# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

PRAKASAM -5/2009-10
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-2021

**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

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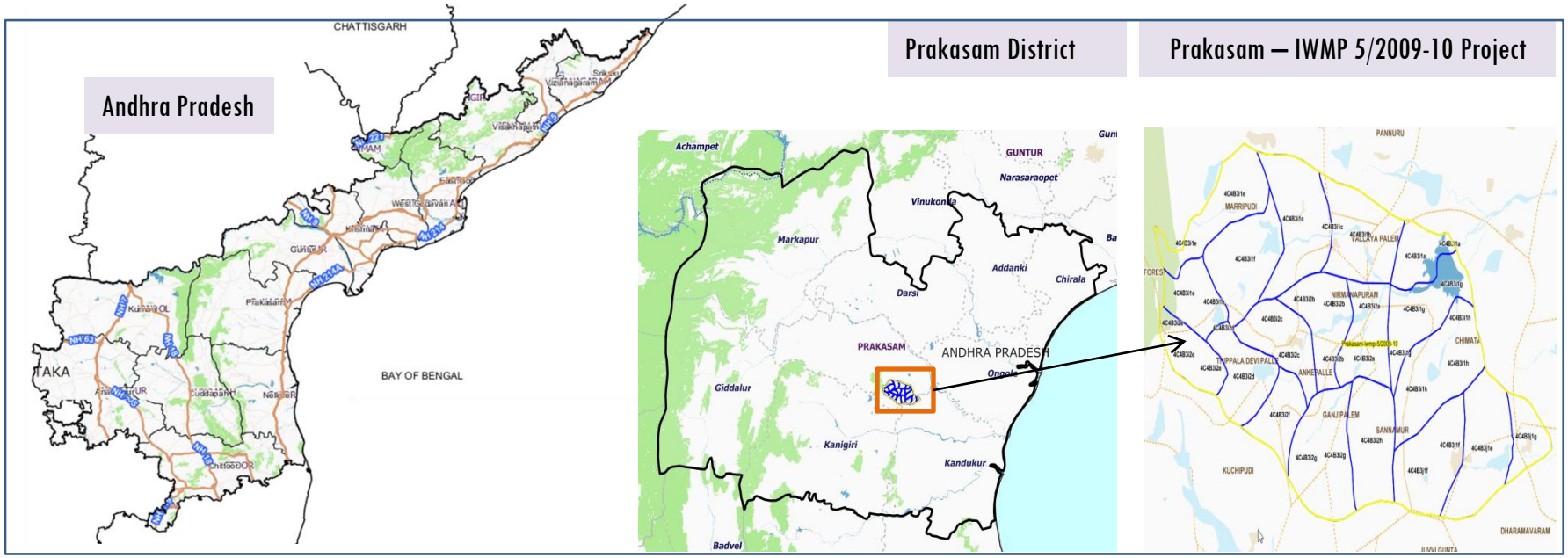
# EXECUTIVE SUMMARY

- Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).
- 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).
- Current summary report gives details of Project - IWMP-05/2009-10, Prakasam District of Andhra Pradesh. The total geographical area of the project is 9332.4 ha. It comprises of 19 micro watersheds.
- In the project area 48 Drishti photos were uploaded showing 6 check dams,38 Dug out pits, 3 Percolation Tanks and 1 plantation.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 38 new farm ponds or dug out ponds with 9.61 ha increase in the area.
- Major percentage i.e. 70.67% is covered by the agriculture, 20.68% is covered by Scrub, 3.87 % by water bodies, 1.84% by Plantation and remaining by other land use classes.

**PROJECT : PRAKASAM - IWMP-05/2009-10**
**DISTRICT : PRAKASAM , STATE : ANDHRA PRADESH**

- The study area falls in Marripudi Mandal of Prakasam district of Andhra Pradesh state. The total geographical area of the project is 9332.4 ha. It comprises of 19 micro watersheds. Location Map of the study area is shown in Figure below.
- Analysis is done for 2009-10 period (***Batch -1***) projects taking 2017-18 period satellite images




- Project area witnesses tropical wet and dry climate characterized by year round high temperatures. Prakasam has a record of reaching more than 46°C.
- December is the coldest month with normal mean maximum temperature of about 27.1°c and mean minimum temperature of 19.2°C. Temperature begins to rise after February. May is the hottest month with mean daily maximum temperature of about 36.1°C and the mean daily minimum temperature of about 27.7°C. During May and early June the maximum temperature rises occasionally to 46°C and with the onset of SW monsoon by about second week of June, temperature begins to drop rapidly.

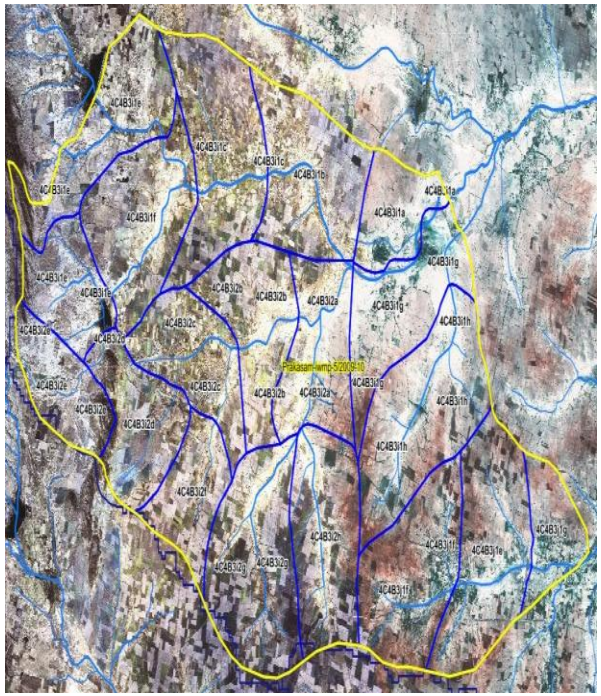
# Satellite Data and Ancillary Data

| Satellite data* | T0-A** | T0-B** | T5 |
|---|---|---|---|
| | 2009-10 | 2011-12 | 2017-18 |
| LISS IV | 2009-10 | | |
| SCENE 1 | | | 26-Sep-18 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |
| | | | |
| CARTO | 2009-10 | | |
| SCENE 1 | | | 26-Sep-18 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |

