

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

Vizianagaram -9/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

March-2023

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



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Ministry of Rural Development
Government of India

C O N T E N T S

EXECUTIVE SUMMARY

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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-9/2013-14, Vizianagaram District of Andhra Pradesh. The total geographical area of the project is **6,147 ha**. It comprises of 9 micro watersheds.
4. In the project area 174 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 with 61 ha increase in the area.
6. Major percentage i.e. 53 % is covered by the Forest, 23 % is covered by Agriculture and 20% is covered by Scrub land and remaining by other land use classes.

STUDY AREA

PROJECT : GORADA WATERSHED – IWMP-9/2013-14

DISTRICT : VIZIANAGARAM, STATE : ANDHRA PRADESH

- The study area falls in Gummalakshmpuram Mandal of Vizianagaram district of Andhra Pradesh state. The total geographical area of the project is **6,147** ha. It comprises of 9 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.

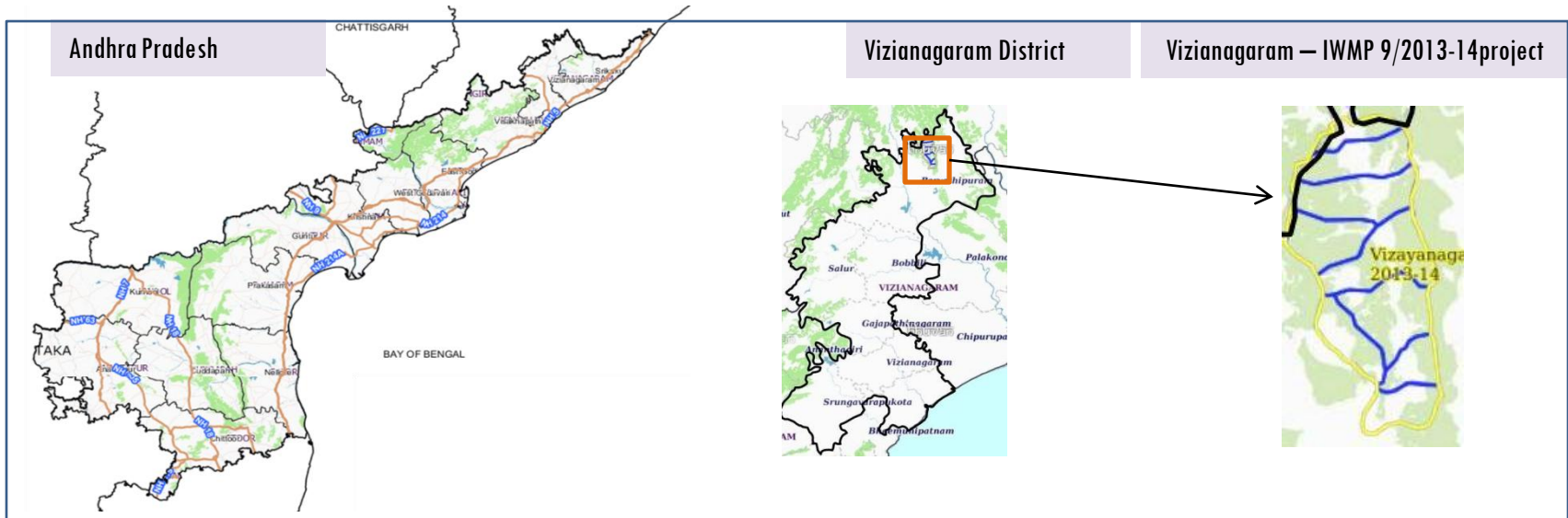


Fig.1. Location map of Gorada Watershed (IWMP-09/2013-14) in Vizianagaram District, A.P

- 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			2-Apr-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			2-Apr-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	174
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 Geoportals
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	14	14
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	0	0
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)	0	0
16	Water harvesting structures (recharge pits and check dams)	1	1
17	Entry Point Activity (Cattle thought)	10	10
18	Others	152	149
	TOTAL	177	174

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. Gorada Watershed (IWMP-09/2013-14) Natural Color Composite 2013-14 to 2021-22

