

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

**IWMP-Batch-V**

Vizianagaram -5/2013-14

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**

## **EXECUTIVE SUMMARY**

		<b>Page Number</b>
<b>01.</b>	<b>STUDY AREA</b>	<b>05</b>
<b>02.</b>	<b>SATELLITE &amp; ANCILLARY DATA INCLUDING DRISHTI STATUS</b>	<b>06</b>
<b>03.</b>	<b>MONITORING IN THE PROJECT AREA</b>	
	<b>3.1 . Site wise changes in the project</b>	<b>08</b>
	<b>3.2. Land use and Land cover Changes in the Project</b>	<b>11</b>
<b>04.</b>	<b>CONCLUSIONS</b>	<b>26</b>

## **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-5/2013-14, Vizianagaram District of Andhra Pradesh. The total geographical area of the project is **5,790 ha**. It comprises of 10 micro watersheds.
4. In the project area 28 Drishti photos were uploaded showing all water harvesting structures of check dams/Rock fill dam, recharge pits etc,.
5. Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and check dams and drainage treatments .
6. Water bodies have shown an increase by 6.6 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.
7. Major percentage i.e 54 % is covered by the Scrub land, 38 % is covered by Agriculture and 4.0 % is covered by Forest land and remaining by other land use classes.

## STUDY AREA

### PROJECT : KURIKUTTI – IWMP-5/2013-14

### 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 **5,790 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

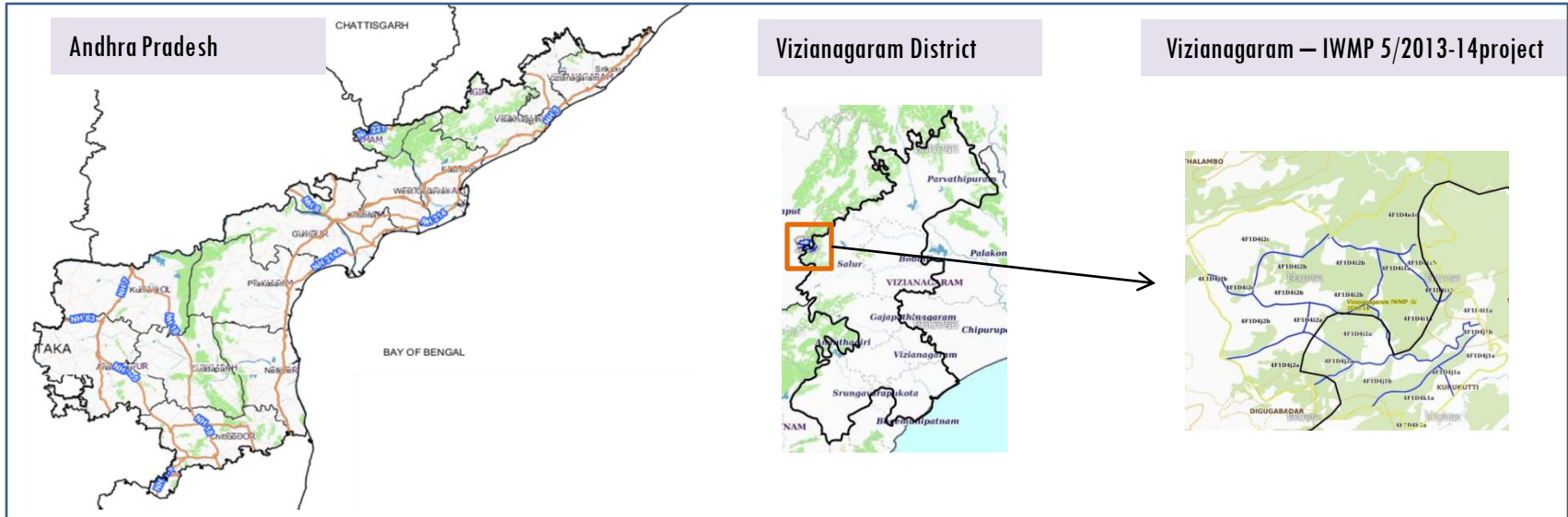


Fig.1. Location map of Kurikutti Watershed (IWMP-05/2013-14) in Vizianagaram, A.P

- The climate of the district is dry and healthy. Out of 66 mandals in the district, 31 are upland mandals which are located in Madanapalle division and are comparatively cooler than the eastern mandals except Chittoor mandal where the climate is moderate. December and January are the coldest months when the mean maximum temperature will be around 26.40 °C, May is the hottest month with the mean daily maximum temperature rising above 40 °C.
- The district receive 83.62 percent of rainfall during South-West monsoon and North-West monsoon period, the rainfall is nominal in summer. On an average the district receives more than 50 percent of rainfall during North- East monsoon.