## 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 | 52 |
| 4 | Detailed Project Report | | |

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



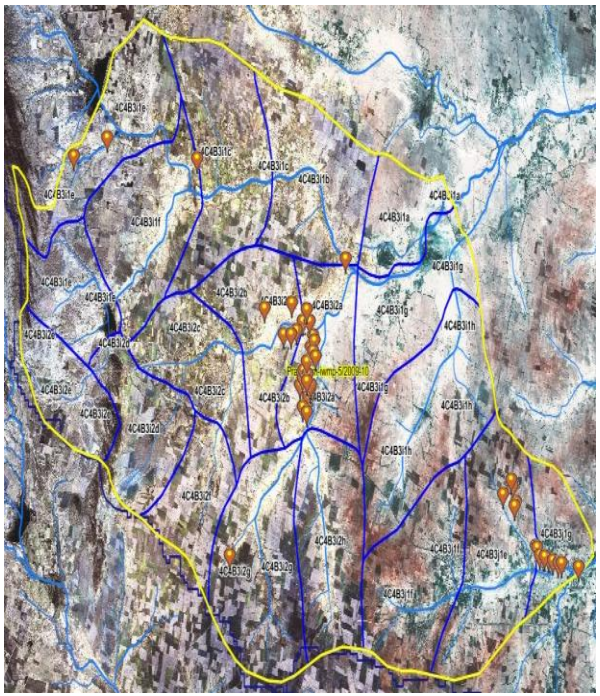
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

## Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

# Classification of the Activities

| Sr. No | Activity | Drishti Photo | Visible on satellite |
|---|---|---|---|
| 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 | Road side Plantation | 1 | 1 |
| 10 | Farm ponds | 41 | 30 |
| 11 | Check dams | 8 | 6 |
| 12 | Nallah Bunds | 0 | 0 |
| 13 | Percolation tanks / Ground water recharge structure | 3 | 3 |
| 14 | Production System and Micro-Enterprises | 0 | 0 |
| 15 | Livelihood Activities | 0 | 0 |
| 16 | Capacity Building Activities | 0 | 0 |
| 17 | Entry Point Activity | 0 | 0 |
| 18 | Others | 4 | 4 |
| | **TOTAL** | **57** | **44** |

# MONITORING IN THE PROJECT AREA

## 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 (2009-10) and T5 is 2017-18 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.

# Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-05/2009-10


T0:2009-10


T1: 23 May 2013

Drishti Sl no. 841819 MWS :4C4B3i2a

**Dug out pit**


T0:2009-10


T1: 22 June 2014

Drishti Sl no.700274 MWS : 4C4B3i2g

**Percolation Tank**

# Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-05/2009-10

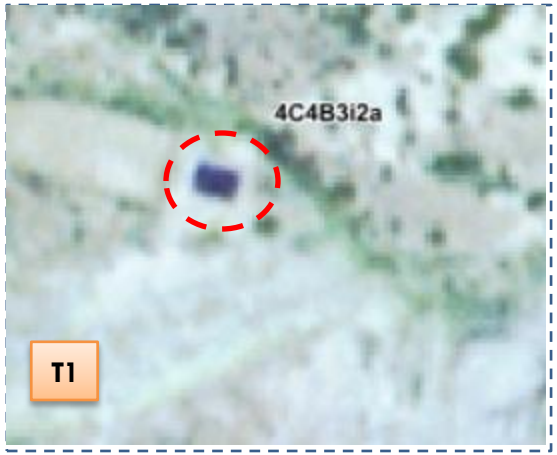

T0: 2009-10


T1: 23 May 2013

Drishti Sl no. 10360 MWS :4C3Ci1f

**Checkdam**


T0: 2009-10




T1: 22 June 2014

Drishti Sl no. 842329 MWS :4C4B3i2a

**Dug out Pit**

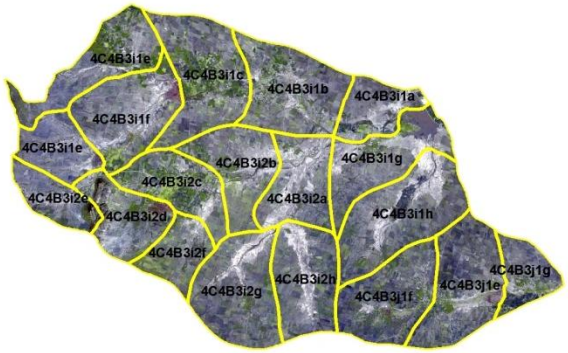
# MONITORING IN THE PROJECT AREA

## 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.
- 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.
- The result obtained for the period T0 to T5 are given in the change matrix table.

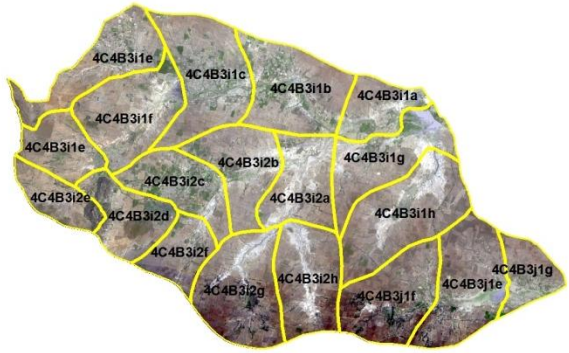
# Natural Color Composite – 2009-10 to 2017-18