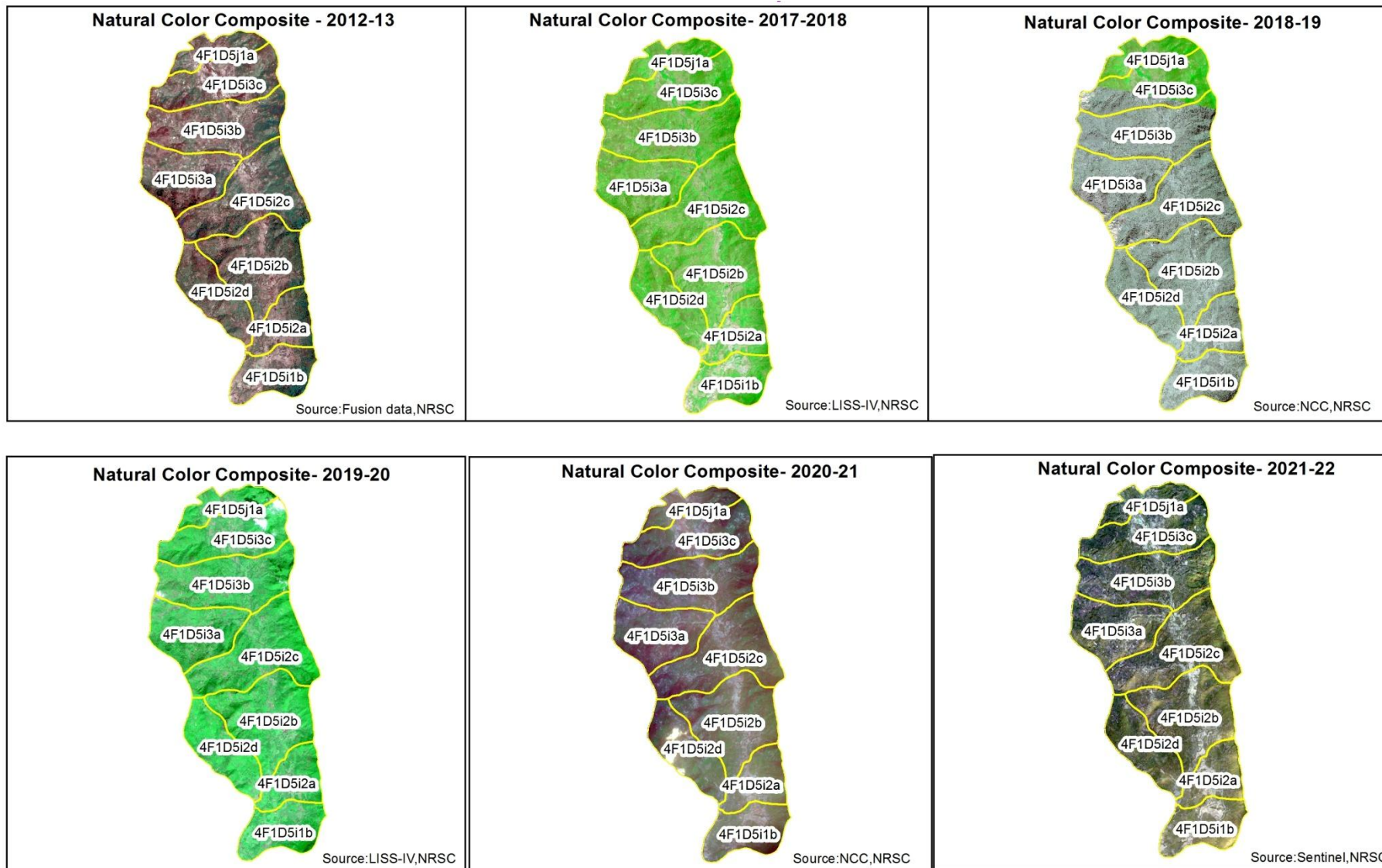


Fig 5. Monitoring of activities in Gorada Watershed (IWMP-09/2013-14) Vizianagaram District , Andhra Pradesh



T0:2013-14

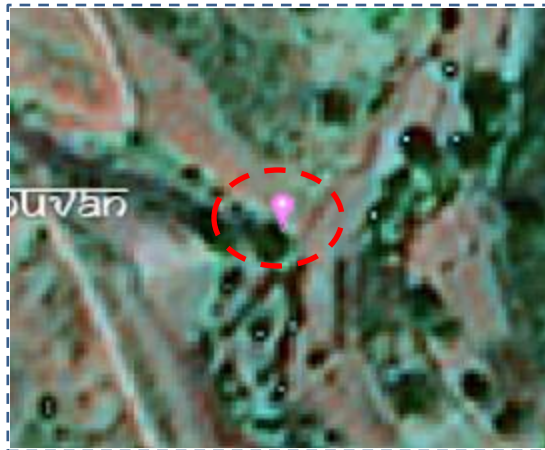


T1: 06 January 2017



Drishti Sl no. 7009437_ MWS :4F1D5j1a

Check dam



T0:2013-14



T1: 06 January 2017



Drishti Sl no. 7008192_ MWS :4F1D5i2c

Percolation Tank

Fig 6. Monitoring of activities in Gorada Watershed (IWMP-09/2013-14) Vizianagaram District , Andhra Pradesh



T0

T0:2013-14



T1

T1: 06 January 2017



Drishti Sl no. 7008380 MWS : 4F1D5i3c

Percolation Tank



T0

T0:2013-14



T1

T1: 06 January 2017



Drishti Sl no. 7024878_ MWS :4F1D5i1b

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 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. Gorada Watershed (IWMP-09/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000