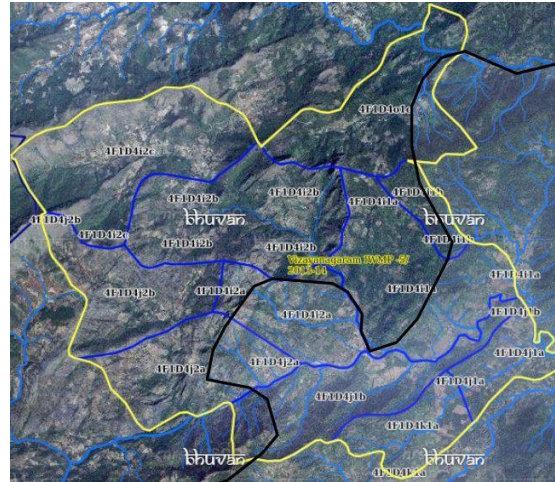
### Table I. Satellite Data and Ancillary Data

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			

### 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	28
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

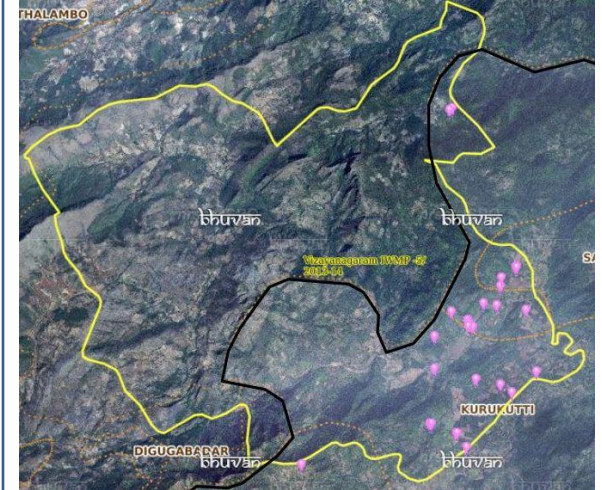


MWS Boundary



Project Boundary

### Fig 3. Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

**Table 3. Classification of the Activities**

<b>Sr. No</b>	<b>Activity</b>	<b>Number of Photographs uploaded in Drishti Mobile Application</b>	<b>Visible on satellite in Srishti Geoportal</b>
1	Agriculture	0	0
2	Bunding	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Existing activity	0	0
8	Checks & Plugs	0	0
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	8	8
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	0	0
13	Land Developments (afforestation, horticulture and bund plantation of teak)	0	0
14	Lm (fodder development, varmi compost)	0	0
15	Livelihood Activities (Horticulture)	1	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity (Cattle thought)	7	6
18	Others	14	14
	<b>TOTAL</b>	<b>30</b>	<b>28</b>

## 03. MONITORING IN THE PROJECT AREA

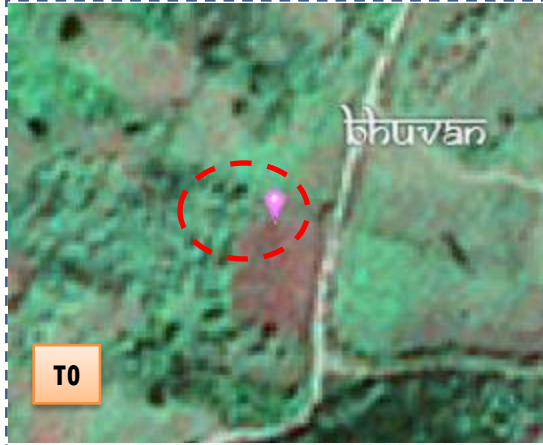
### 3.1 Site Wise Changes in the Project

- 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 5. Kurikutti Watershed (IWMP-05/2013-14) Monitoring of activities in Vizianagaram Dt Andhra Pradesh



T0

T0:2013-14



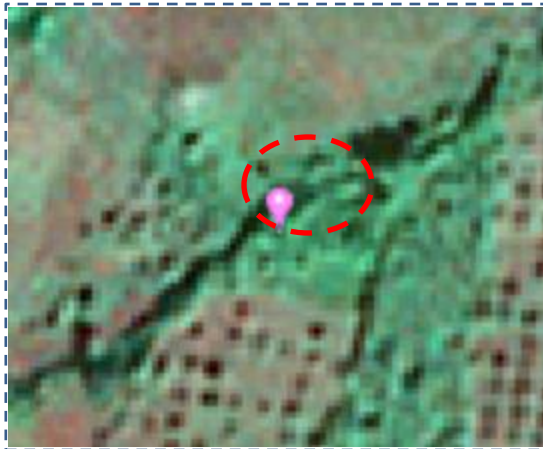
T1

T1: 26 November 2017

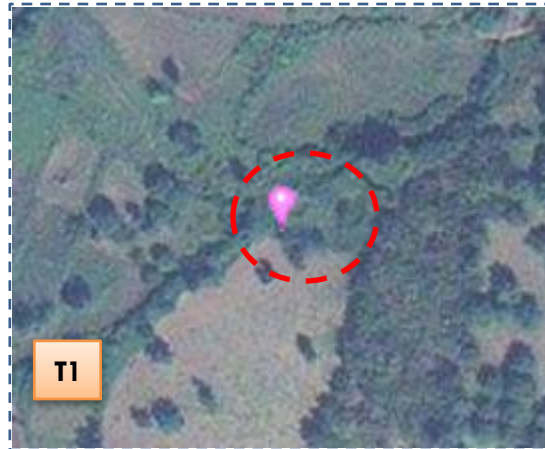


Drishti Sl no. 1789903 MWS :4F1D4i1a

Farm pond



T0:2013-14



T1: 26 November 2017



Drishti Sl no. 1789905 MWS :4F1D4i1a

Farm pond

Fig 6. Kurikutti Watershed (IWMP-05/2013-14) Monitoring of activities in Vizianagaram Dt Andhra Pradesh