**Natural Color Composite- 2009-10**



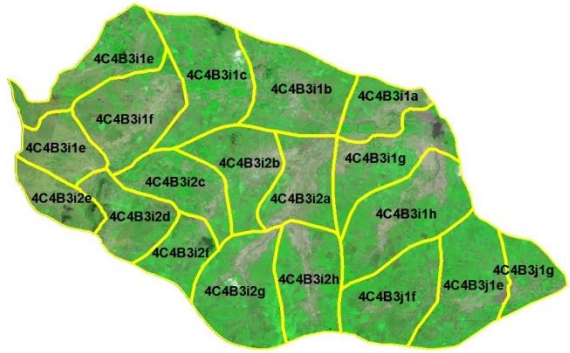

Source:Fusen data,NRSC

**Natural Color Composite- 2013-14**



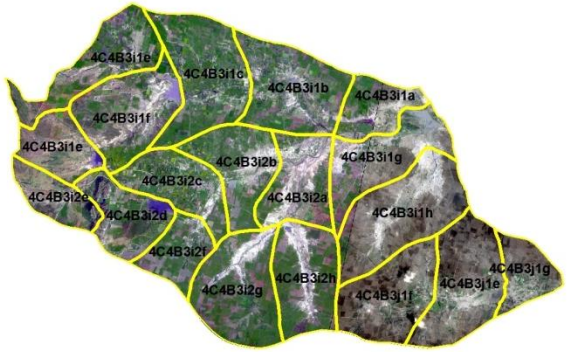

Source:Fusen data,NRSC

**Natural Color Composite- 09th January 2015**



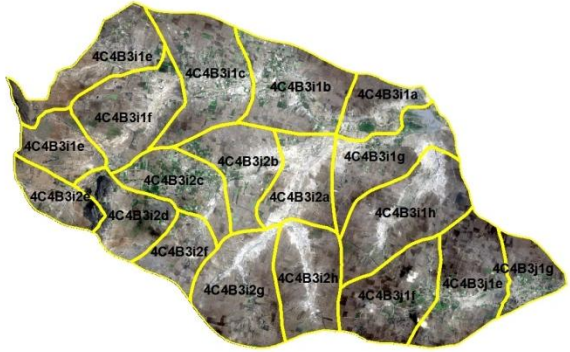

Source:LISS-IV,NRSC

**Natural Color Composite- 16h January 2016**



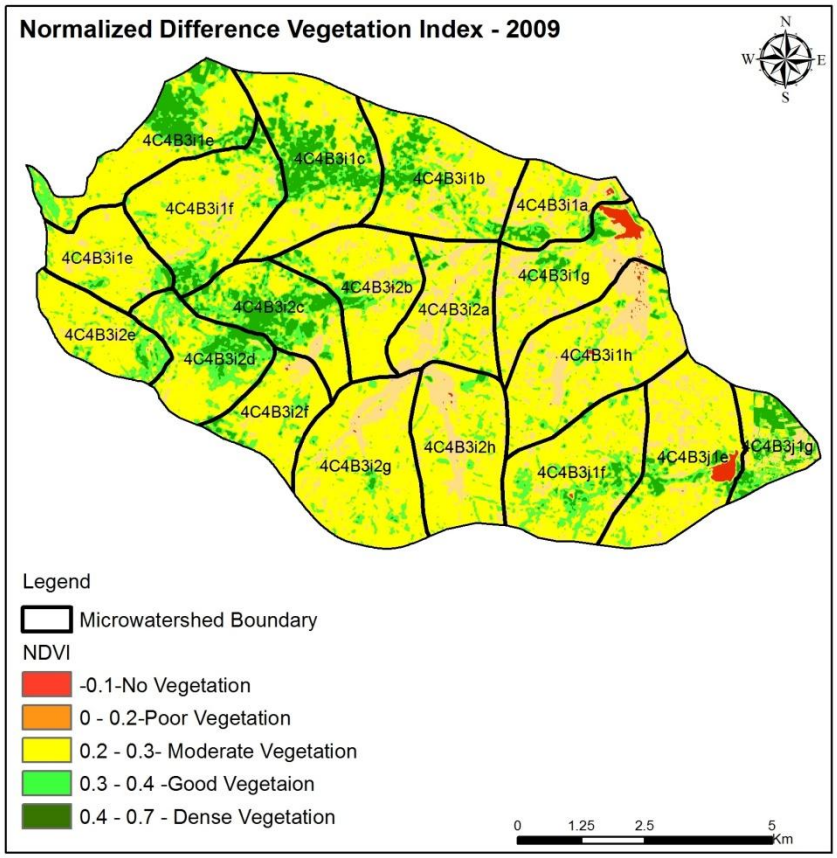

Source:LISS-IV,NRSC

**Natural Color Composite- 20th March 2017**

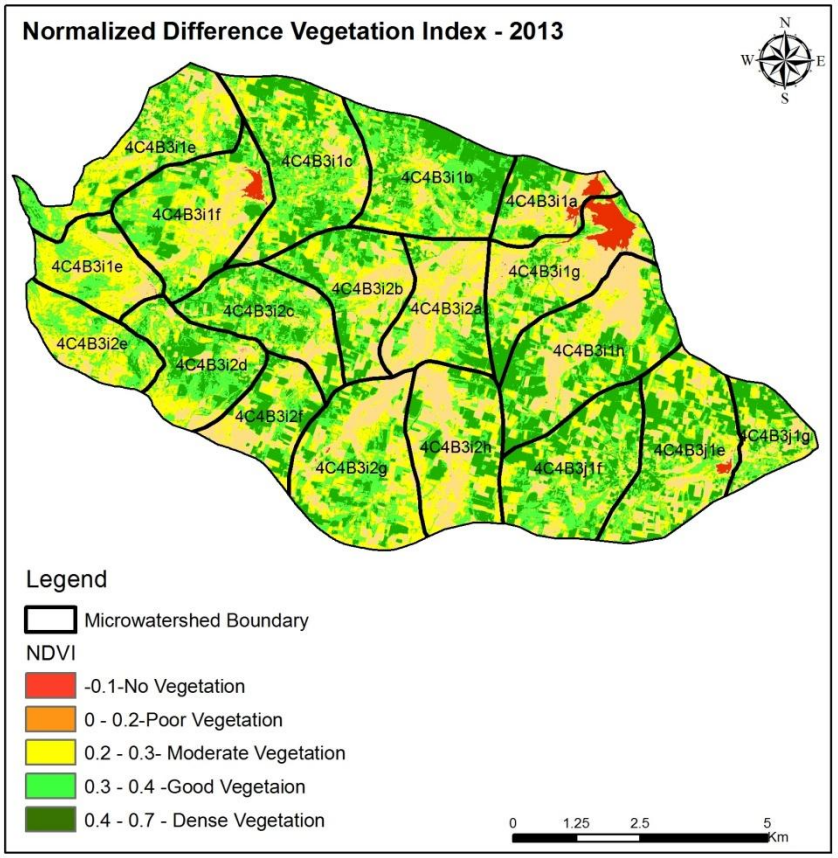



Source:Fusen data,NRSC

# Changes in Vegetation Cover

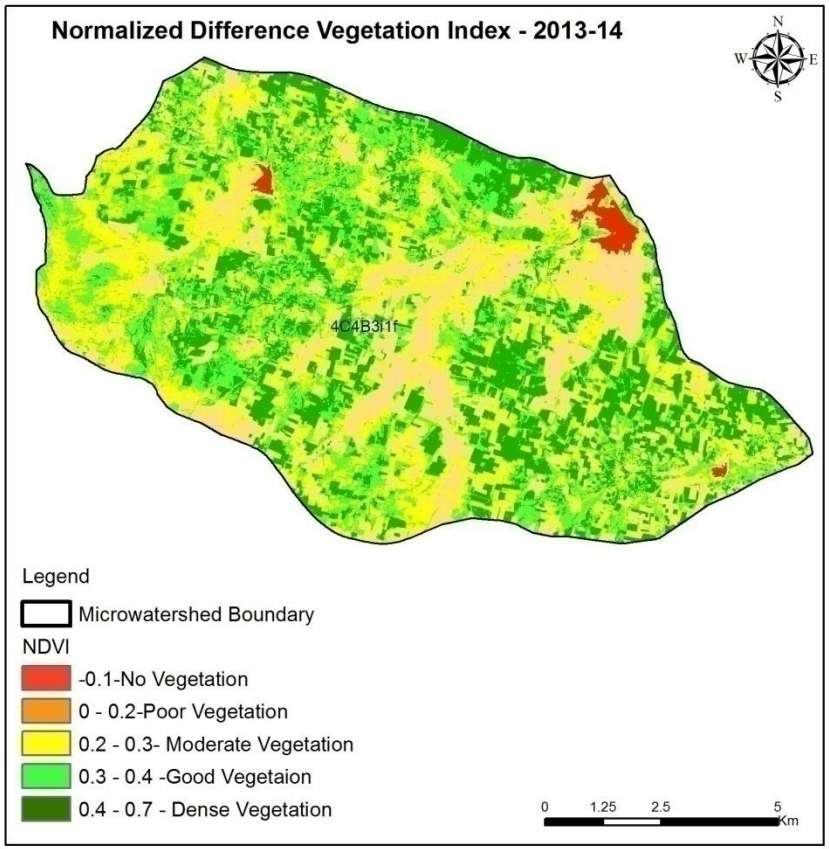



NDVI (2009-10)

