

T0

T1

T0: 2013-14(83°7'37.168"E 18°39'39.229"N)

T1: 29th October 2017

Scrub to Agriculture

T0

T1
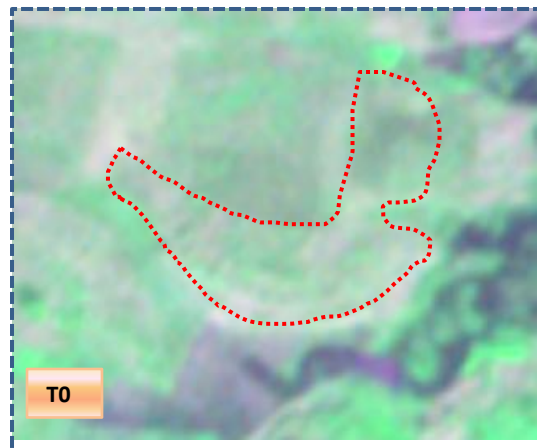
T0: 2013-14(83°10'29.17"E 18°39'3.949"N)
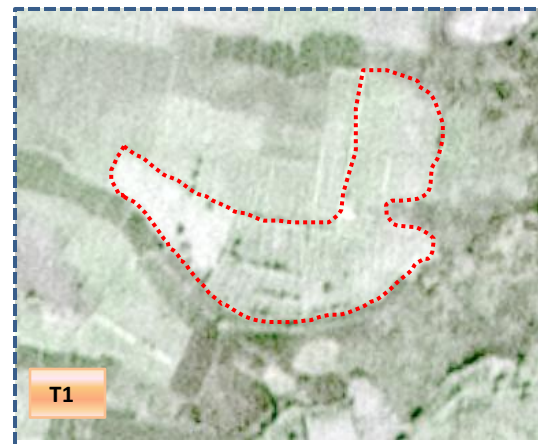
T1: 29th October 2017

Table 4. showing change matrix depicting Land cover transitions for Thonam (Micro) Watershed (IWMP-02/2013-14) 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	26.27			0.54							26.81
Mining/dump											
Agriculture	3.71	0.26	528.02	46.57				0.65	0.16	0.84	580.21
Plantation Horticulture	0.76		83.13	160.66					0.14		244.69
Forest	0.13	0.23	101.11		1447.91						1549.38
Forest Plantation											
Barren Rocky							24.98				24.98
Scrub	0.43		268.97	2.76				2273.45		0.06	2545.67
Waterbody-Streams/River			15.47					0.08	62.62		78.17
Waterbody – Ponds										1.91	1.91
Grand Total	31.3	0.49	996.7	210.53	1447.91		24.98	2274.18	62.92	2.81	5052

Interpretation : The example of "Agriculture" Land cover for the period 2013-14 to 2021-22

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 52 ha of the agriculture area has decreased and it is converted into Built-up (3.7 ha), mining/dump (0.2 ha), plantation/horticulture (46.5 ha) and water body (0.6 ha) and water body (1 ha) in T1.

3. In T1 468 ha of the agriculture area has increased from plantations (83 ha), forest (101 ha), scrubland (269 ha) and water body (15 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions for Thonam (Micro) Watershed (IWMP-02/2013-14) during study period-2017-18 to 2018-19

Land cover T1	Monitoring period (T2) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Units in Hectares Water body Ponds	Grand Total
Built up	31.3										**31.3**
Mining/dump		0.49									**0.49**
Agriculture	1.47		993.42	1.61						0.2	**996.7**
Plantation Horticulture	0.35		61.05	149.01						0.12	**210.53**
Forest	0.35		238.09		1209.47						**1447.91**
Forest Plantation											
Barren Rocky							24.98				**24.98**
Scrub	1.18		415.62					1857.09		0.29	**2274.18**
Waterbody-Streams/River			0.85						62.07		**62.92**
Waterbody – Ponds										2.81	**2.81**
Grand Total	**34.65**	**0.49**	**1709.03**	**150.62**	**1209.47**		**24.98**	**1857.09**	**62.07**	**3.42**	**5052**

4. In T1 03 ha of the agriculture area has decreased and it is converted into Built-up (1.4 ha), plantations/horticulture (1.6 ha) and water body (0.02 ha) in T2.

5. In T2 715 ha of the agriculture area has increased from plantations/horticulture (61 ha), forest (238 ha), scrubland (415 ha) and water body (0.8 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions for Thonam (Micro) Watershed (IWMP-02/2013-14) during study period-2018-19 to 2019-20

Land cover T2	Monitoring period (T3)										Units in Hectares
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	34.65										34.65
Mining/dump		0.49									0.49
Agriculture	0.45		1688.35	18.72				1.01		0.5	1709.03
Plantation Horticulture			8.55	142.07							150.62
Forest			87.25		1122.22						1209.47
Forest Plantation											
Barren Rocky							24.98				24.98
Scrub	0.11		107.66					1749.32			1857.09
Waterbody-Streams/River									62.07		62.07
Waterbody – Ponds										3.42	3.42
Grand Total	35.21	0.49	1891.81	160.79	1122.22		24.98	1750.33	62.07	3.92	5051.82

6. In T2 20 ha of the agriculture area has decreased and it is converted into Built-up (0.4 ha), plantations/horticulture (18.7 ha), scrub (1 ha) and water body (0.5 ha) in T3.

7. In T3 203 ha of the agriculture area has increased from plantations (8.5 ha), forest (87 ha) and scrubland (107 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions for Thonam (Micro) Watershed (IWMP-02/2013-14) during study period-2019-20 to 2020-21

Land cover / 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	35.21										35.21
Mining/dump		0.49									0.49
Agriculture			1891.53							0.28	1891.81
Plantation Horticulture				160.79							160.79
Forest			65.82		1056.4						1122.22
Forest Plantation											
Barren Rocky							24.98				24.98
Scrub	1.12		168.59					1579.25		1.37	1750.33
Waterbody- Streams/River									62.07		62.07
Waterbody – Ponds										3.92	3.92
Grand Total	36.33	0.49	2125.94	160.79	1056.4		24.98	1579.25	62.07	5.57	5051.82

Units in Hectares

8. In T3 0.28 ha of the agriculture area has decreased and it is converted into water body (0.2 ha) in T4.

9. In T4 234 ha of the agriculture area has increased from forest (65 ha) and scrubland (168 ha)of T3.

Table 8. showing change matrix depicting Land cover transitions for Thonam (Micro) Watershed (IWMP-02/2013-14) during study period-2020-21 to 2021-22

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
Built up	36.33										36.33
Mining/dump		0.49									0.49
Agriculture	0.06		2125.07							0.81	2125.94
Plantation Horticulture				160.79							160.79
Forest			72.13		984.27						1056.4
Forest Plantation											
Barren Rocky							24.98				24.98
Scrub	1.68		130.84					1446.6		0.13	1579.25
Waterbody-Streams/River									62.07		62.07
Waterbody – Ponds										5.57	5.57
Grand Total	38.07	0.49	2328.04	160.79	984.27		24.98	1446.6	62.07	6.51	5051.82

Units in Hectares

10. In T4 0.87 ha of the agriculture area has decreased and it is converted into built-up (0.06 ha) and water body (0.8 ha) in T5.

11. In T5 202 ha of the agriculture area has increased from forest (72 ha) and scrubland (130 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 decrease of 11 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 416, 712, 182, 234 & 202 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 1,747 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.

4. There is a decrease of 1,099 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.

5. Farm ponds (0) is visible on IWMP (Integrated Watershed Management Programme) Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (0) 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