T0

T0:2013-14



T1

T1: 26 November 2017



Drishti Sl no. 7015969 MWS : 4F1D4k1a

Loose Boulder



T0

T0:2013-14



T1

T1: 26 November 2017



Drishti Sl no. 7012017 MWS :4F1D4j1a

Farm pond

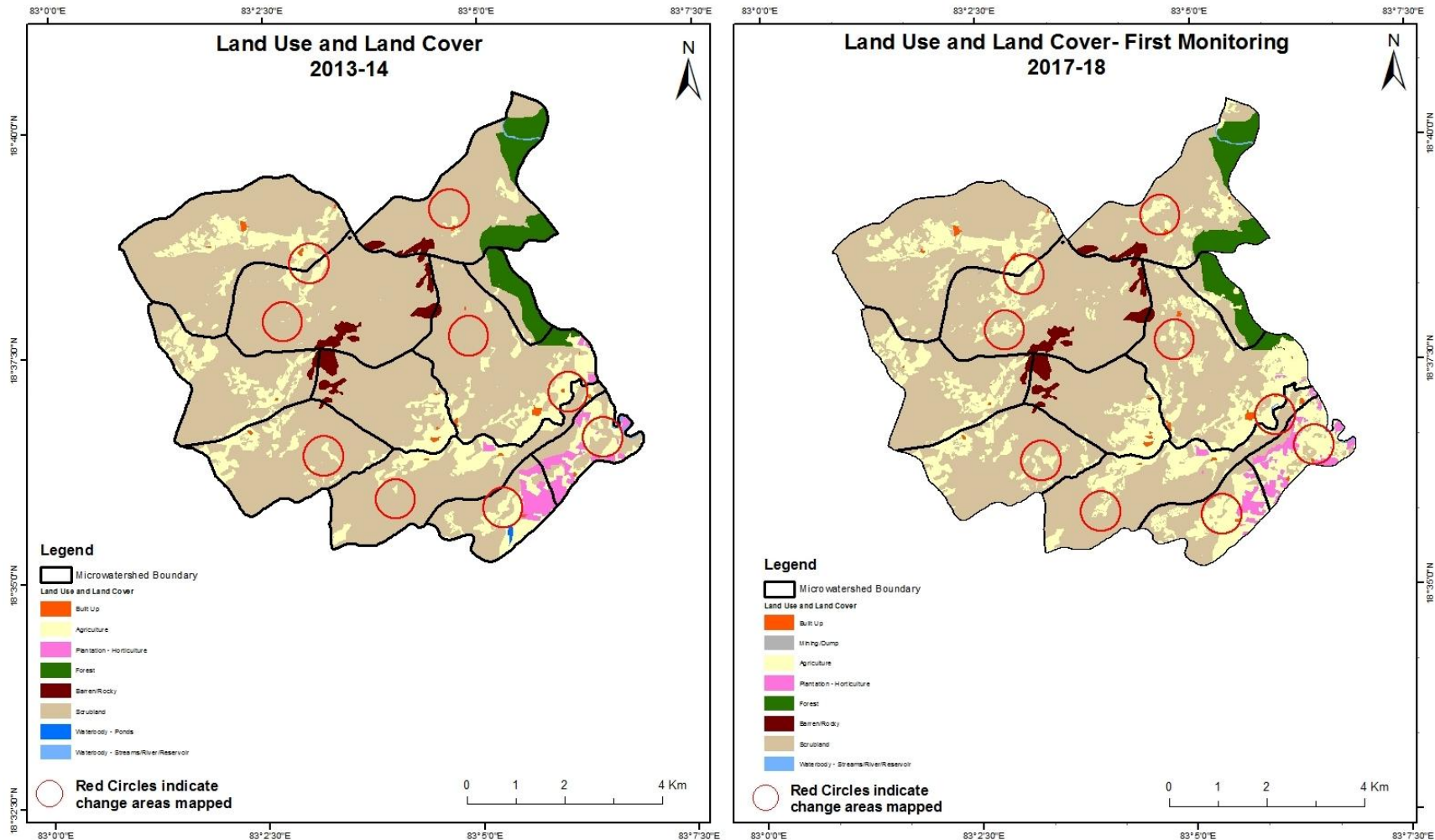
### 03. MONITORING IN THE PROJECT AREA

#### 3.2 Land use and Land cover Changes in the Project

- Change in land use and land cover from 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)