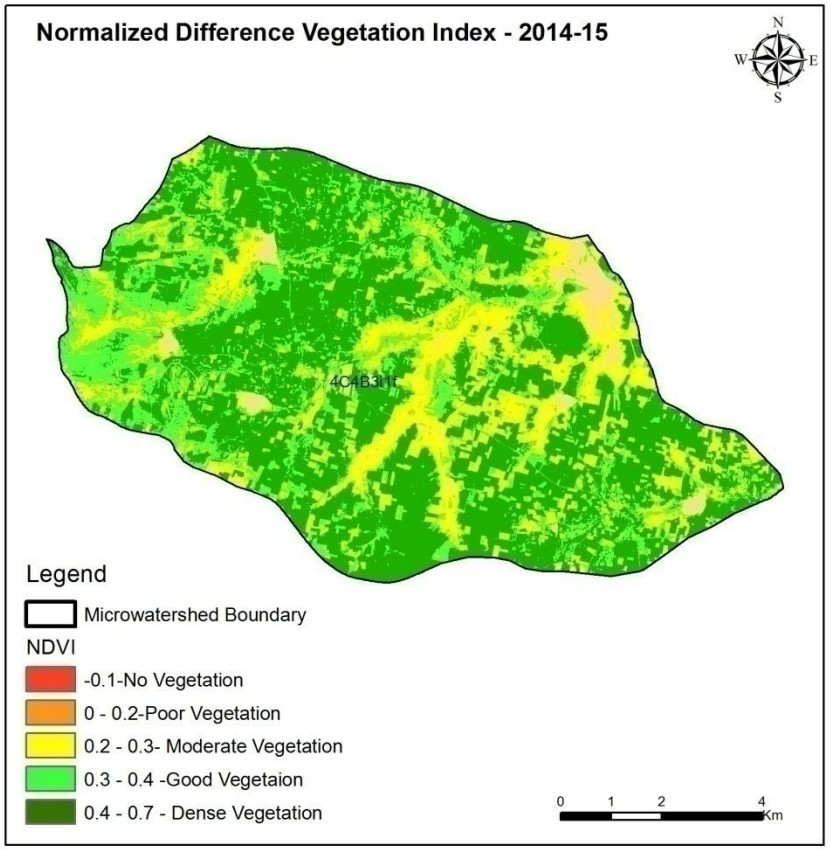



NDVI (2013-14)

# Changes in Vegetation Cover



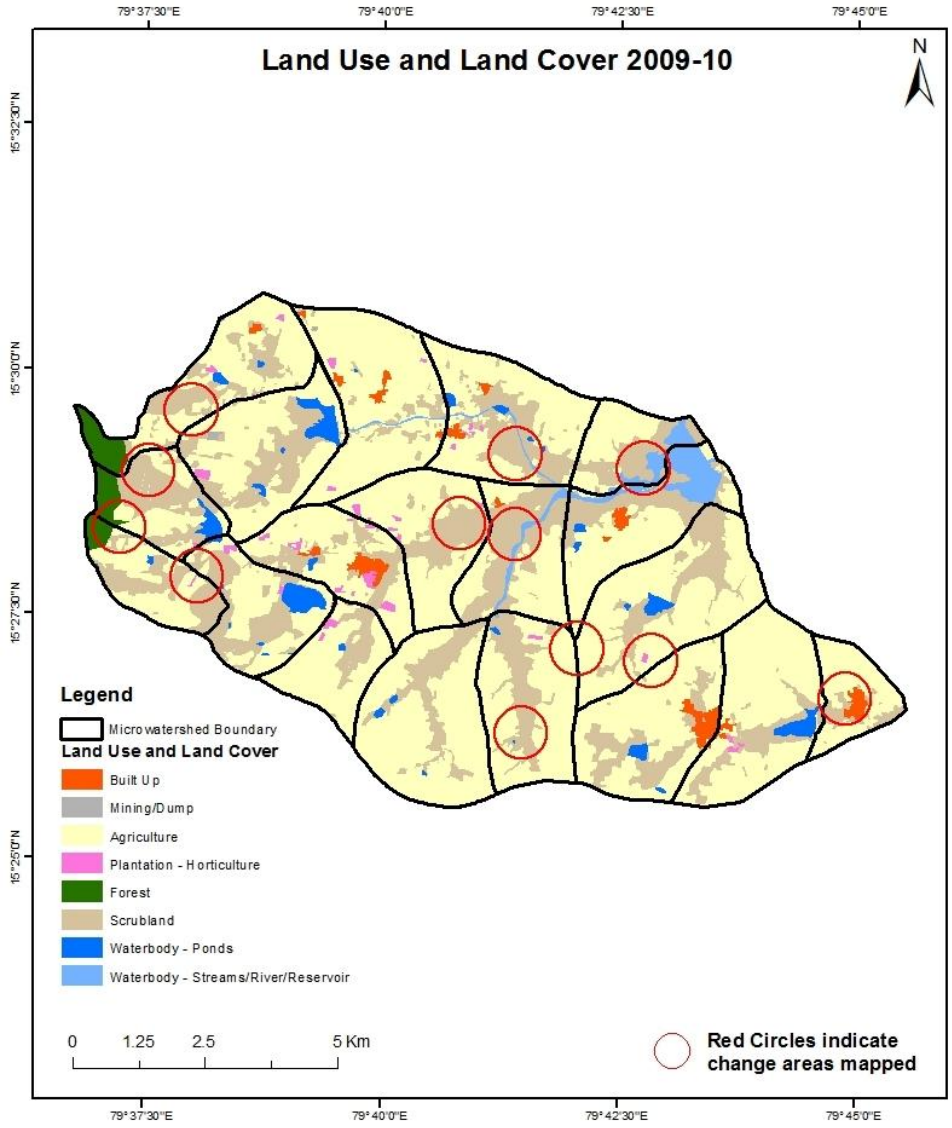

NDVI (2013-14)