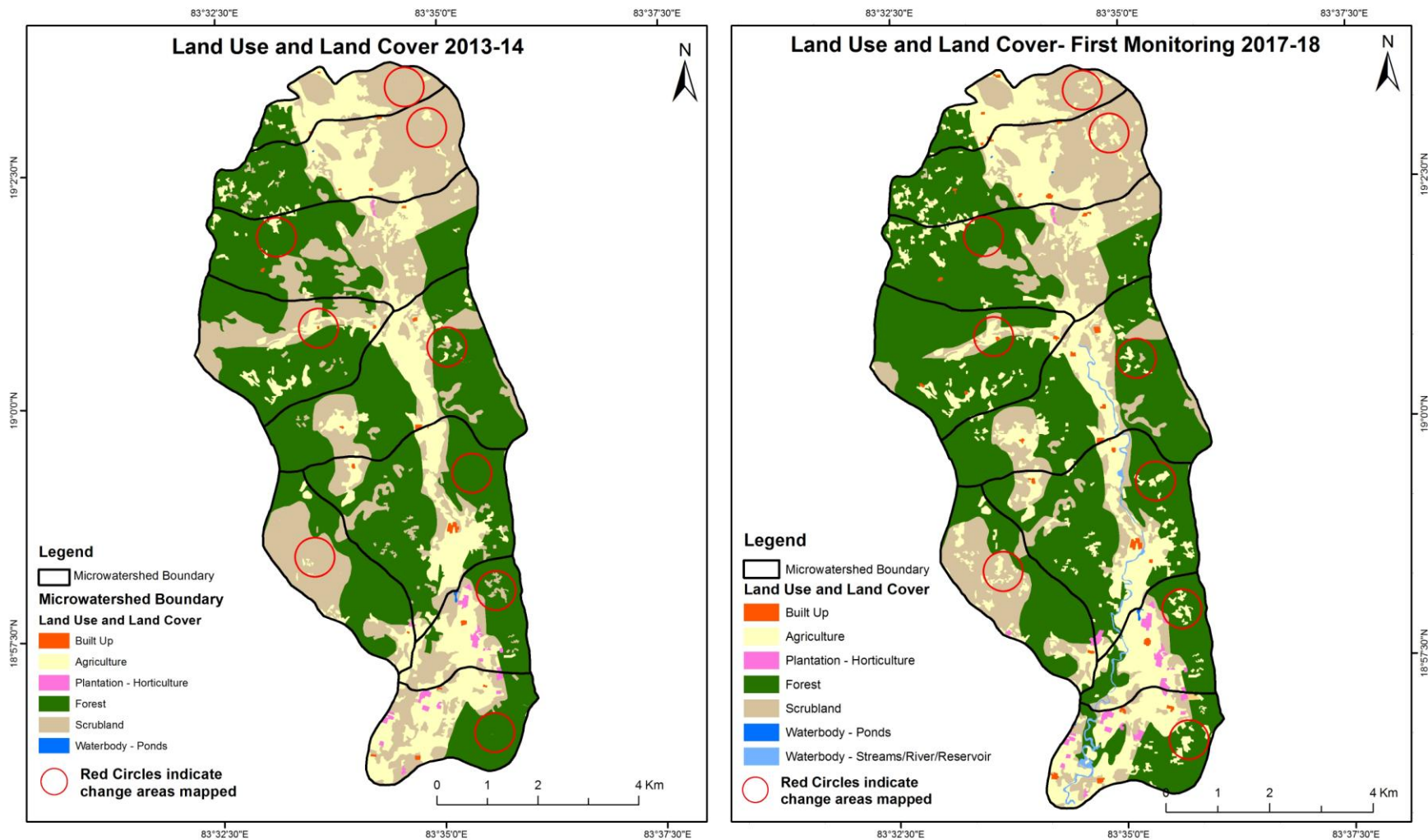


Fig 8. Gorada Watershed (IWMP-09/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