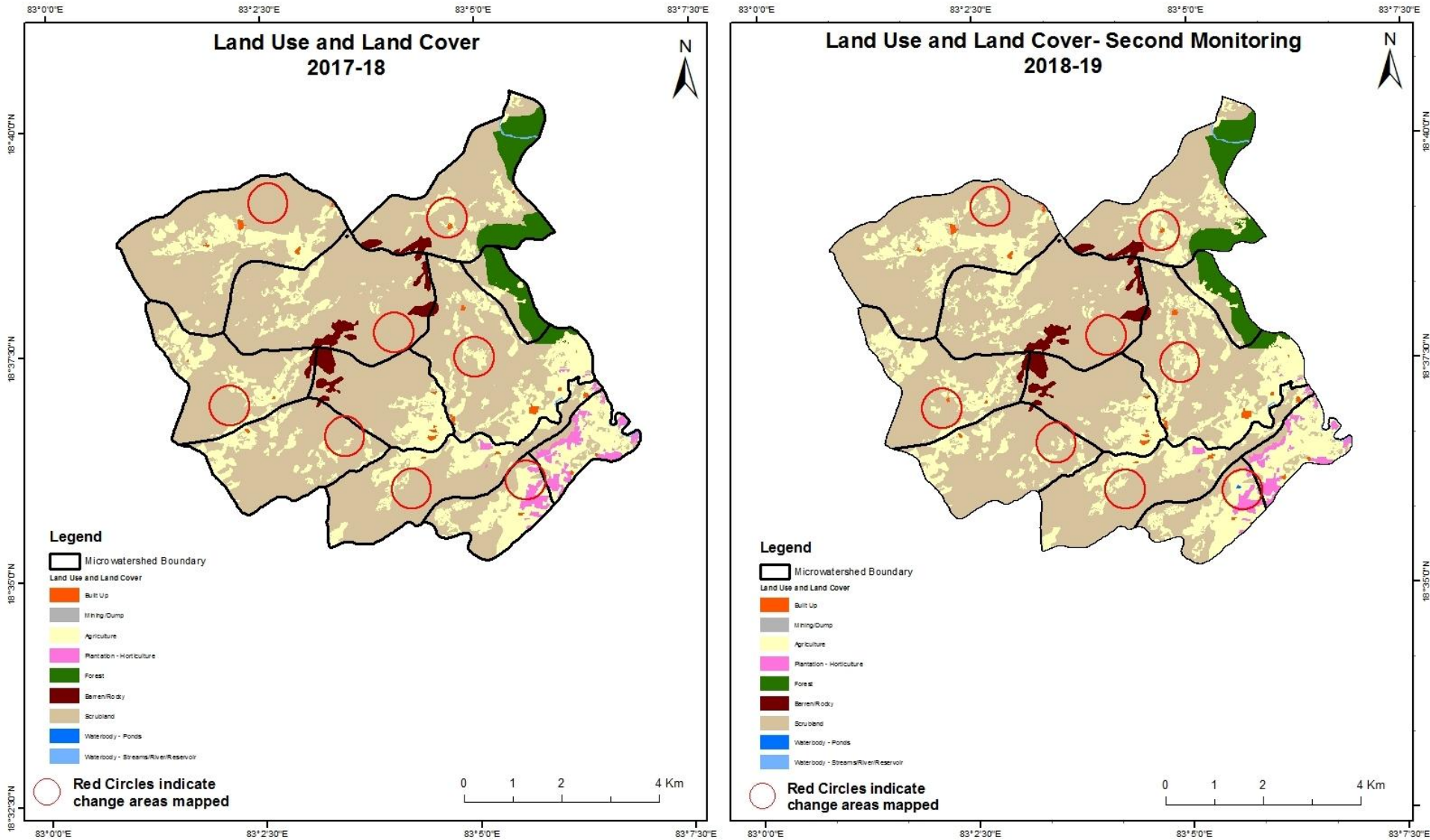
**Fig 7. Kurikutti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)**

**Scale: 1:10000**



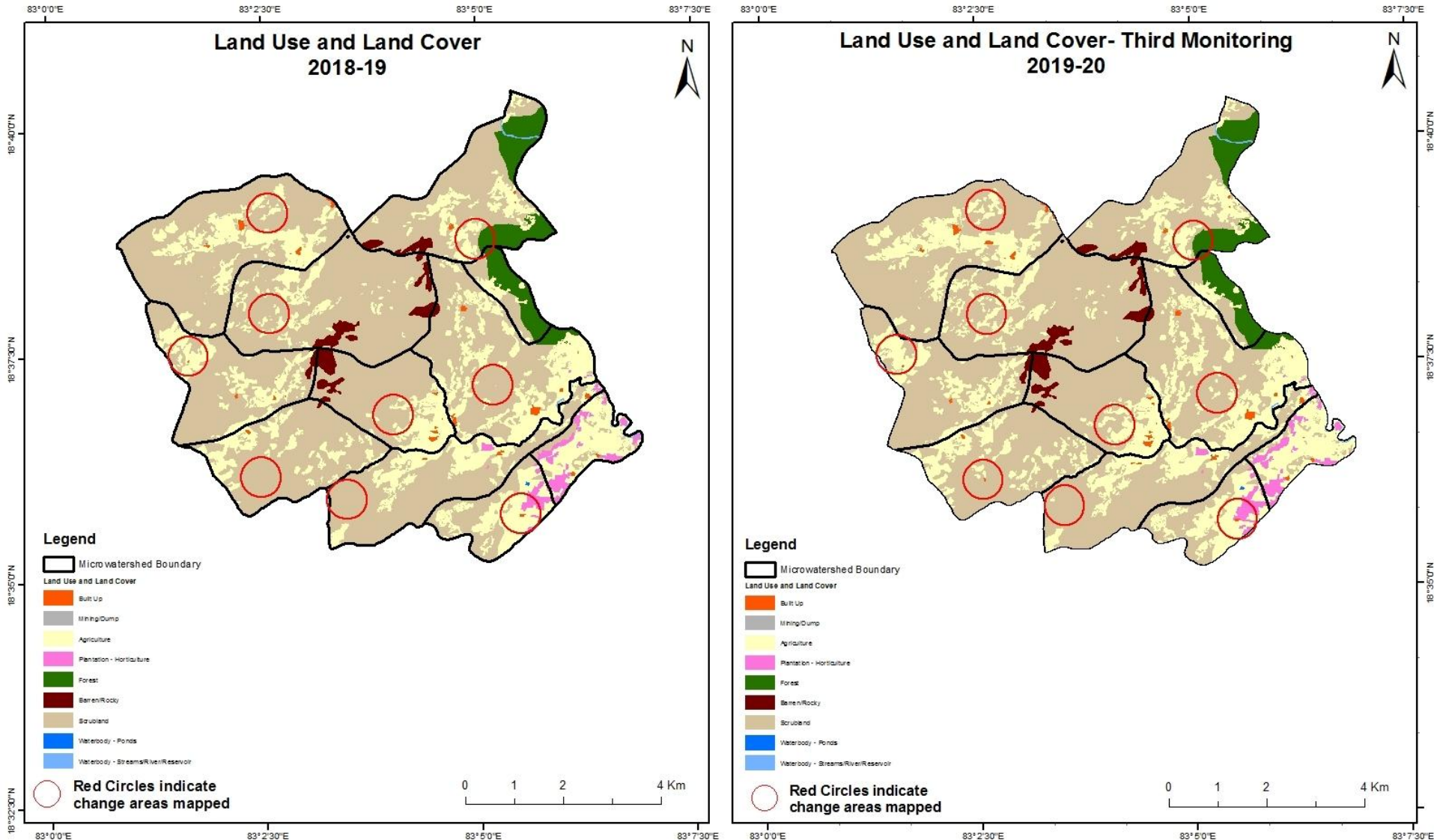
**Fig 8. Kurikutti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)**

