MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

VISAKHAPATNAM -08/2013-14
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

March-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**

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

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-08/2013-14, Visakhapatnam District of Andhra Pradesh.   The total geographical area of the project is **5,440 ha**. It comprises of 10 micro watersheds.

4. In the project area 13 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 4.6 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. 61 % is covered by forest, 25 % is covered by the agriculture 9.5 % is covered by scrubland and remaining by other land use classes.

- The study area falls in Ananthagiri Mandal of Visakhapatnam district of Andhra Pradesh state. The total geographical area of the project is **5,440 ha.** It comprises of 10 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.
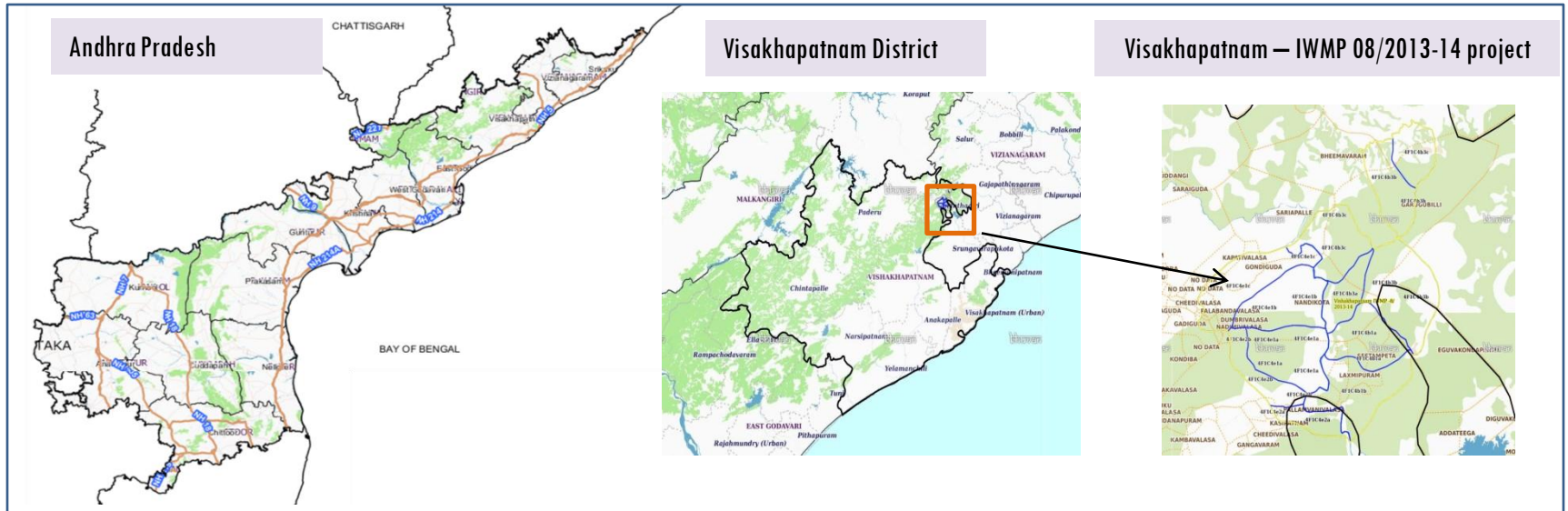

Fig.1. Location map of Seethampeta Watershed (IWMP-08/2013-14) in Visakhapatnam District, A.P

- Visakhapatnam has a tropical wet and dry climate. The annual mean temperature ranges between 24.7 °C to 30.6 °C, with the maximum in the month of May and the minimum in January; the minimum temperatures ranges between 20-27 °C.
- The climate of the district is varied and has differing climate conditions in different parts. Near the coast the air is humid and moist and relaxing, but gets warmer towards the interior and cools down in the hilly areas on account of elevation and dense vegetation.

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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			10-Jan-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			10-Jan-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	13
4	Detailed Project Report		

Fig2. Natural Color Composite overlaid with Project boundaries and high detail stream network
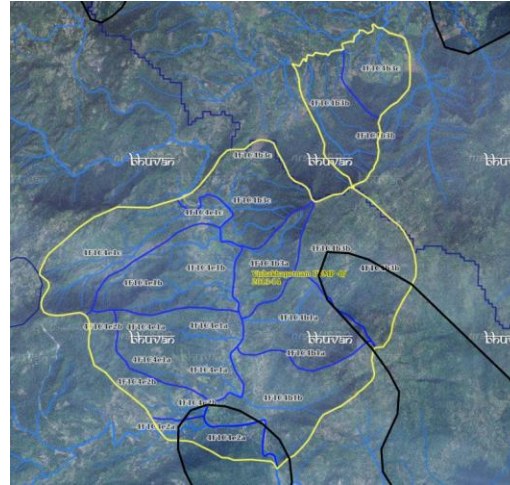
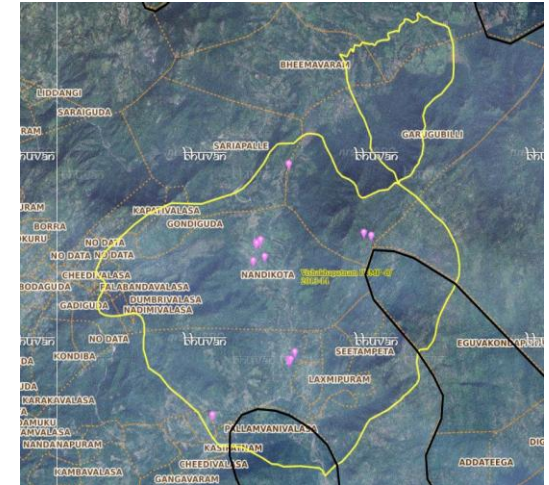Legend

 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	0	0
2	Horticulture	0	0
3	Agriculture	0	0
4	Pasture	0	0
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/Dug out pit	0	0
11	Civil work-Check dams/Rock fill dam	3	3
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	1	1
18	Others	9	9
	TOTAL	**13**	**13**

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.