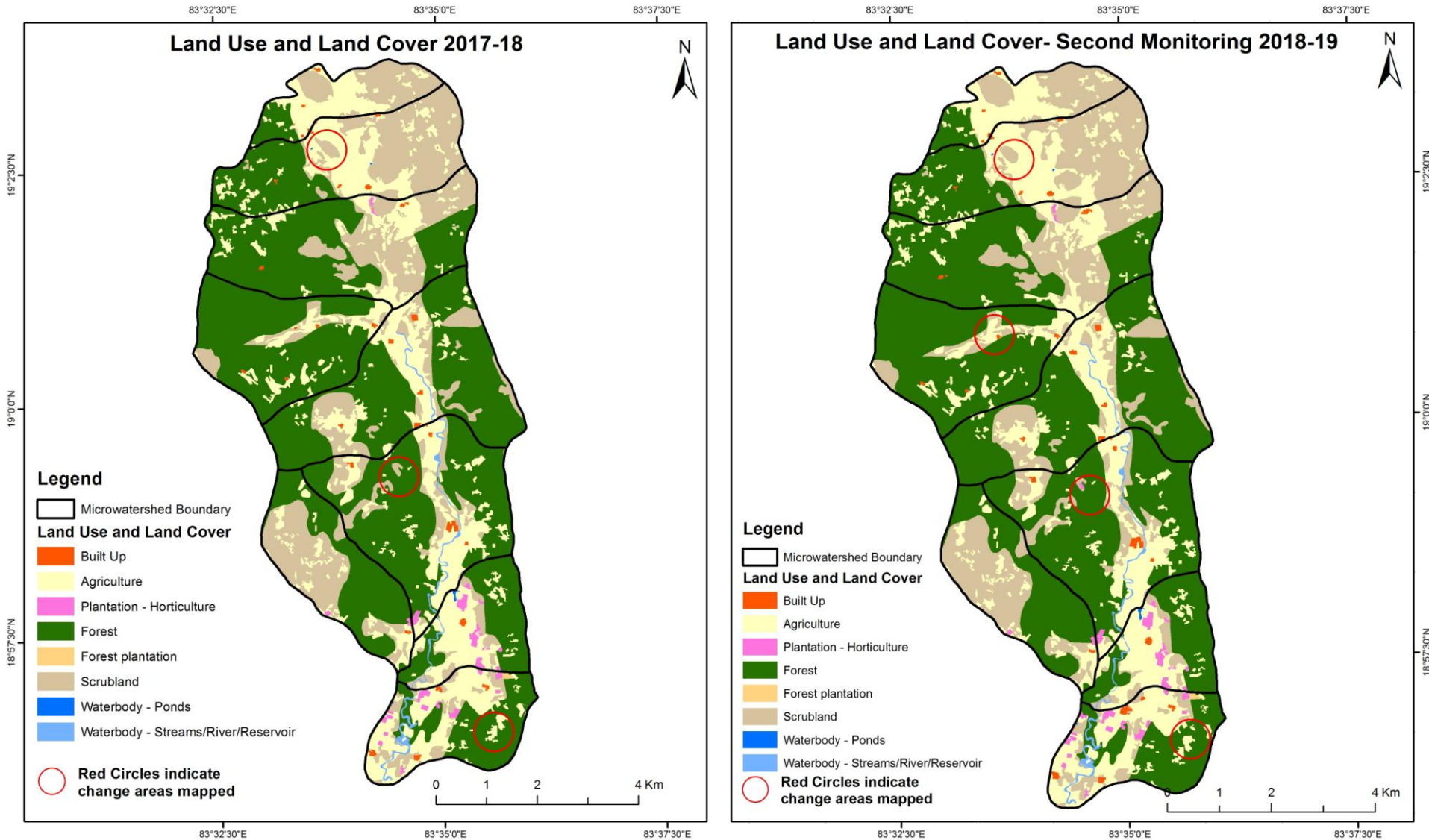


Fig 9. Gorada Watershed (IWMP-09/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