Scale: 1:10000



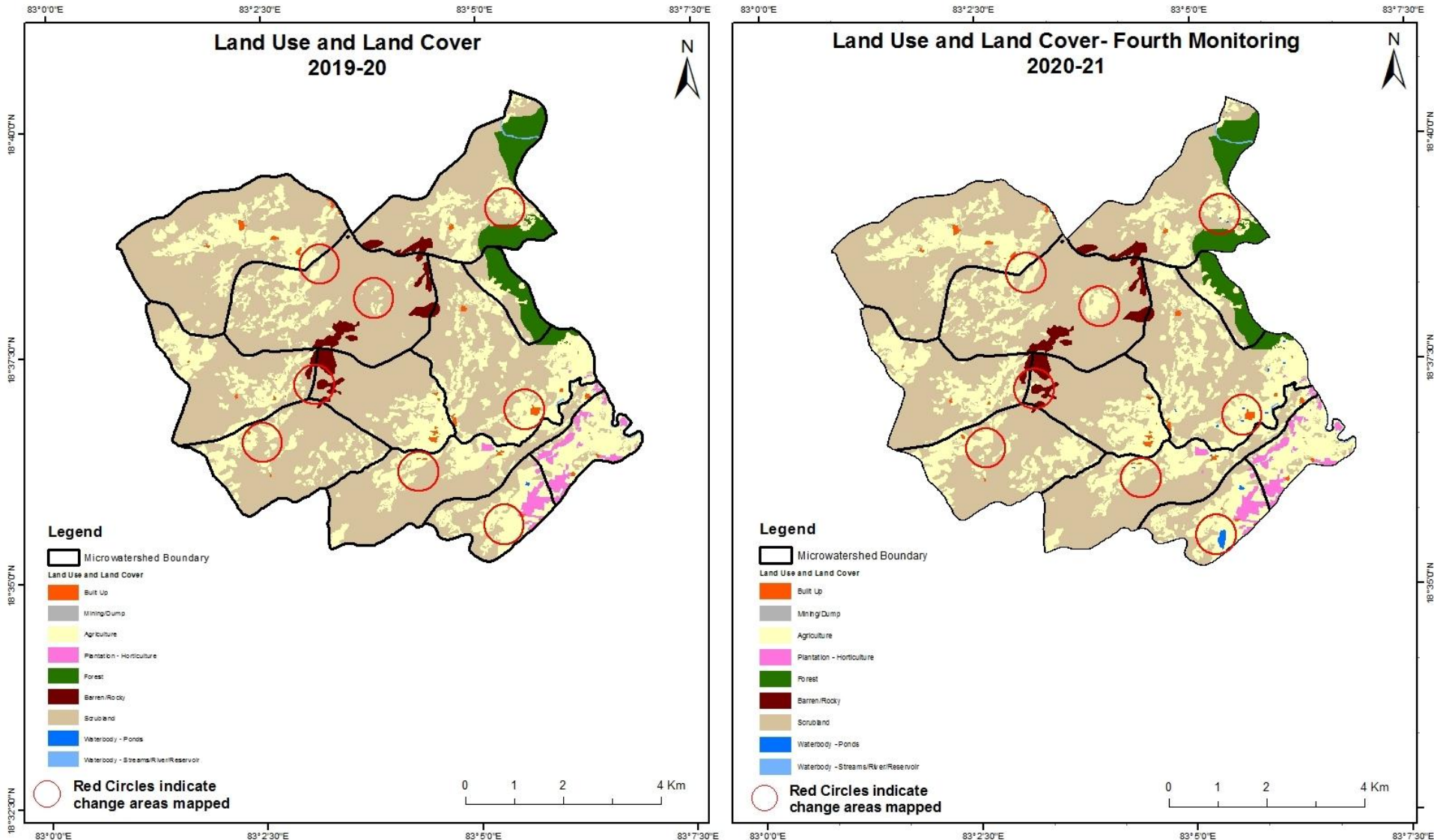
**Fig 9. Kurikutti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)**