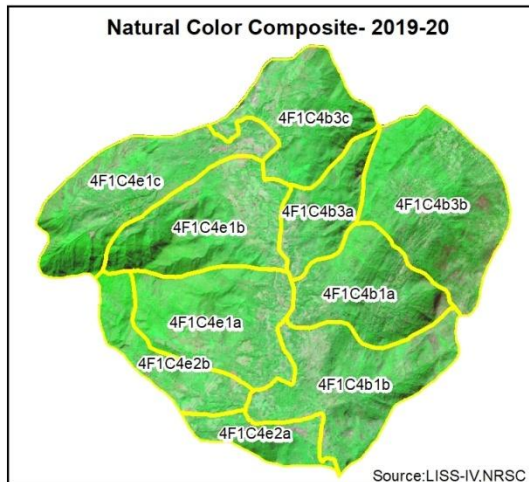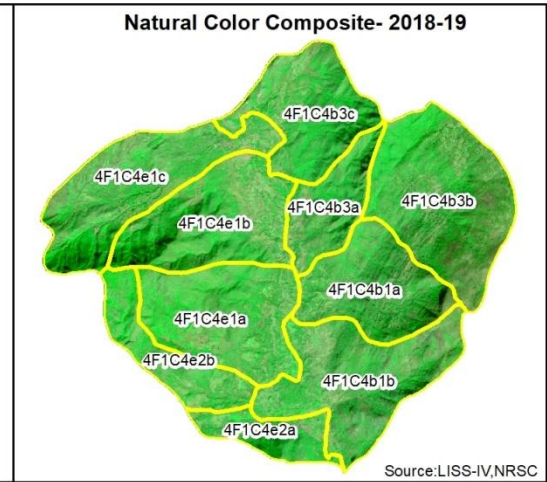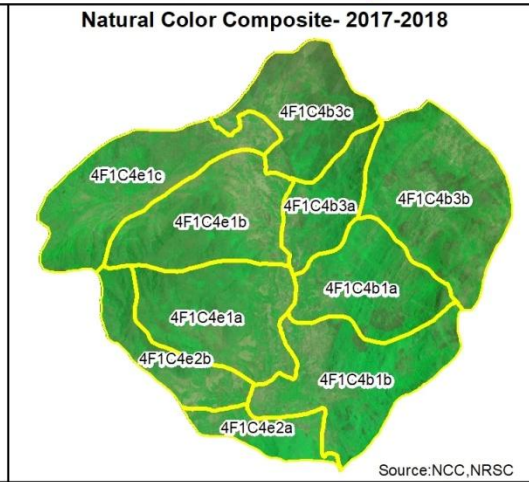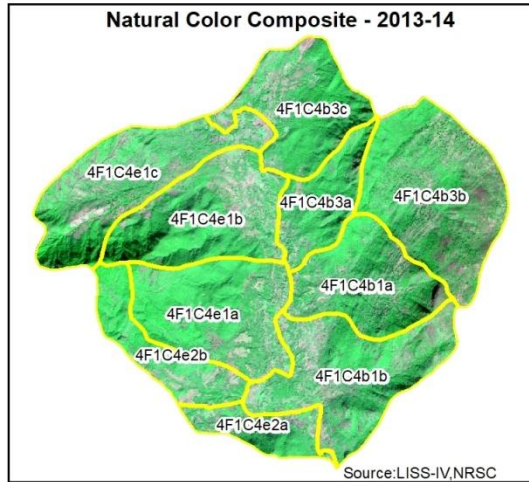# Fig 4. Seethampeta Watershed (IWMP-08/2013-14) Natural Colour Composite (NCC)
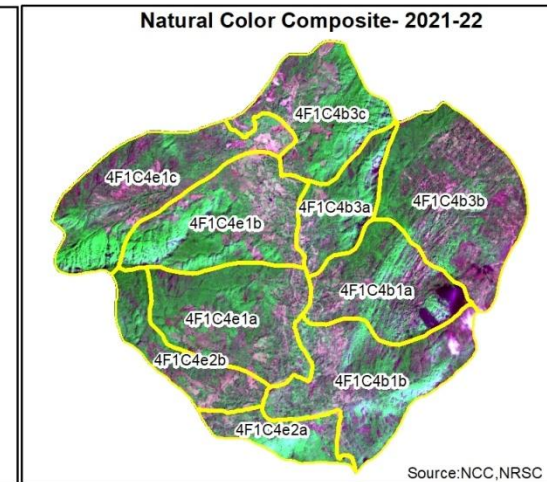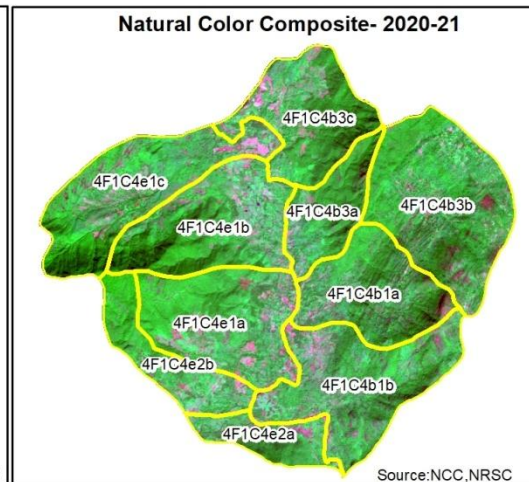
Fig 5. Monitoring of activities in Seethampeta Watershed (IWMP-08/2013-14) Visakhapatnam District Andhra Pradesh
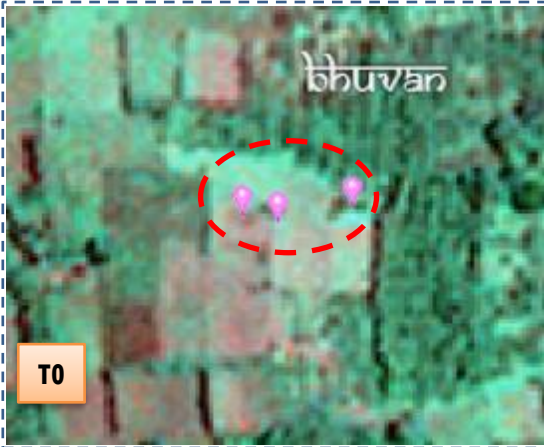

| T0:2013-14 | T1: 26 November 2017 | Drishti Sl no. 7033869 MWS : 4F1C4b3c |

Check dam

| T0:2013-14 | T1: 26 November 2017 | Drishti Sl no. 7009810   MWS : 4F1C4b1b |

Entry Point Activities

Fig 6. Monitoring of activities in Seethampeta Watershed (IWMP-08/2013-14) Visakhapatnam District Andhra Pradesh
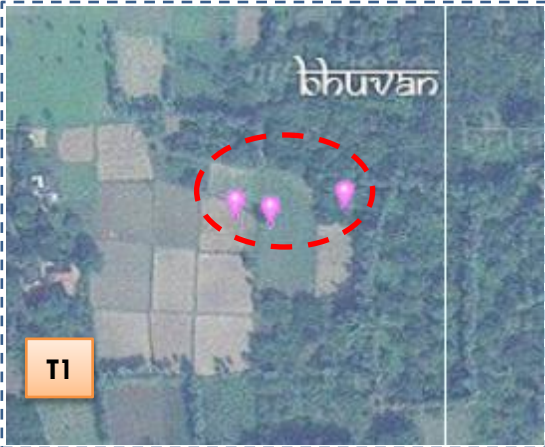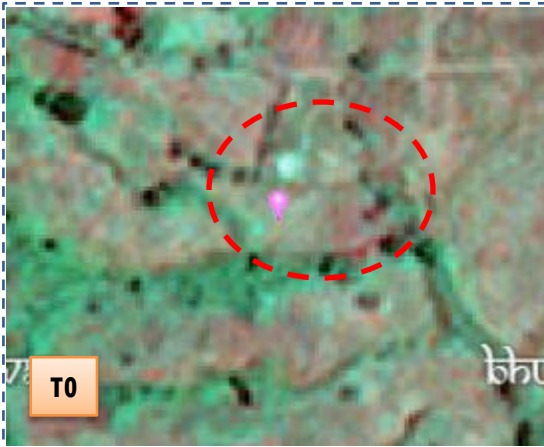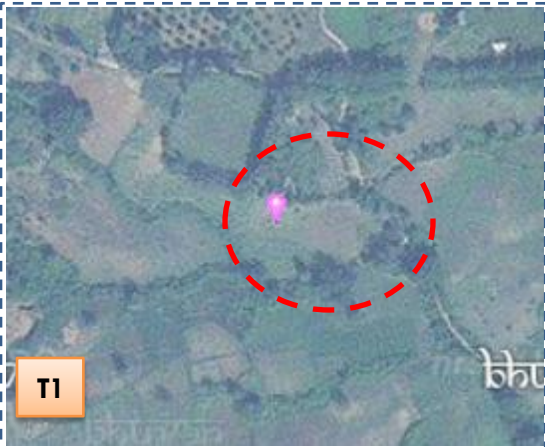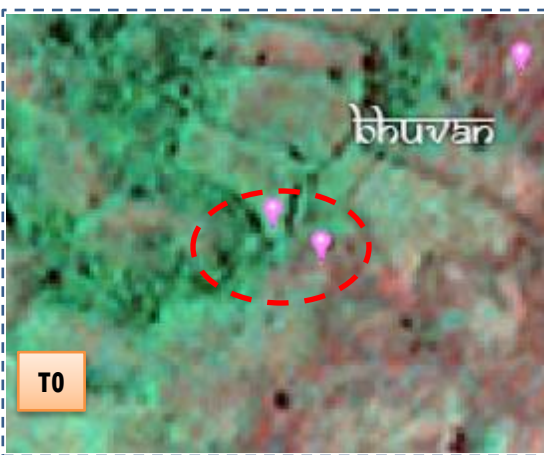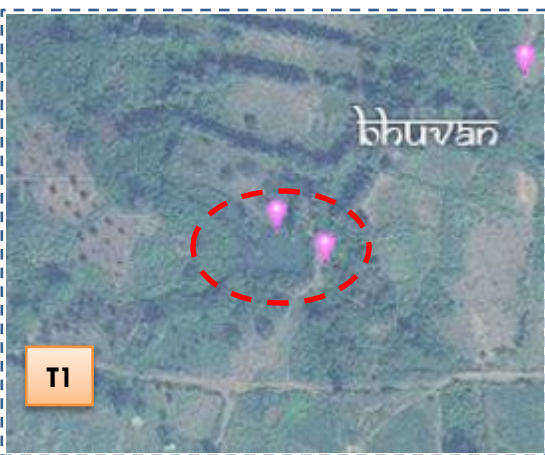