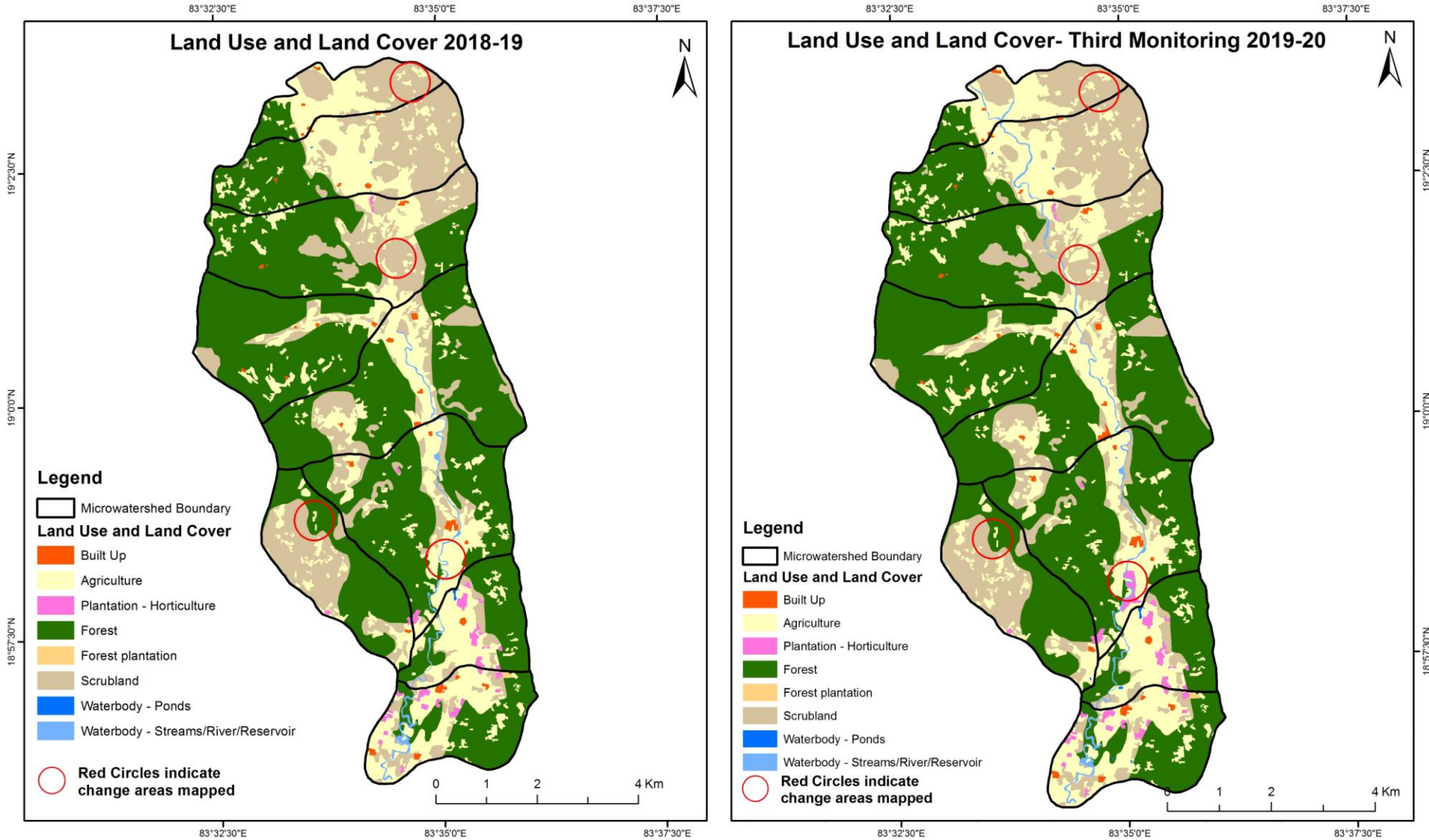


Fig 10. Gorada Watershed (IWMP-09/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

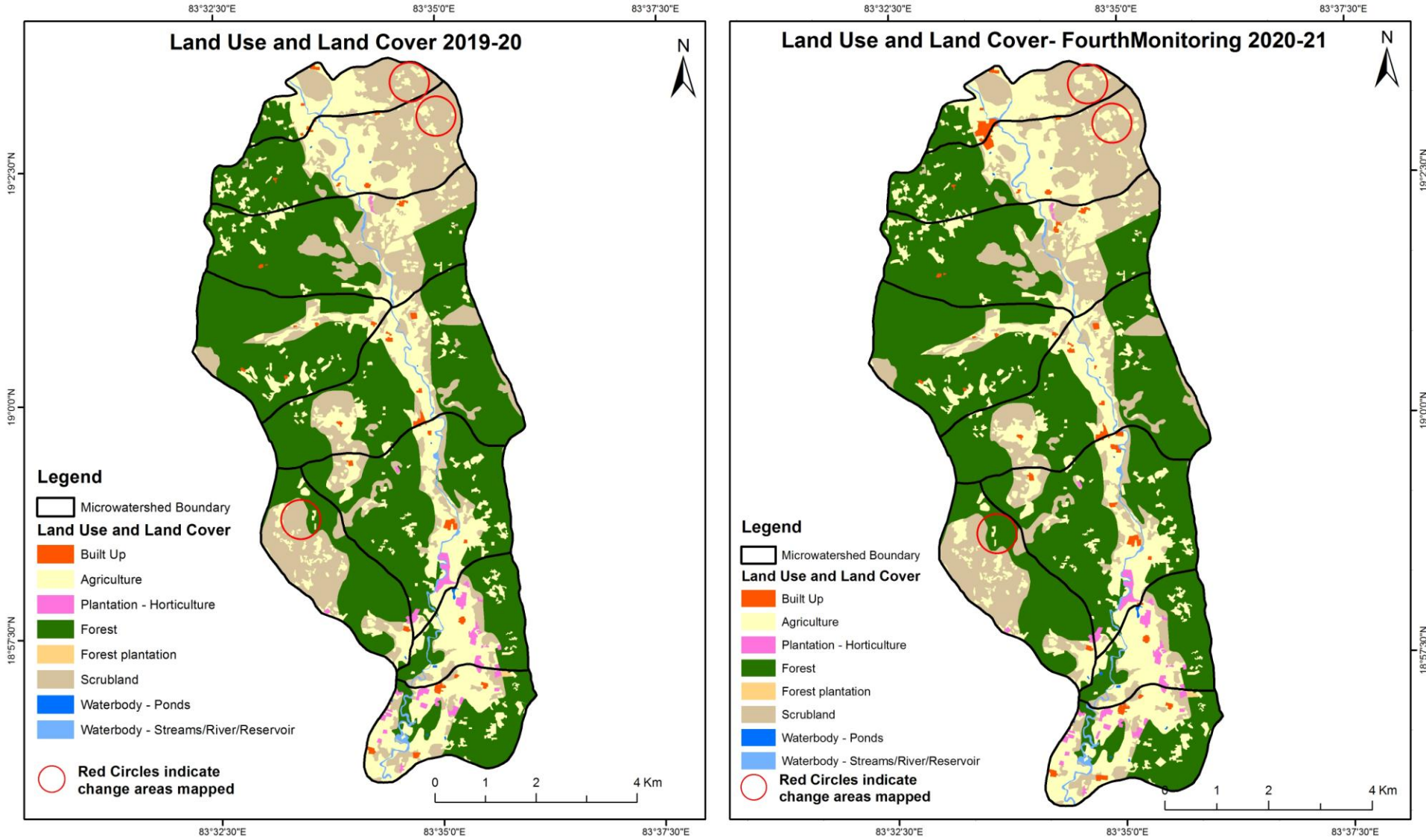


Fig 11. Gorada Watershed (IWMP-09/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