**Scale: 1:10000**



**Fig 10. Kurikutti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)**

**Scale: 1:10000**



**Fig 11. Kurikutti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)**

**Scale: 1:10000**

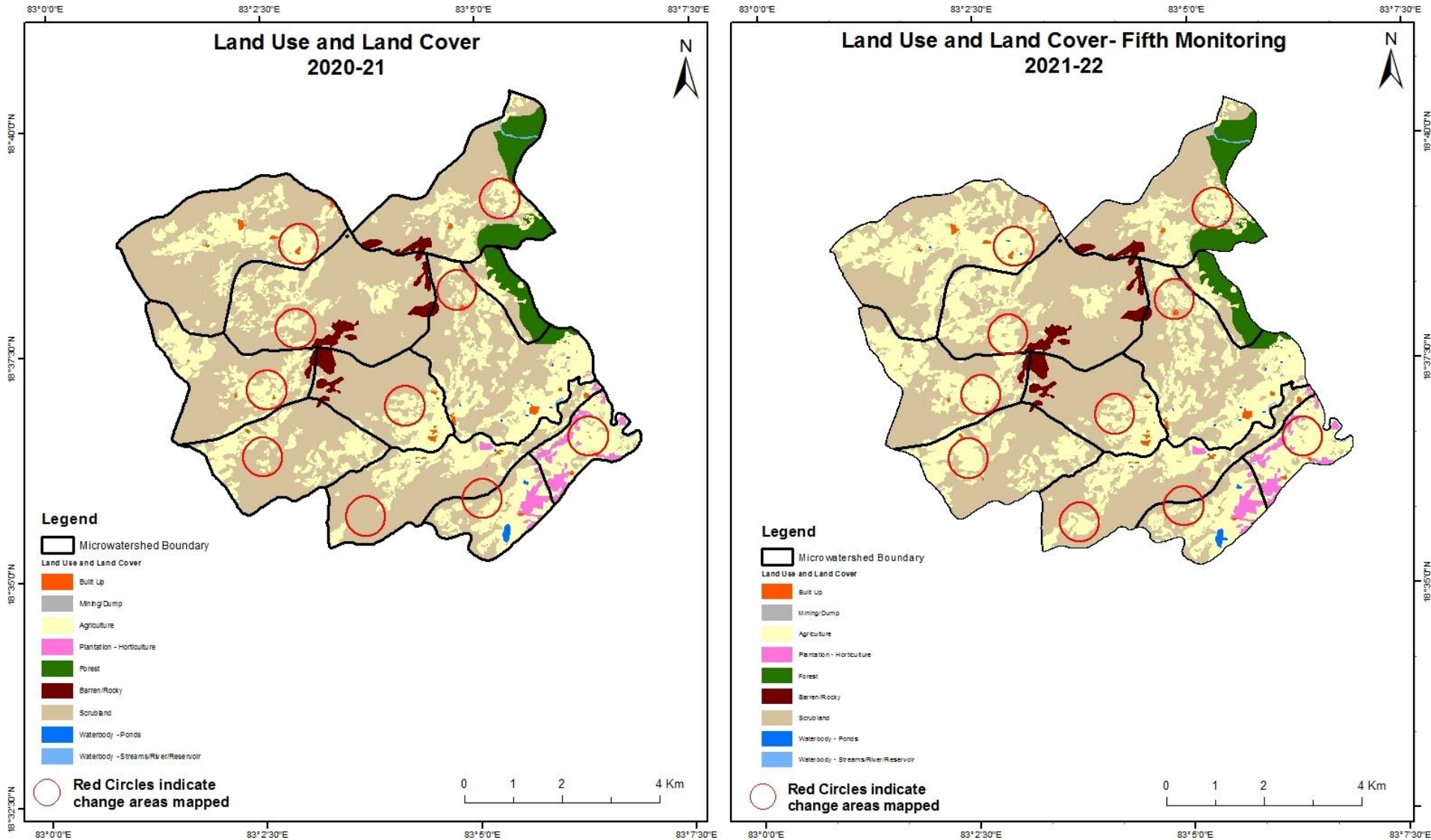
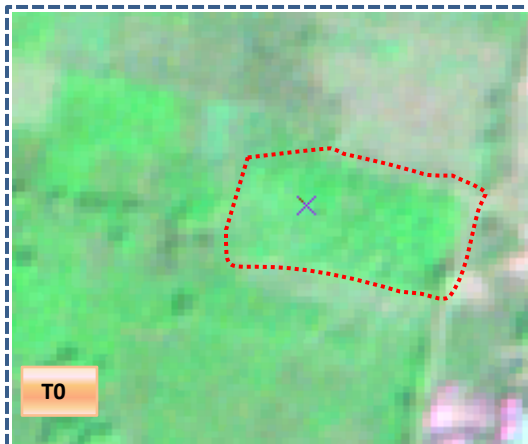




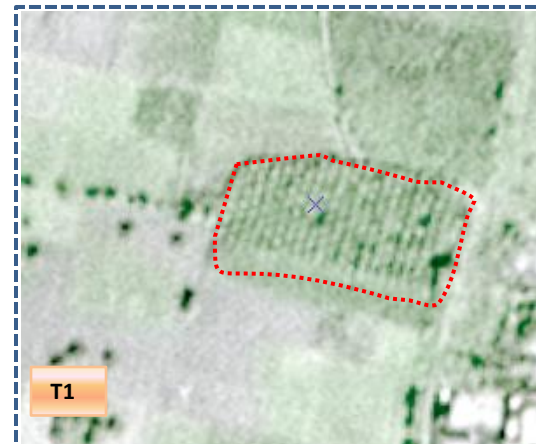
Fig 12. Kurikutti Watershed (IWMP-05/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