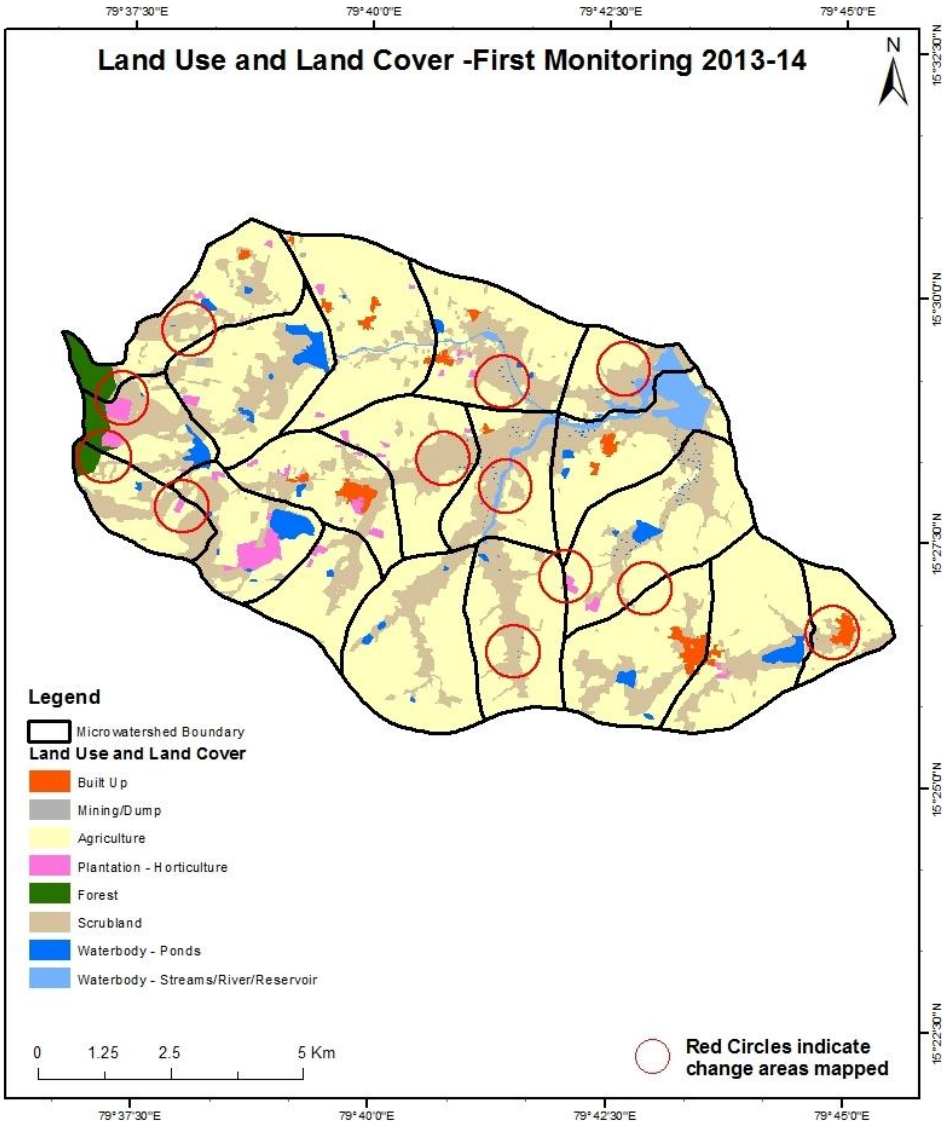



NDVI (2014-15)

# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

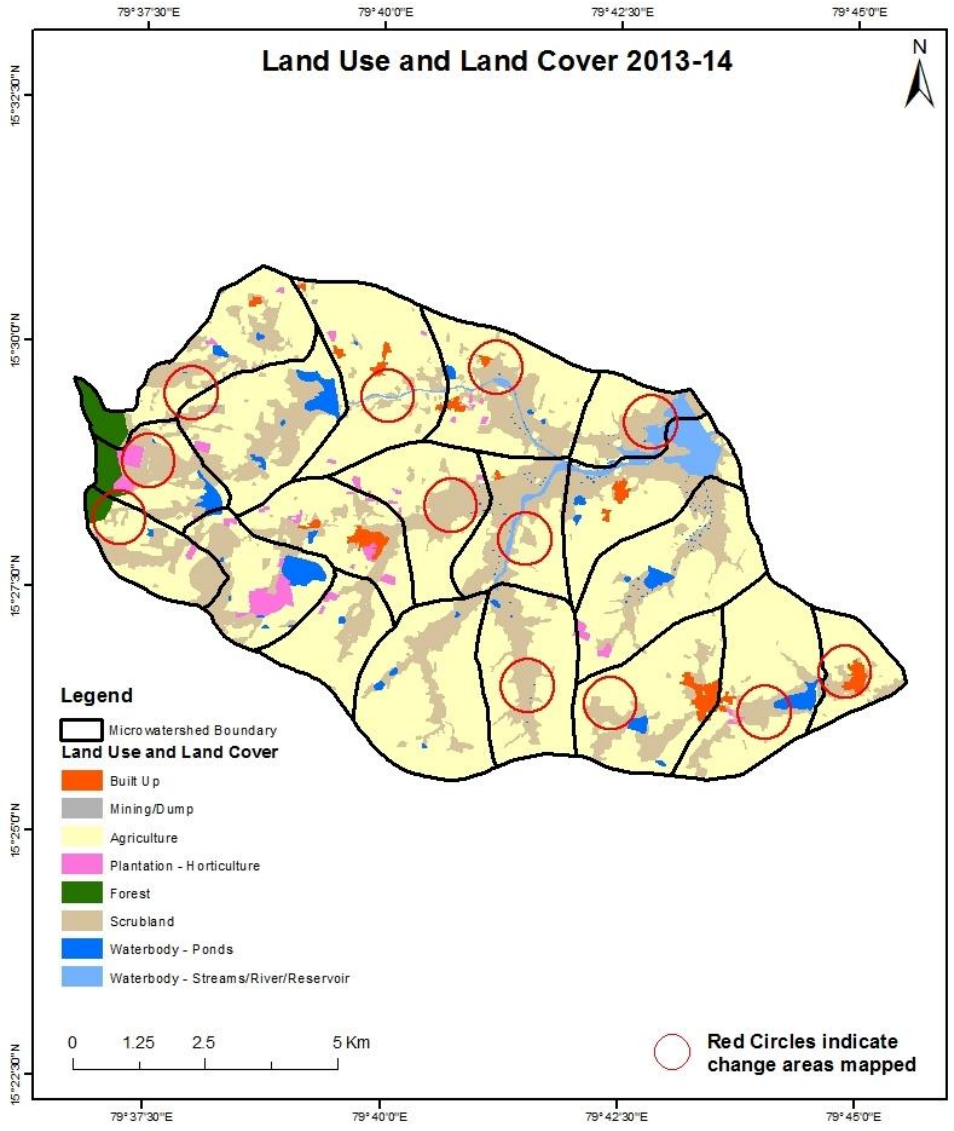
**Scale: 1:10000**

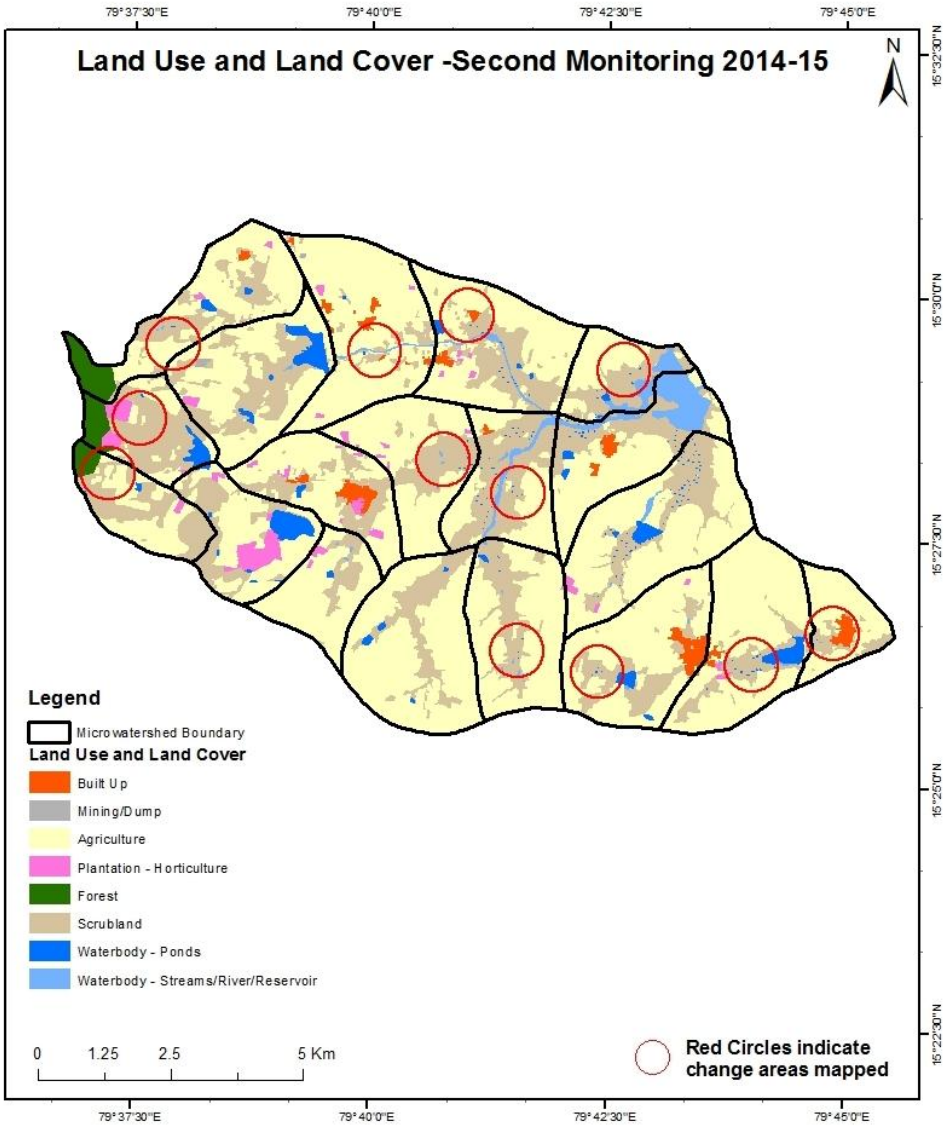


# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