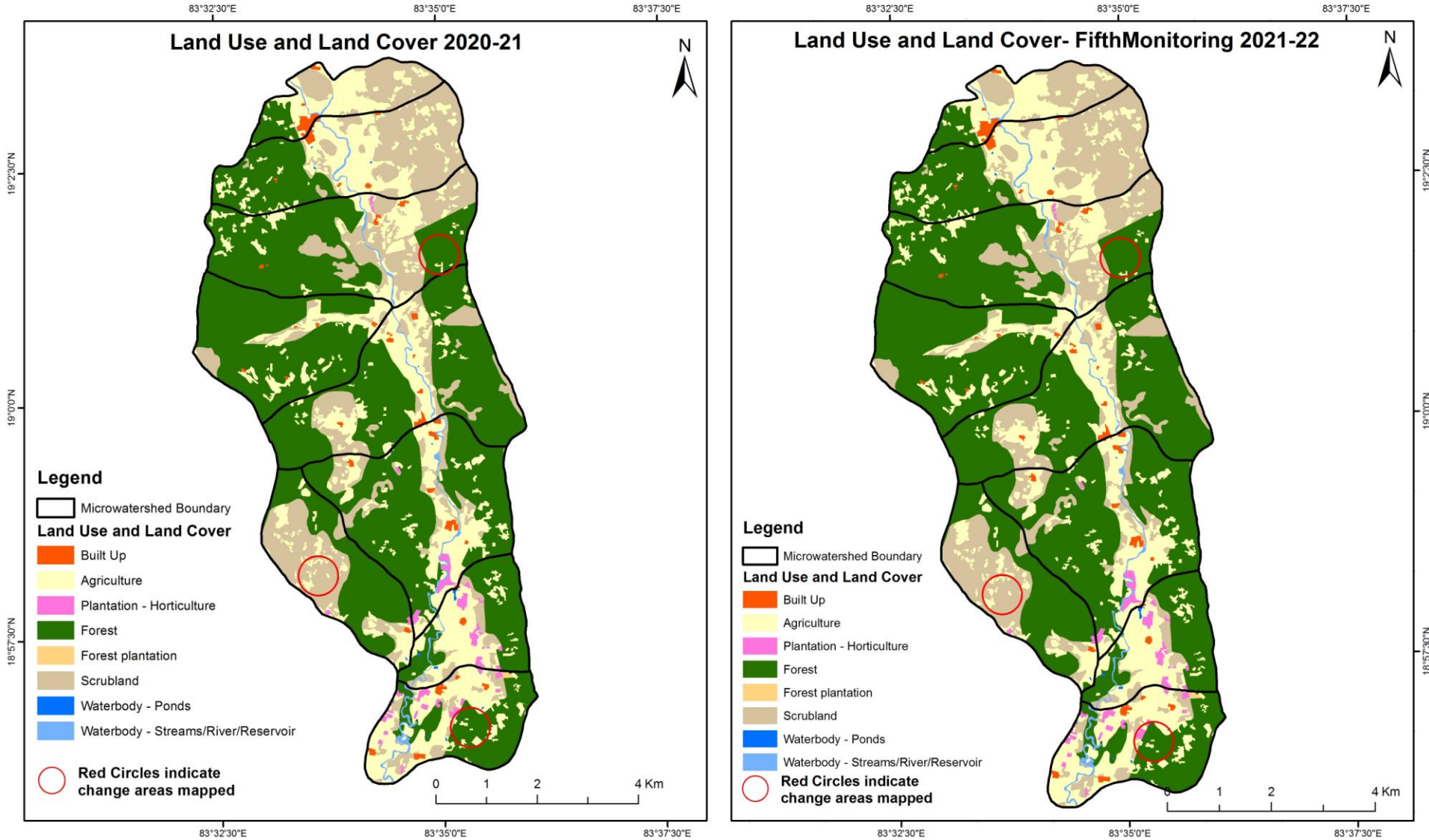
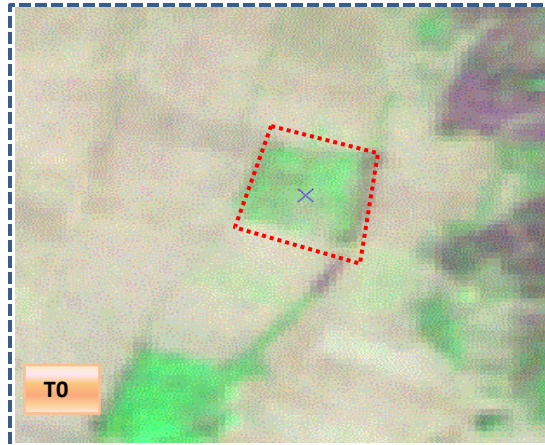
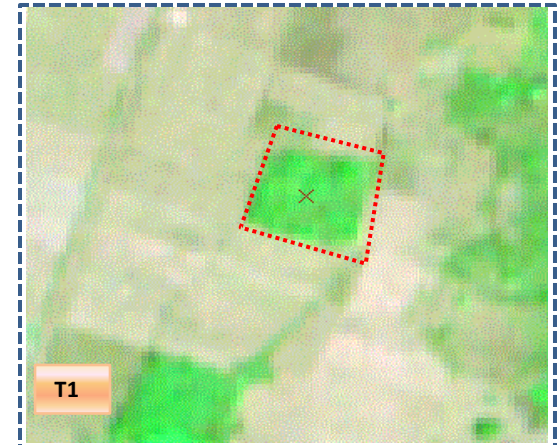