T0: 2013-14 (83°5'35.306"E 18°35'33.872"N)



T1

T1: 29<sup>th</sup> October 2017

Agriculture to Plantation



T0

T0: 2013-14 (83°5'38.938"E 18°36'3.271"N)

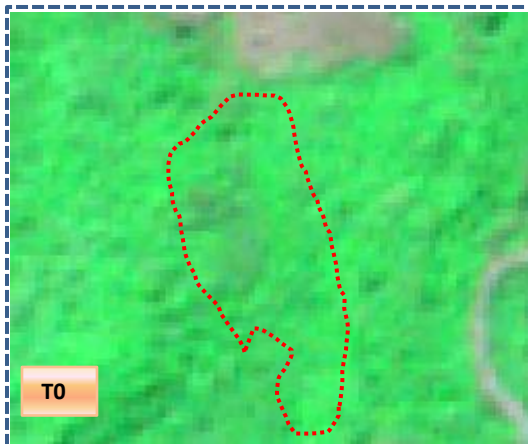


T1

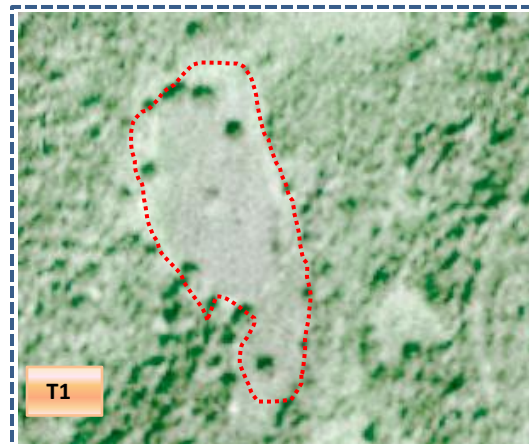
T1: 29<sup>th</sup> October 2017

**Fig 13. Kurikutti Watershed (IWMP-05/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates**

Scrub to Agriculture

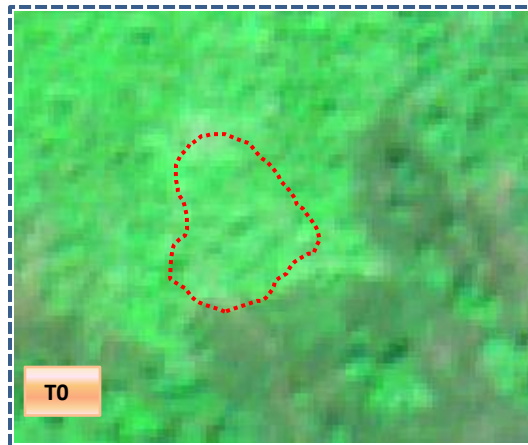


T0: 2013-14 (83°4'40.13"E 18°37'23.789"N)

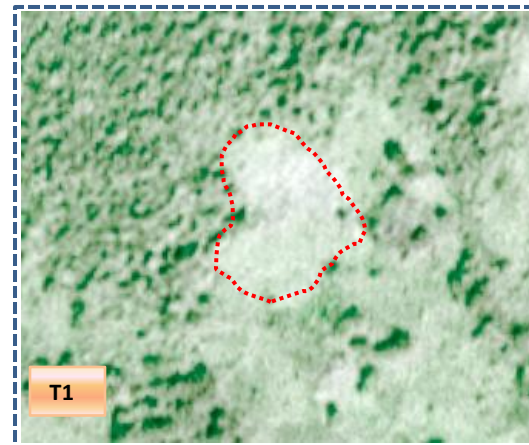


T1: 29<sup>th</sup> October 2017

Scrub to Agriculture



T0: 2013-14 (83°3'29.238"E 18°36'32.057"N)



T1: 29<sup>th</sup> October 2017

**Table 4. showing change matrix depicting Land cover transitions for Kurikutti Watershed (IWMP-05/2013-14) during study period-2013-14 to 2017-18**

Land cover	Monitoring period (T1)										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	17.71												17.71
Mining/dump													
Agriculture	2.56	0.86	833.02	18.26				1.84	1.24				857.78
Plantation Horticulture			53.12	52.93									106.05
Forest			7.27		241.65								248.92
Forest Plantation													
Barren Rocky							102.64						102.64
Scrub	0.77	0.1	364.25	15.91				4036.22	0.1				4417.35
Waterbody- Streams/River			7.53						28.88				36.41
Waterbody – Ponds			2.77										2.77
<b>Grand Total</b>	<b>21.04</b>	<b>0.96</b>	<b>1267.96</b>	<b>87.1</b>	<b>241.65</b>		<b>102.64</b>	<b>4038.06</b>	<b>30.22</b>				<b>5789.63</b>

**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 24 ha of the agriculture area has decreased and it is converted into Built-up (2.5 ha), mining/dump(0.8 ha), plantations/horticulture (18 ha), scrub (1.8 ha) and water body (1.2 ha) in T1.
3. In T1 435 ha of the agriculture area has increased from plantations/horticulture (53 ha), forest(7 ha), scrubland(364 ha) and water body (10 ha) of T0.