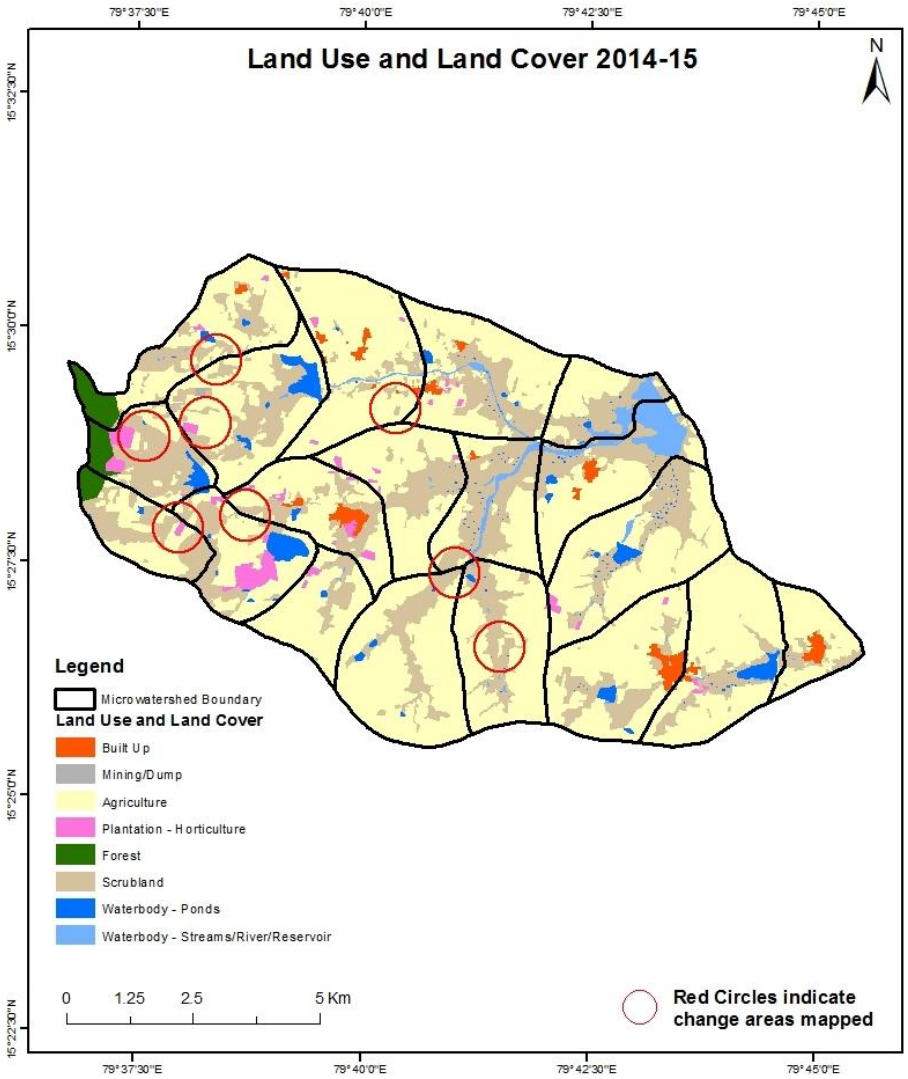
Scale: 1:10000

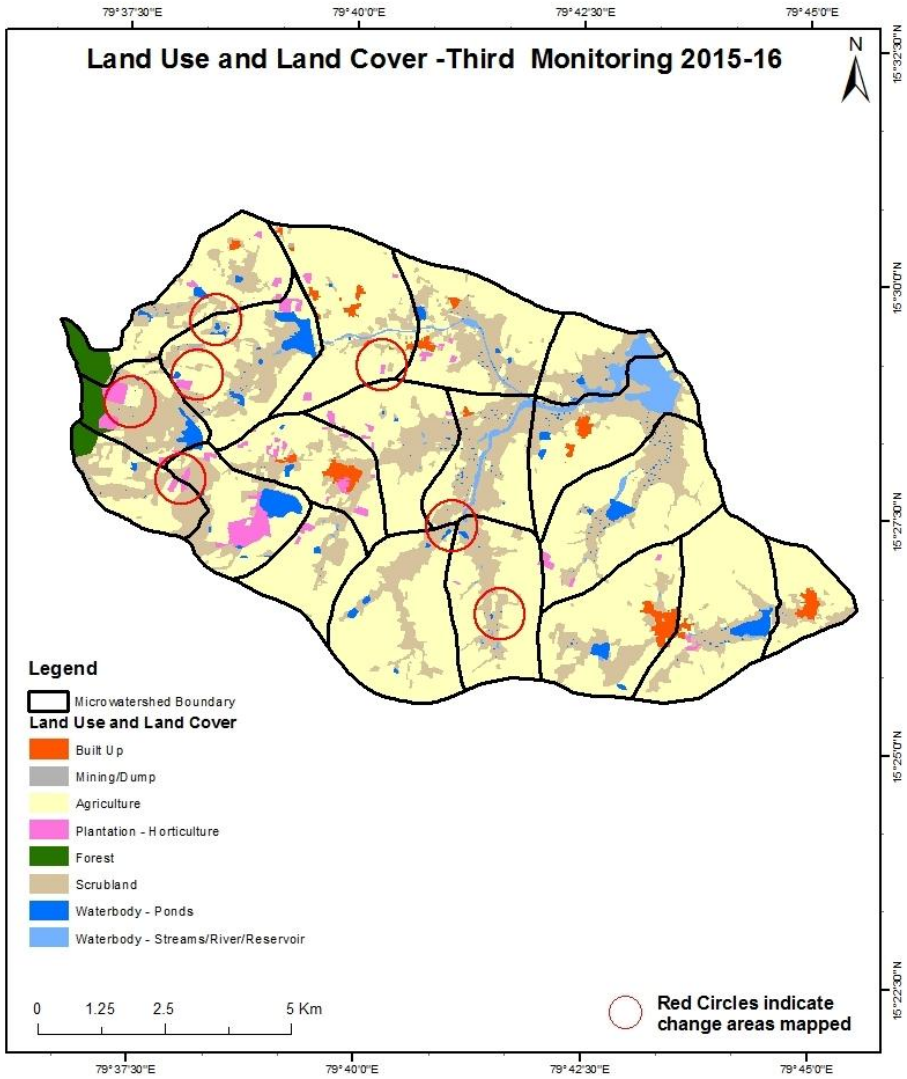


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

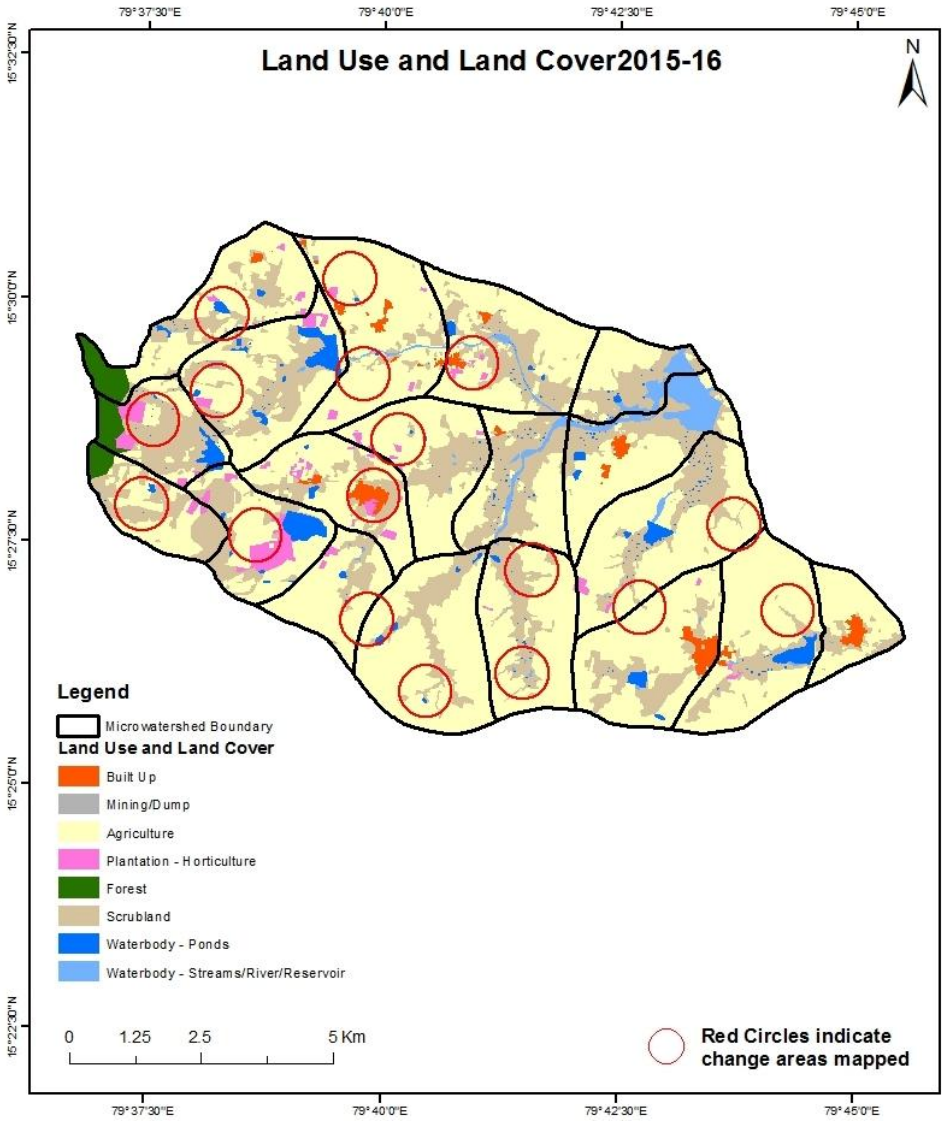