Fig 12. Gorada Watershed (IWMP-09/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

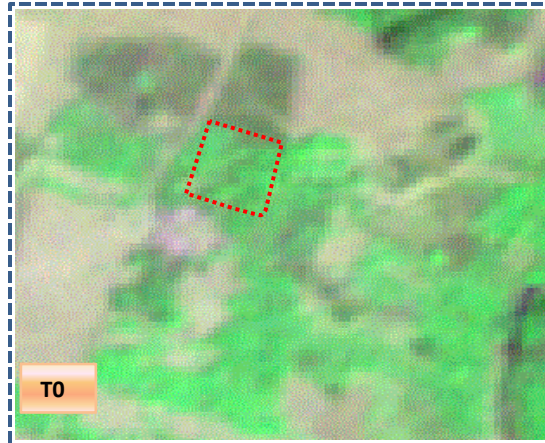


T0: 2013-14 ($83^{\circ}34'20.259''E$ $18^{\circ}56'28.513''N$)

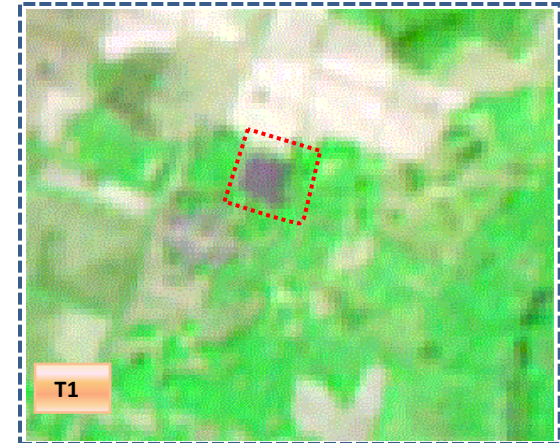


T1: 02 April 2018

Scrub to Water body



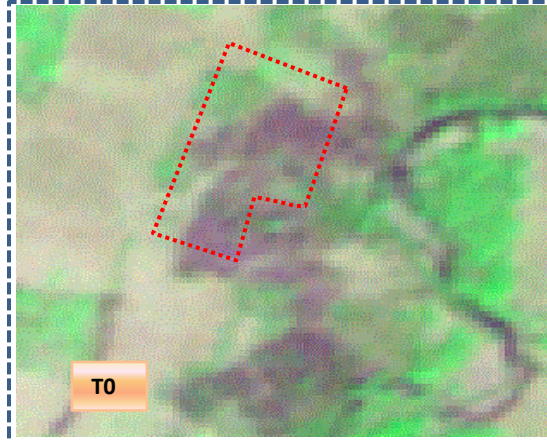
T0: 2013-14 ($83^{\circ}34'25.356''E$ $18^{\circ}56'48.484''N$)



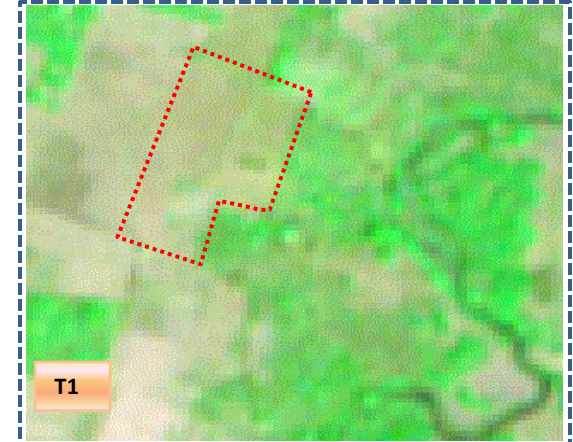
T1: 02 April 2018

Fig 13. Gorada Watershed (IWMP-09/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

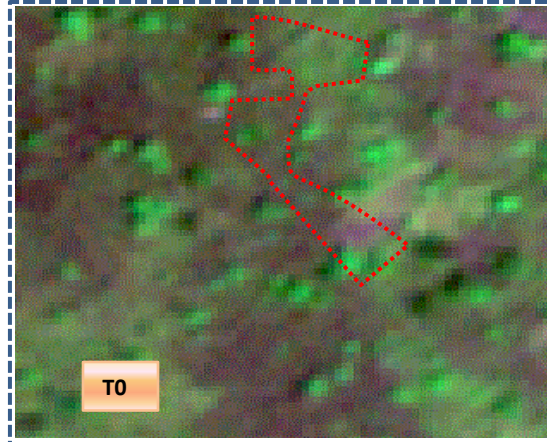


T0: 2013-14 (83°34'25.422"E 18°56'35.108"N)

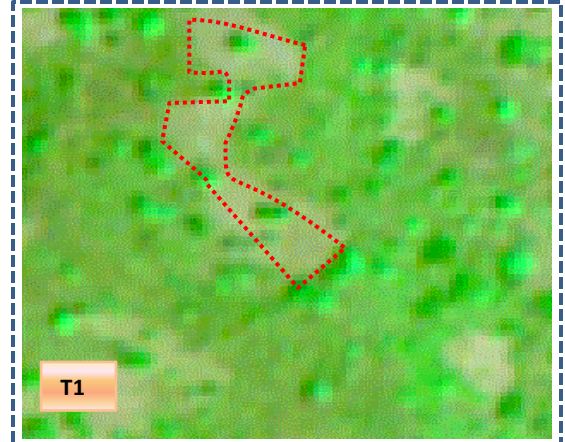


T1: 02 April 2018

Scrub to Agriculture



T0: 2013-14(83°33'46.651"E 18°58'26.599"N)