**Table 5. showing change matrix depicting Land cover transitions for Kurikutti Watershed (IWMP-05/2013-14) during study period-2017-18 to 2018-19**

Land cover	Monitoring period (T2)										Units in Hectares	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
<b>Built up</b>	21.04										<b>21.04</b>	
<b>Mining/dump</b>		0.96									<b>0.96</b>	
<b>Agriculture</b>	1.05		1260.79	5.58					0.54		<b>1267.96</b>	
<b>Plantation Horticulture</b>	0.19		19.24	67.67							<b>87.1</b>	
<b>Forest</b>			6.82		234.83						<b>241.65</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							102.64				<b>102.64</b>	
<b>Scrub</b>	1.64		163.86					3872.56			<b>4038.06</b>	
<b>Waterbody- Streams/River</b>			0.19							30.03	<b>30.22</b>	
<b>Waterbody – Ponds</b>												
<b>Grand Total</b>	<b>23.92</b>	<b>0.96</b>	<b>1450.9</b>	<b>73.25</b>	<b>234.83</b>		<b>102.64</b>	<b>3872.56</b>	<b>0.54</b>	<b>30.03</b>	<b>5789.63</b>	

4. In T1 7.1 ha of the agriculture area has decreased and it is converted into Built-up (1 ha), plantations (5.5 ha) and water body (0.5 ha) in T2.

5. In T2 190 ha of the agriculture area has increased from plantations (19 ha), forest (6.8 ha), scrubland (163 ha) and water body (0.19 ha) of T1.

**Table 6. showing change matrix depicting Land cover transitions for Kurikutti Watershed (IWMP-05/2013-14) during study period-2018-19 to 2019-20**

Land cover	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		
<b>Built up</b>	23.92												<b>23.92</b>
<b>Mining/dump</b>		0.96											<b>0.96</b>
<b>Agriculture</b>	2.92		1441.42	6.49						0.07			<b>1450.9</b>
<b>Plantation Horticulture</b>			2.89	70.36									<b>73.25</b>
<b>Forest</b>			1.47		233.36								<b>234.83</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							102.64						<b>102.64</b>
<b>Scrub</b>	0.27		115.75	1.31				3755.23					<b>3872.56</b>
<b>Waterbody- Streams/River</b>									30.03				<b>30.03</b>
<b>Waterbody – Ponds</b>											0.54		<b>0.54</b>
<b>Grand Total</b>	<b>27.11</b>	<b>0.96</b>	<b>1561.53</b>	<b>78.16</b>	<b>233.36</b>		<b>102.64</b>	<b>3755.23</b>	<b>30.03</b>		<b>0.61</b>		<b>5789.63</b>

6. In T2 9.4 ha of the agriculture area has decreased and it is converted into Built-up (2.9 ha), plantations (6.4 ha) and water body (0.07 ha) in T3.

7. In T3 120 ha of the agriculture area has increased from plantations (2.8 ha), forest (1.7 ha) and scrubland (115 ha) of T2.

**Table 7. showing change matrix depicting Land cover transitions for Kurikutti Watershed (IWMP-05/2013-14) during study period-2019-20 to 2020-21**

Land cover	Monitoring period (T4)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
<b>T3</b>													
<b>Built up</b>	27.11												27.11
<b>Mining/dump</b>		0.96											0.96
<b>Agriculture</b>			1554	0.25							7.28		1561.53
<b>Plantation Horticulture</b>				78.16									78.16
<b>Forest</b>			1.87		231.49								233.36
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							102.64						102.64
<b>Scrub</b>	0.14		184.55					3570.23			0.31		3755.23
<b>Waterbody- Streams/River</b>									30.03				30.03
<b>Waterbody – Ponds</b>											0.61		0.61
<b>Grand Total</b>	<b>27.25</b>	<b>0.96</b>	<b>1740.42</b>	<b>78.41</b>	<b>231.49</b>		<b>102.64</b>	<b>3570.23</b>	<b>30.03</b>		<b>8.2</b>		<b>5789.63</b>

8. In T3 30 ha of the agriculture area has decreased and it is converted into plantations 90.25 ha) and water body (7.2 ha) in T4.

9. In T4 186 ha of the agriculture area has increased from forest (1.8 ha) and scrubland (184 ha) of T3.

**Table 8. showing change matrix depicting Land cover transitions for Kurikutti Watershed (IWMP-05/2013-14) during study period-2020-21 to 2021-22**

Land cover	Monitoring period (T5)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
T4													
Built up	27.25												27.25
Mining/dump		0.96											0.96
Agriculture	0.29		1738.91								1.22		1740.42
Plantation Horticulture				78.41									78.41
Forest			0.24		231.25								231.49
Forest Plantation													
Barren Rocky							102.64						102.64
Scrub			439.99					3130.24					3570.23
Waterbody- Streams/River									30.03				30.03
Waterbody – Ponds											8.2		8.2
<b>Grand Total</b>	<b>27.54</b>	<b>0.96</b>	<b>2179.14</b>	<b>78.41</b>	<b>231.25</b>		<b>102.64</b>	<b>3130.24</b>	<b>30.03</b>		<b>9.42</b>		<b>5789.63</b>

10. In T4 1.5 ha of the agriculture area has decreased and it is converted into built-up (0.29 ha) and water body (1.2 ha) in T5.

11. In T5 440 ha of the agriculture area has increased from forest (0.24 ha) and scrubland (439 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 6.6 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 410, 182, 110, 178 & 438 Hectares from T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 1321 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 1287 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
5. 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