| T0:2013-14 | T1: 26 November 2017 | Drishti Sl no. 7033833   MWS : 4F1C4e1b |

Percolation tank

| T0:2013-14 | T1: 26 November 2017 | Drishti Sl no. 7033835   MWS : 4F1C4e1b |

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. Seethampeta Watershed (IWMP-08/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)
Scale: 1:10000

Fig 8. Seethampeta Watershed (IWMP-08/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)
Scale: 1:10000
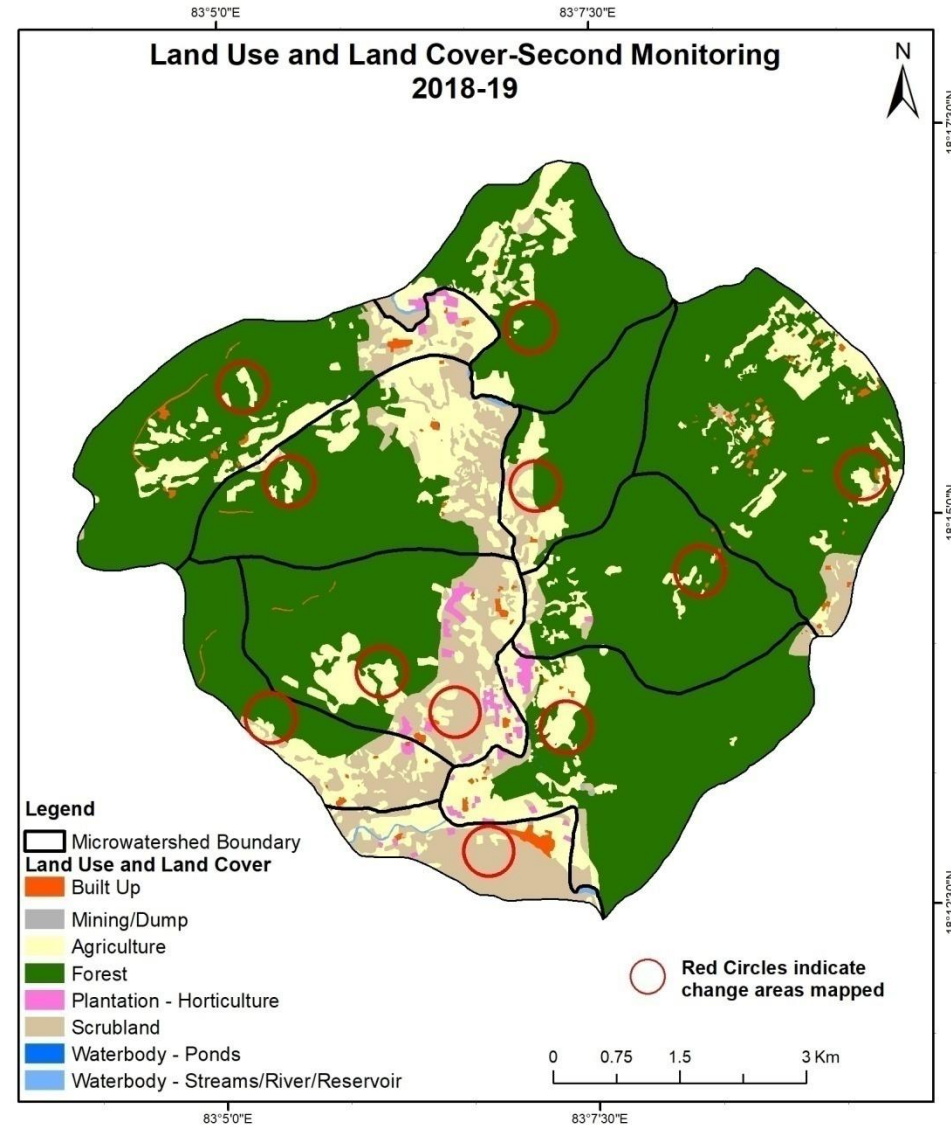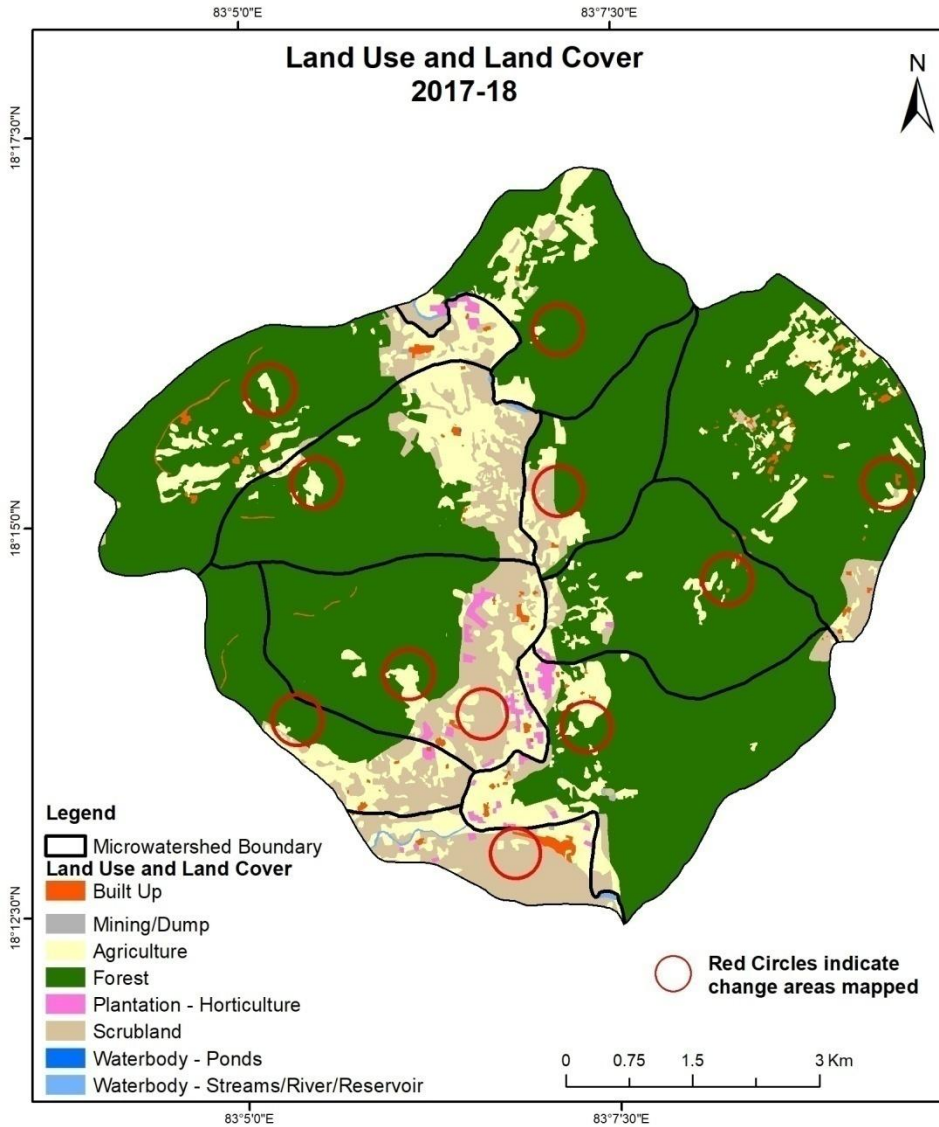
Fig 9. Seethampeta Watershed (IWMP-08/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)
Scale: 1:10000
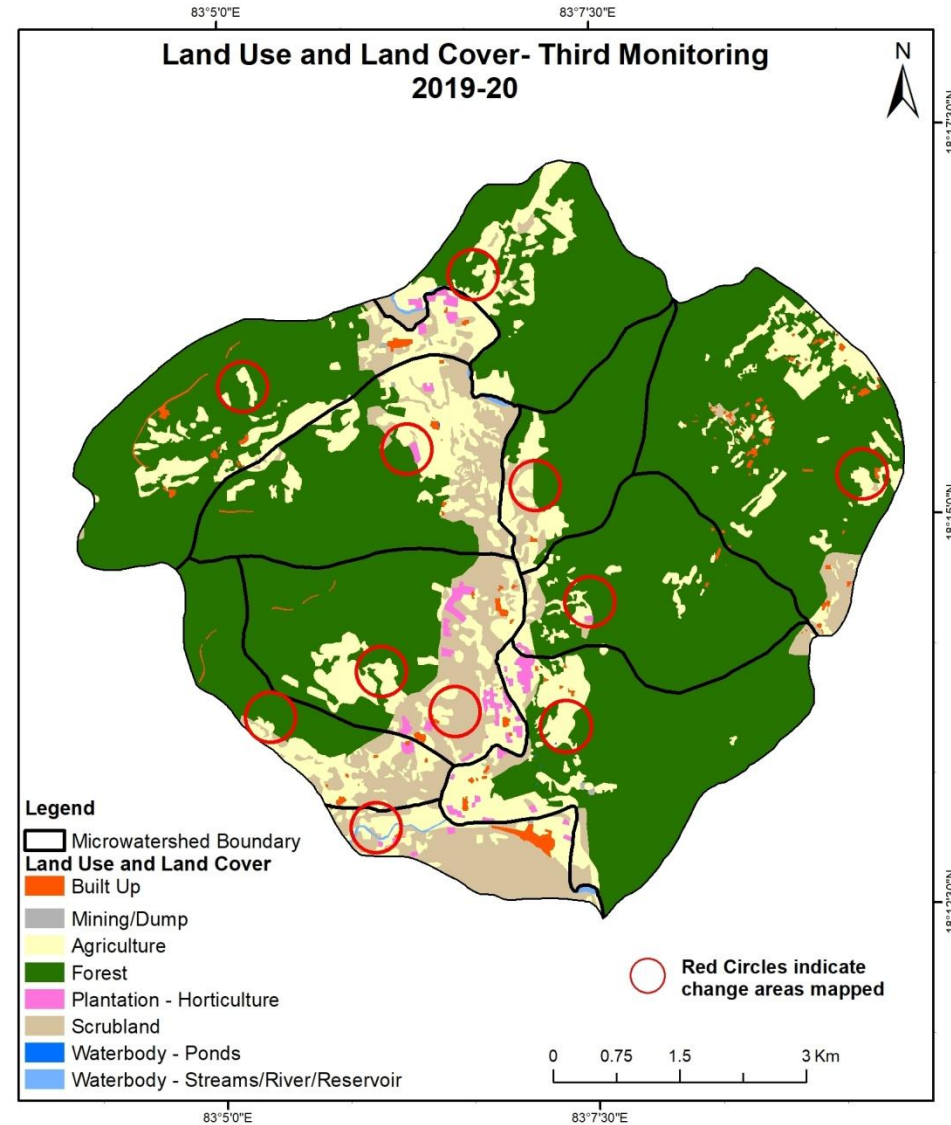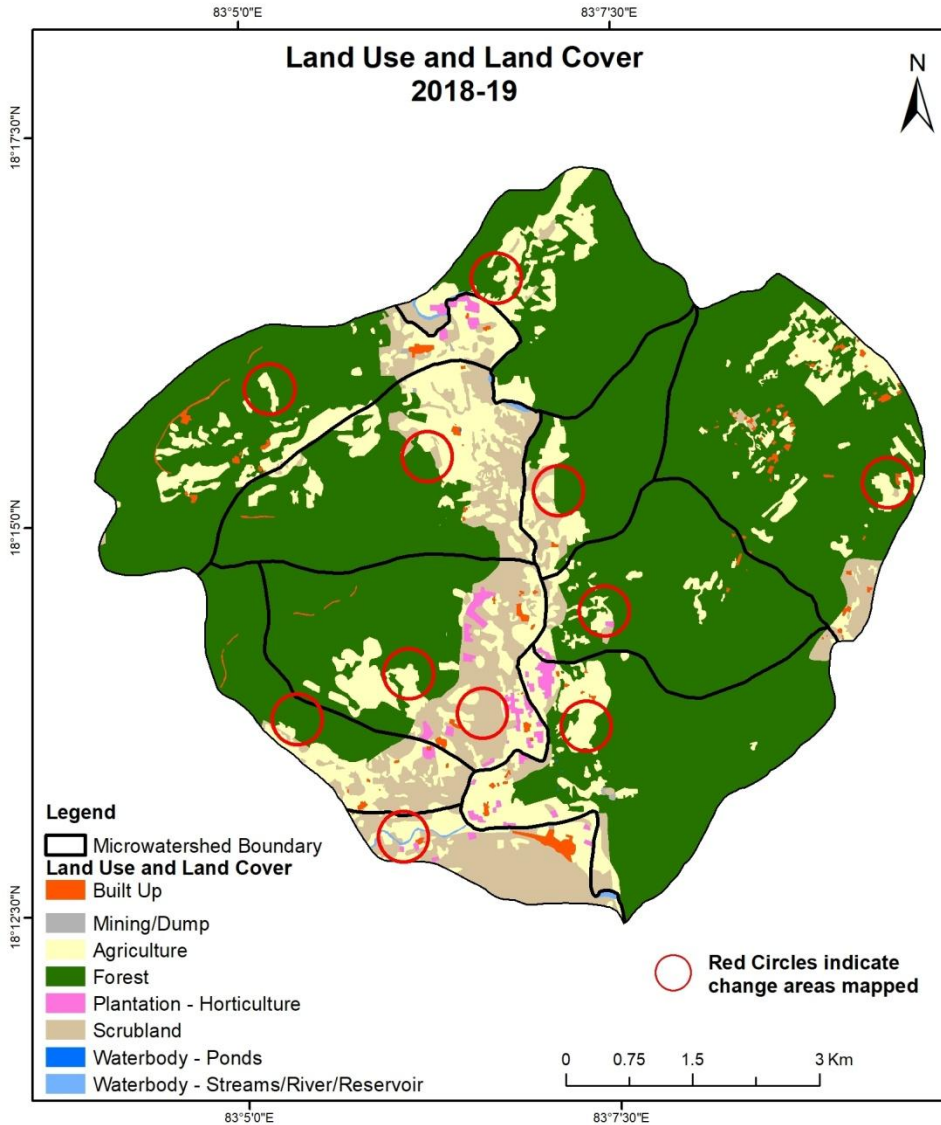
Fig 10. Seethampeta Watershed (IWMP-08/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