T1: 02 April 2018

Table 5. showing change matrix depicting Land cover transitions for Gorada Watershed (IWMP-09/2013-14) 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	14.85												14.85
Mining/dump													
Agriculture	11.23		1117.53	6.21	29.74				19.2	0.16			1184.07
Plantation Horticulture				27.68									27.68
Forest	0.11		66.25		3031.96	2.7			5.05				3106.07
Forest Plantation													
Barren Rocky													
Scrub	2.64		201.16	6.4	203.85			1385.07	14.13	0.18			1813.43
Waterbody- Streams/River													
Waterbody – Ponds										1.33			1.33
Grand Total	28.83		1384.94	40.29	3265.55	2.7		1385.07	38.38	1.67			6147.43

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 66 ha of the agriculture area has decreased and it is converted into Built-up (11 ha), plantation/horticulture (6 ha), forest (29.7 ha) and water body (19 ha) in T1.
3. In T1 267 ha of the agriculture area has increased from forest (66 ha) and scrubland (201 ha) of T0.

Table 6. showing change matrix depicting Land cover transitions for Gorada Watershed (IWMP-09/2013-14) 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		
Built up	28.83												28.83
Mining/dump													
Agriculture	2.89		1381.68	0.37									1384.94
Plantation Horticulture				40.29									40.29
Forest	0.16				3265.39								3265.55
Forest Plantation						2.7							2.7
Barren Rocky													
Scrub	1.39		12.69	2.99				1367.69	0.31				1385.07
Waterbody- Streams/River									38.38				38.38
Waterbody – Ponds											1.67		1.67
Grand Total	33.27		1394.37	43.65	3265.39	2.7		1367.69	38.69		1.67		6147.43

4. In T1 3.2 ha of the agriculture area has decreased and it is converted into Built-up(2.8 ha) and plantations/horticulture (0.37 ha) of T2.

5. In T2 12 ha of the agriculture area has increased from scrubland (12.6 ha) of T1.

Table 7. showing change matrix depicting Land cover transitions for Gorada Watershed (IWMP-09/2013-14) 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		
Built up	33.27												33.27
Mining/dump													
Agriculture	5.08		1361.56	10.46					16.39	0.88			1394.37
Plantation Horticulture				43.65									43.65
Forest			0.6		3264.53				0.1	0.16			3265.39
Forest Plantation						2.7							2.7
Barren Rocky													
Scrub			38.3					1326.51	2.88				1367.69
Waterbody- Streams/River									38.69				38.69
Waterbody – Ponds										1.67			1.67
Grand Total	38.35		1400.46	54.11	3264.53	2.7		1326.51	58.06	2.71			6147.43

6. In T2 32.8 ha of the agriculture area has decreased and it is converted into Built-up (5 ha), plantations/horticulture (10 ha) and water body (17 ha) in T3.

7. In T3 38.9 ha of the agriculture area has increased from forest (0.6 ha) and scrubland (38 ha) of T2.

Table 8. showing change matrix depicting Land cover transitions for Gorada Watershed (IWMP-09/2013-14) 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		
Built up	38.35												38.35
Mining/dump													
Agriculture	20.65		1378.38	0.73					0.33	0.37			1400.46
Plantation Horticulture				54.11									54.11
Forest			2.19		3261.32				0.7	0.32			3264.53
Forest Plantation						2.7							2.7
Barren Rocky													
Scrub			40.88					1285.63					1326.51
Waterbody- Streams/River									58.06				58.06
Waterbody – Ponds										2.71			2.71
Grand Total	59		1421.45	54.84	3261.32	2.7		1285.63	59.09	3.4			6147.43

8. In T3 22 ha of the agriculture area has decreased and it is converted into built-up (20.6 ha), plantation (0.7 ha) and water body (0.7 ha) in T4.

9. In T4 43 ha of the agriculture area has increased from forest (2.1 ha) scrubland (40.8 ha) of T3.

Table showing change matrix depicting Land cover transitions for Gorada Watershed (IWMP-09/2013-14) 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		
Built up	59												59
Mining/dump													
Agriculture			1420.38					1.07					1421.45
Plantation Horticulture				54.84									54.84
Forest					3261.32								3261.32
Forest Plantation						2.7							2.7
Barren Rocky													
Scrub			4.78					1280.85					1285.63
Waterbody-Streams/River									59.09				59.09
Waterbody – Ponds											3.4		3.4
Grand Total	59		1425.16	54.84	3261.32	2.7		1281.92	59.09		3.4		6147.43

10. In T4 1.07 ha of the agriculture area has decreased and it is converted into scrubland (1 ha) in T5.

11. In T5 80 ha of the agriculture area has increased from scrubland (4.7 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 61 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 200, 9.4, 06, 20 & 3 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 241 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. About **27 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 531 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
6. 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