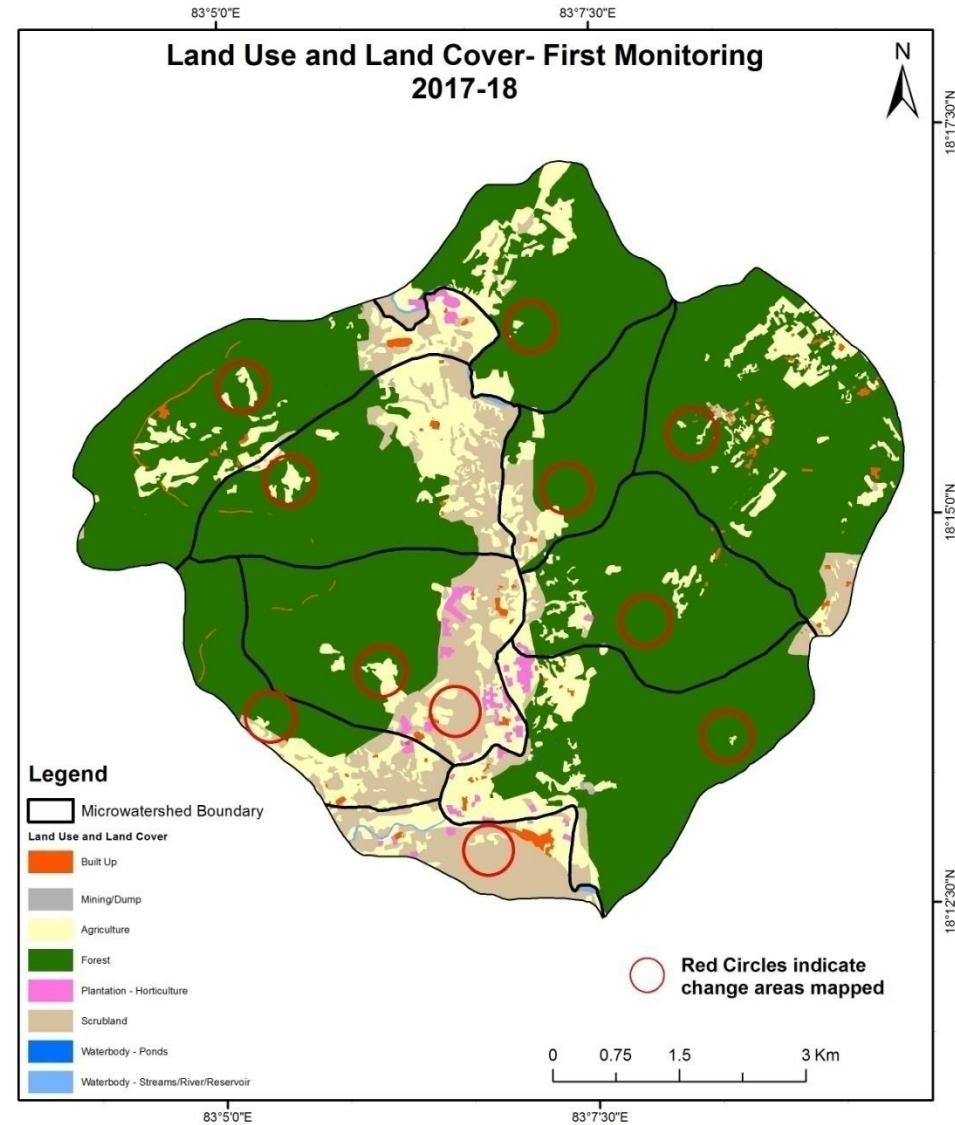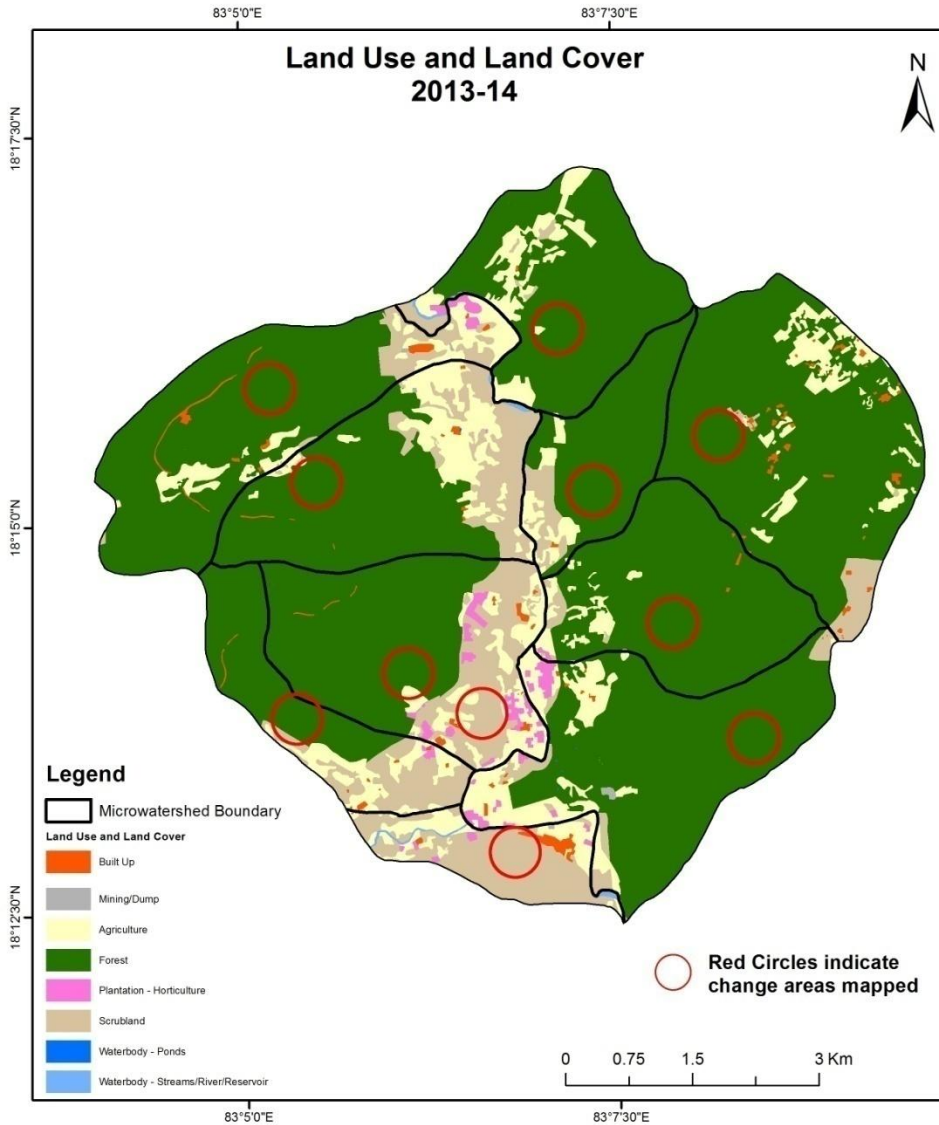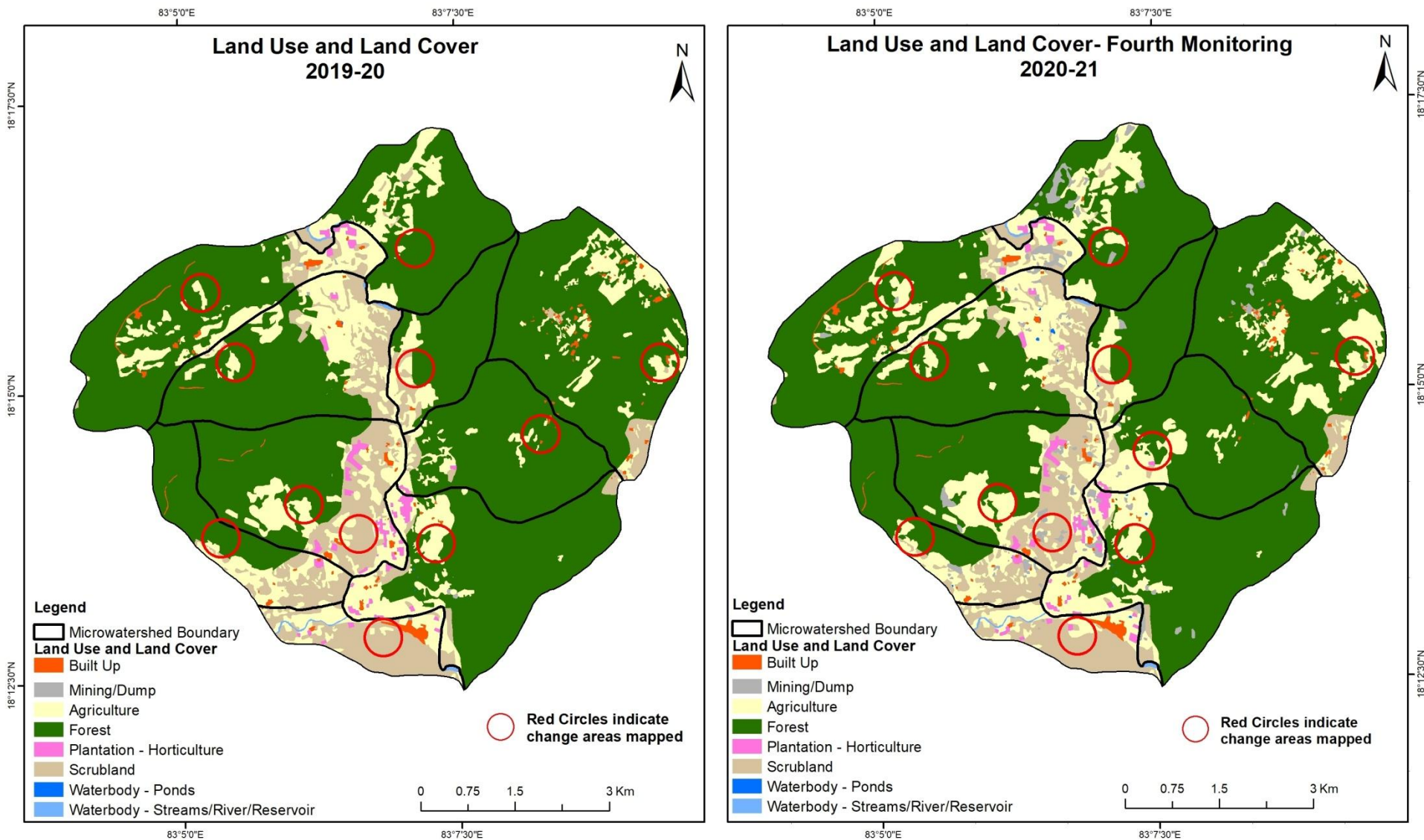# Fig 11. Seethampeta Watershed (IWMP-08/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)
Scale: 1:10000

Fig 12. Seethampeta Watershed (IWMP-08/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

T0

T1

T0: 2013-14 (83°6'32.659"E 18°16'5.376"N)

T1: 10 January 2017

Scrub to Agriculture

T0

T1

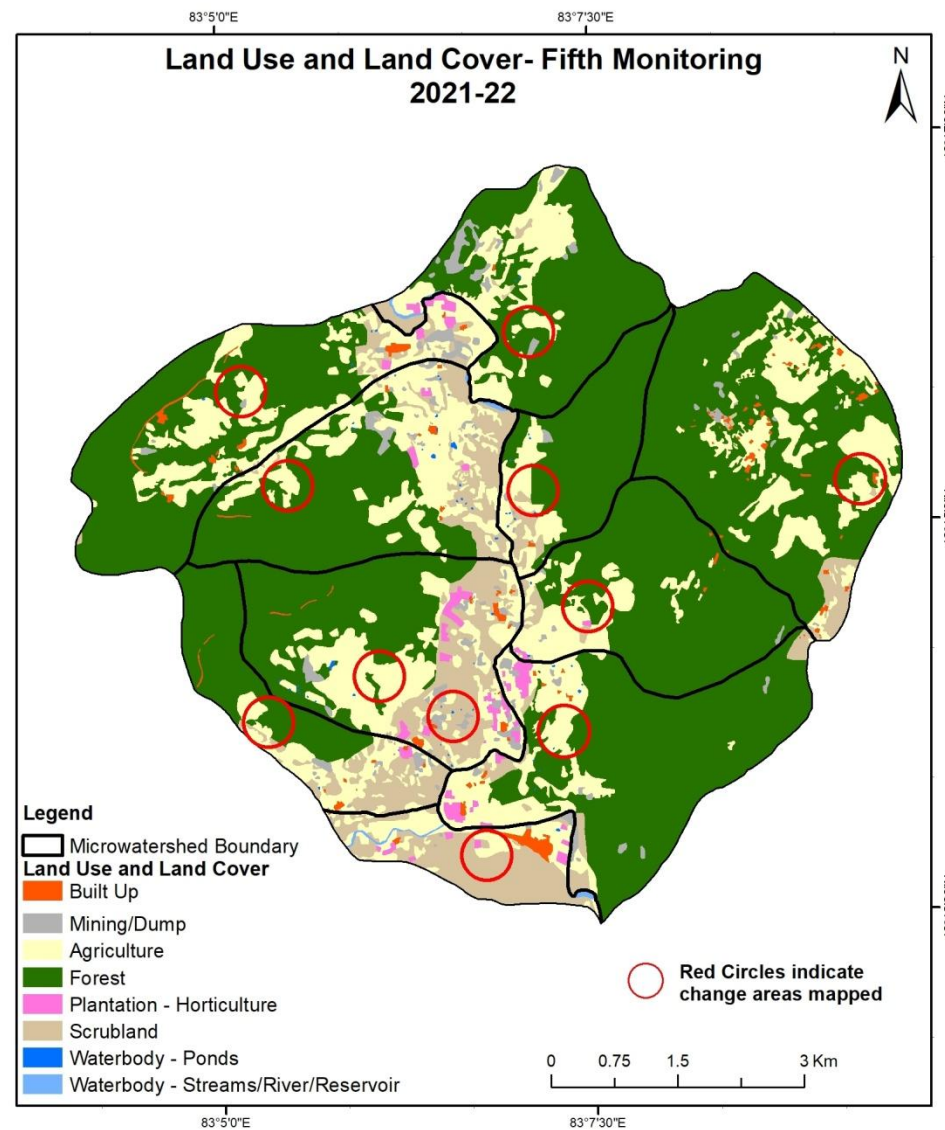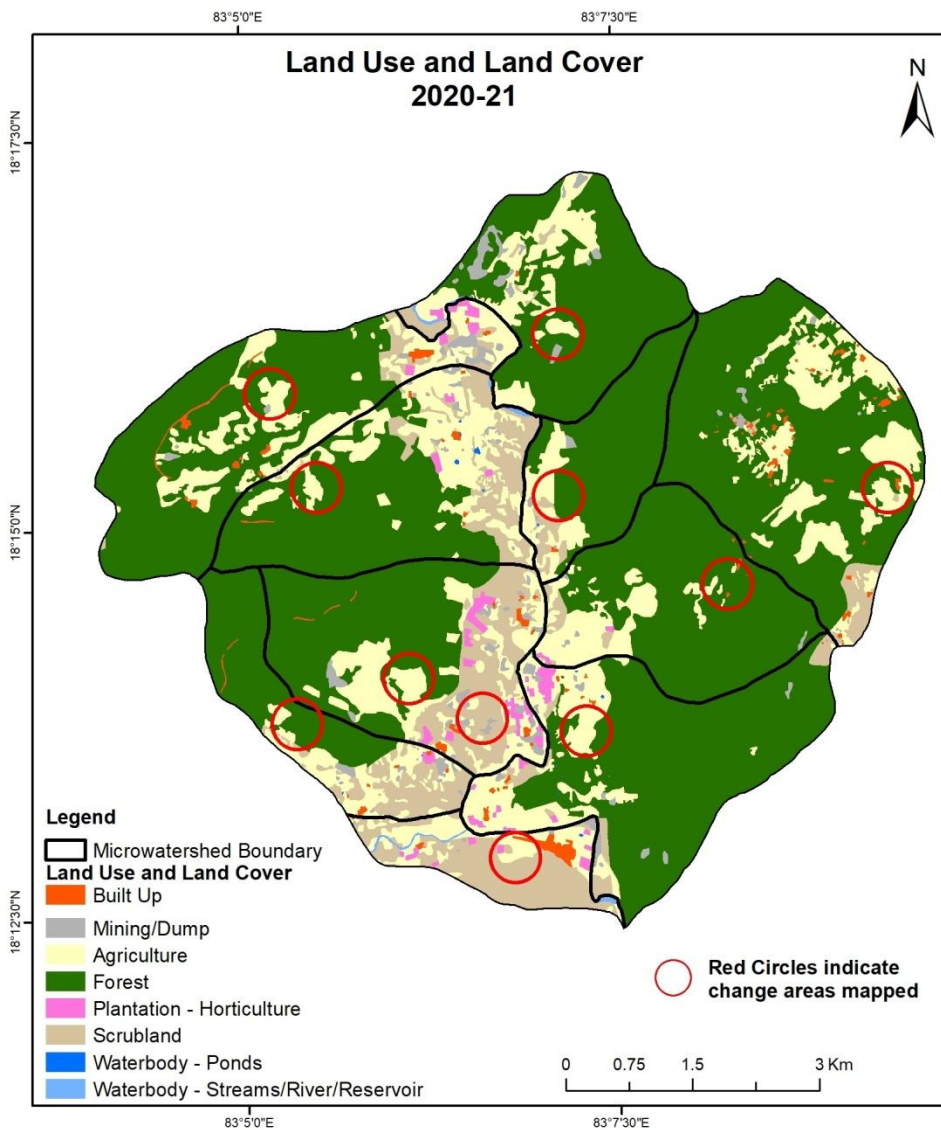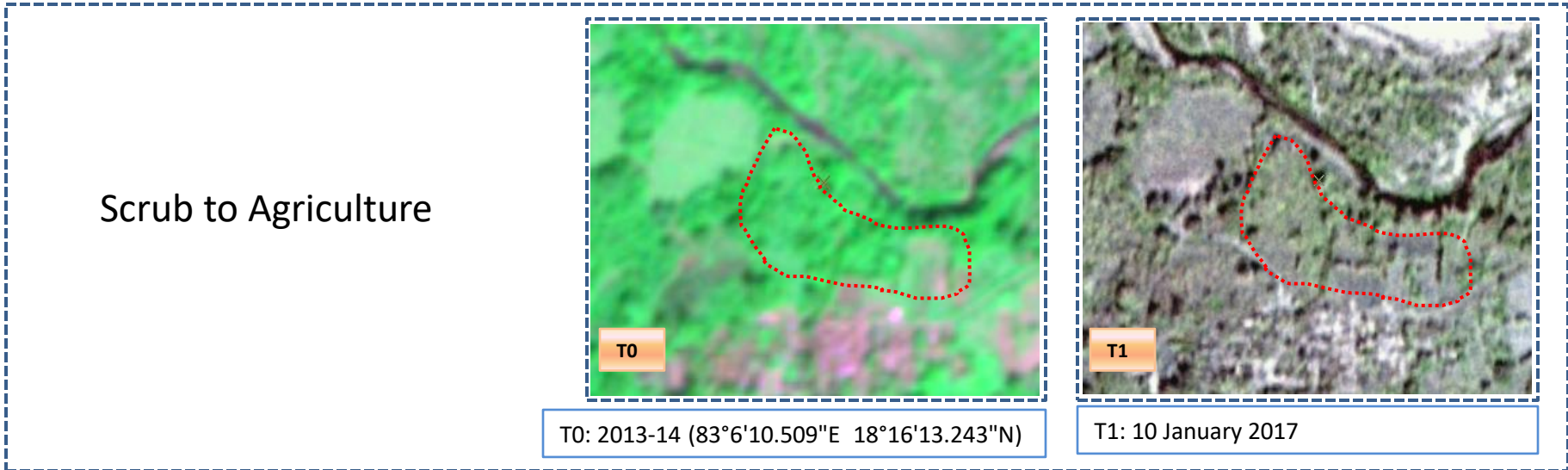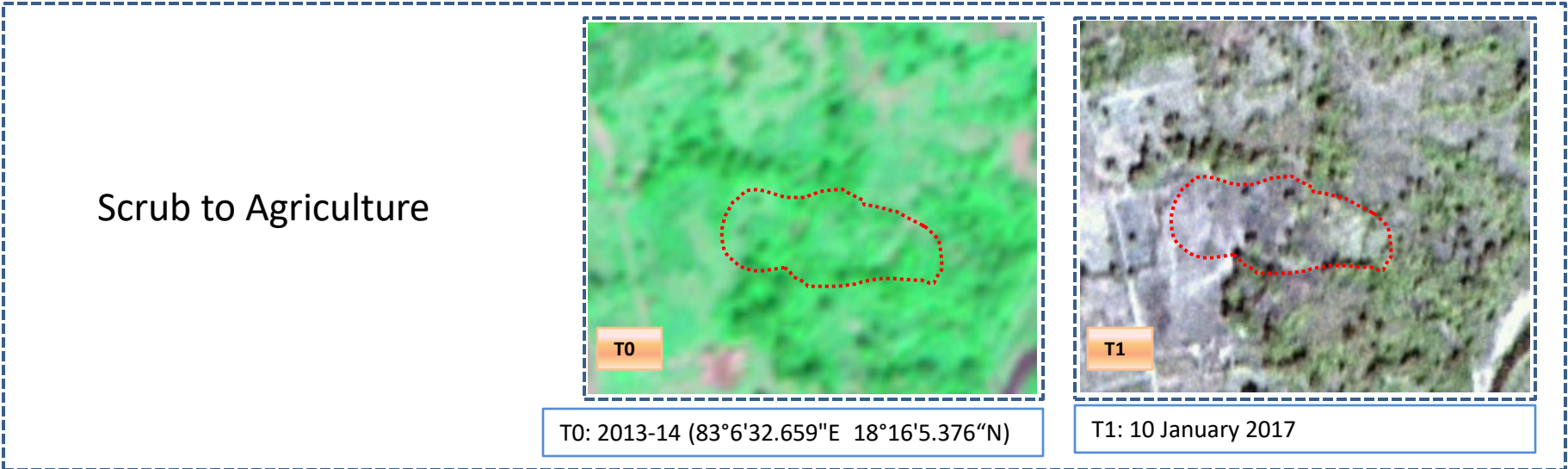T0: 2013-14 (83°6'10.509"E 18°16'13.243"N)

T1: 10 January 2017

Fig 13. Seethampeta Watershed (IWMP-08/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture
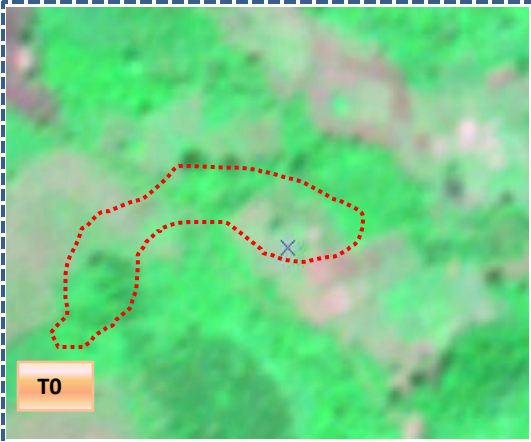
T0: 2013-14 (83°5'32.592"E 18°13'24.902"N)
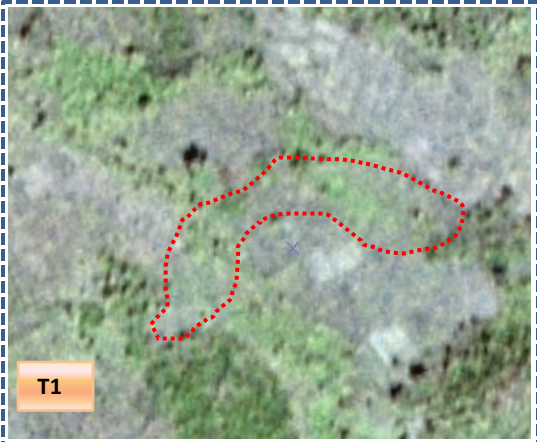
T1: 10 January 2017

Scrub to Agriculture
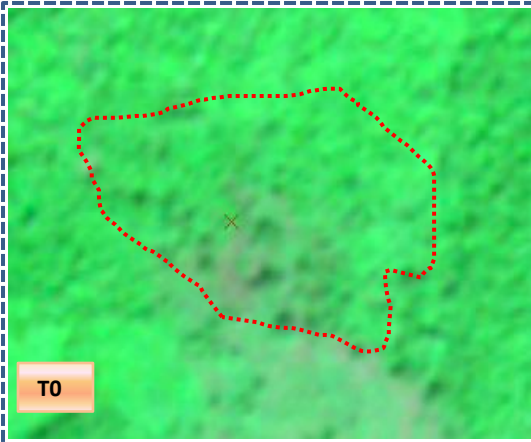
T0: 2013-14 (83°6'1.474"E 18°14'0.78"N)

T1: 10 January 2017

Table 4. showing change matrix depicting Land cover transitions for Seethampeta Watershed (IWMP-08/2013-14) 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	44.60										44.60
Mining/dump		2.44						0.78			3.22
Agriculture	1.04		664.59	1.20							666.82
Plantation Horticulture	0.16		4.62	46.67							51.45
Forest	0.97		94.30		3889.11						3984.38
Forest Plantation											
Barren Rocky											
Scrub	0.47		52.81					593.94			647.21
Waterbody-Streams/River									0.26		0.26
Waterbody – Ponds										42.79	42.79
Grand Total	47.23	2.44	816.31	47.87	3889.11			594.72	0.26	42.79	5440.73

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 2.2 ha of the agriculture area has decreased and it is converted into Built-up (1 ha), plantation/horticulture (1.2 ha) in T1.

3. In T1 151 ha of the agriculture area has increased from plantations/horticulture (4.6 ha), forest (94 ha) and scrubland (52.8 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions for Seethampeta Watershed (IWMP-08/2013-14) during study period-2017-18 to 2018-19

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	47.23										47.23
Mining/dump		2.44									2.44
Agriculture	1.47		814.85								816.31
Plantation Horticulture				47.87							47.87
Forest			127.19		3761.92						3889.11
Forest Plantation											
Barren Rocky											
Scrub			15.13	1.26				578.32			594.72
Waterbody-Streams/River									0.26		0.26
Waterbody – Ponds										42.79	42.79
Grand Total	48.70	2.44	957.17	49.13	3761.92			578.32	0.26	42.79	5440.73

4. In T1 1.4 ha of the agriculture area has decreased and it is converted into Built-up (1.47 ha) in T2.

5. In T2 142 ha of the agriculture area has increased from forest (127 ha) and scrubland (15 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions for Seethampeta Watershed (IWMP-08/2013-14) 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	48.70										48.70
Mining/dump		2.44									2.44
Agriculture			956.97	0.20							957.17
Plantation Horticulture			0.48	48.65							49.13
Forest			3.61		3758.31						3761.92
Forest Plantation											
Barren Rocky											
Scrub	0.13		4.94	2.97				570.29			578.32
Waterbody-Streams/River									0.26		0.26
Waterbody – Ponds										42.79	42.79
Grand Total	48.82	2.44	966.00	51.82	3758.31			570.29	0.26	42.79	5440.73

6. In T2 0.20 ha of the agriculture area has decreased and it is converted into plantations/horticulture (0.20 ha) in T3.

7. In T3 224 ha of the agriculture area has increased from plantations/horticulture (0.48 ha), forest (3.6 ha) and scrubland (4.9 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions for Seethampeta Watershed (IWMP-08/2013-14) 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	48.82										48.82
Mining/dump		2.44									2.44
Agriculture	0.45	25.85	936.50	2.50					0.70		966.00
Plantation Horticulture			1.37	50.45							51.82
Forest		15.98	240.16		3502.08				0.08		3758.31
Forest Plantation											
Barren Rocky											
Scrub		7.07	35.60	2.56				524.50	0.56		570.29
Waterbody-Streams/River									0.26		0.26
Waterbody – Ponds										42.79	42.79
Grand Total	49.27	51.34	1213.64	55.51	3502.08			524.50	1.60	42.79	5440.73

Units in Hectares

8. In T3 29 ha of the agriculture area has decreased and it is converted into built-up (0.45 ha), mining/dump (25.8 ha), plantations/horticulture (2.50 ha) and water body (0.70 ha) in T4.

9. In T4 277 ha of the agriculture area has increased from plantations/horticulture (1.3 ha), forest (240 ha) and scrubland (35.6 ha) of T3.

Table 8. showing change matrix depicting Land cover transitions for Seethampeta Watershed (IWMP-08/2013-14) during study period-2020-21 to 2021-22

Land cover	Monitoring period (T4)										
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	49.27										49.27
Mining/dump		51.34									51.34
Agriculture		0.16	1209.11	3.65					0.71		1213.64
Plantation Horticulture			2.29	53.22							55.51
Forest		1.46	157.51		3341.99				1.12		3502.08
Forest Plantation											
Barren Rocky											
Scrub			4.53					518.46	1.50		524.50
Waterbody-Streams/River									1.60		1.60
Waterbody – Ponds										42.79	42.79
Grand Total	49.27	52.96	1373.44	56.88	3341.99			518.46	4.93	42.79	5440.73

10. In T4 4.5 ha of the agriculture area has decreased and it is converted into mining/dump (0.16 ha), plantations/horticulture (3.6 ha) and water body (0.7 ha) in T5.

11. In T5 164 ha of the agriculture area has increased from plantations/horticulture (2.2 ha), forest (157 ha) and scrubland (4.5 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 4.6 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 149, 140, 8.8, 247 & 159 Hectares from T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 706 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2012-13 (T0) & 2021-22 (T5) years.

4. About **5.4 ha of the plantation/horticulture area has been increased** in during the monitoring period of 2012-13 (T0) to 2021-22 (T5) years.

5. There is a decrease of 128 Hectares in Scrubland area as compared between 2012-13 (T0) & 2021-22 (T5) years.

6. Farm ponds (09) is visible on IWMP (Integrated Watershed Management Programme) Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (09) 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