**Scale: 1:10000**

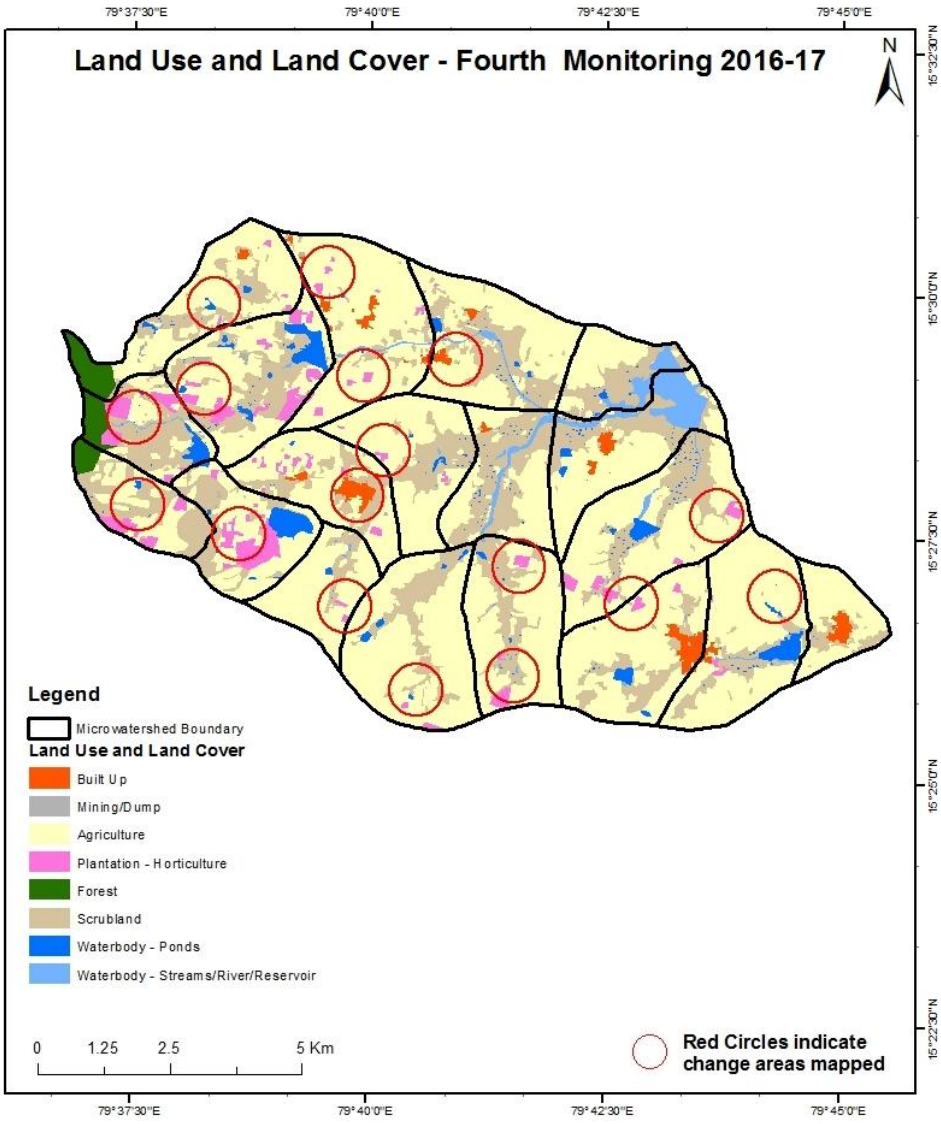


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

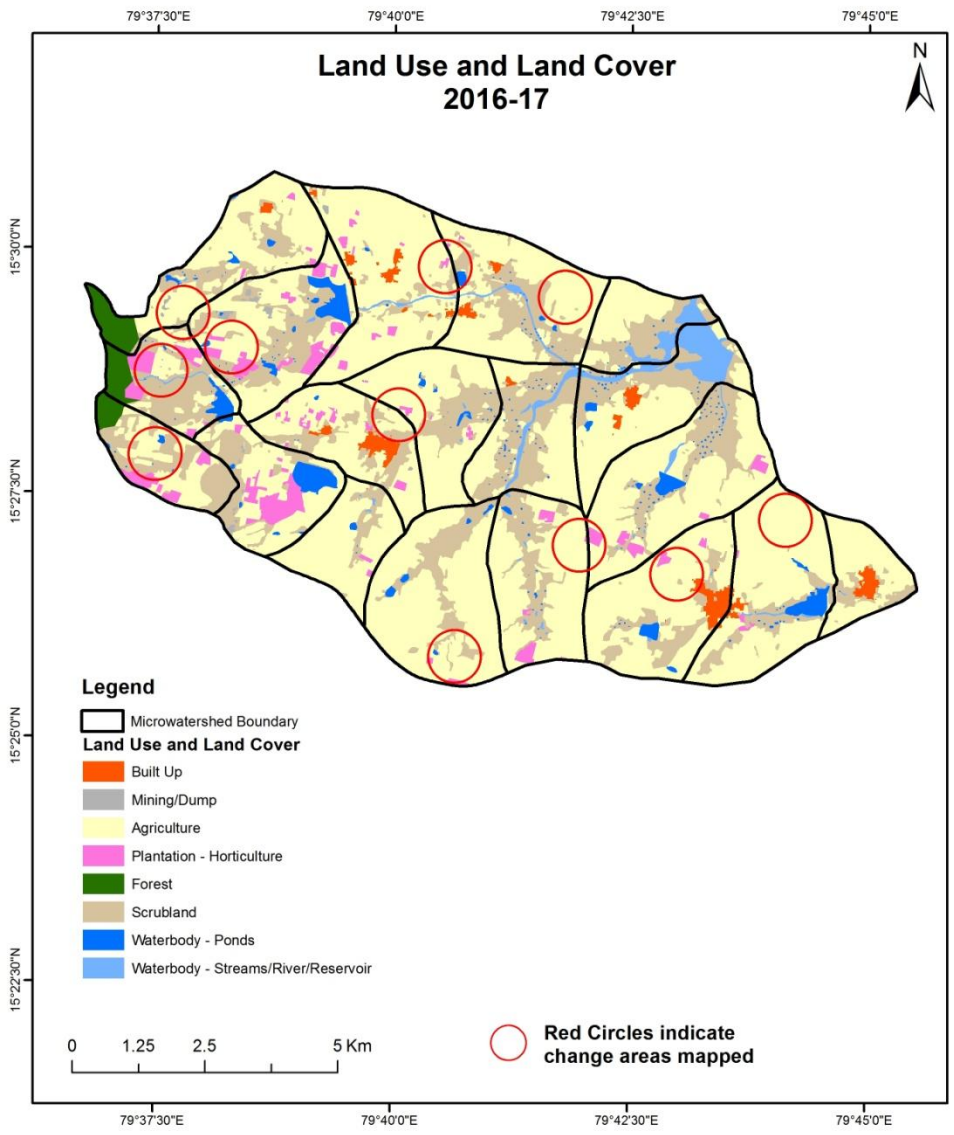
**Scale: 1:10000**

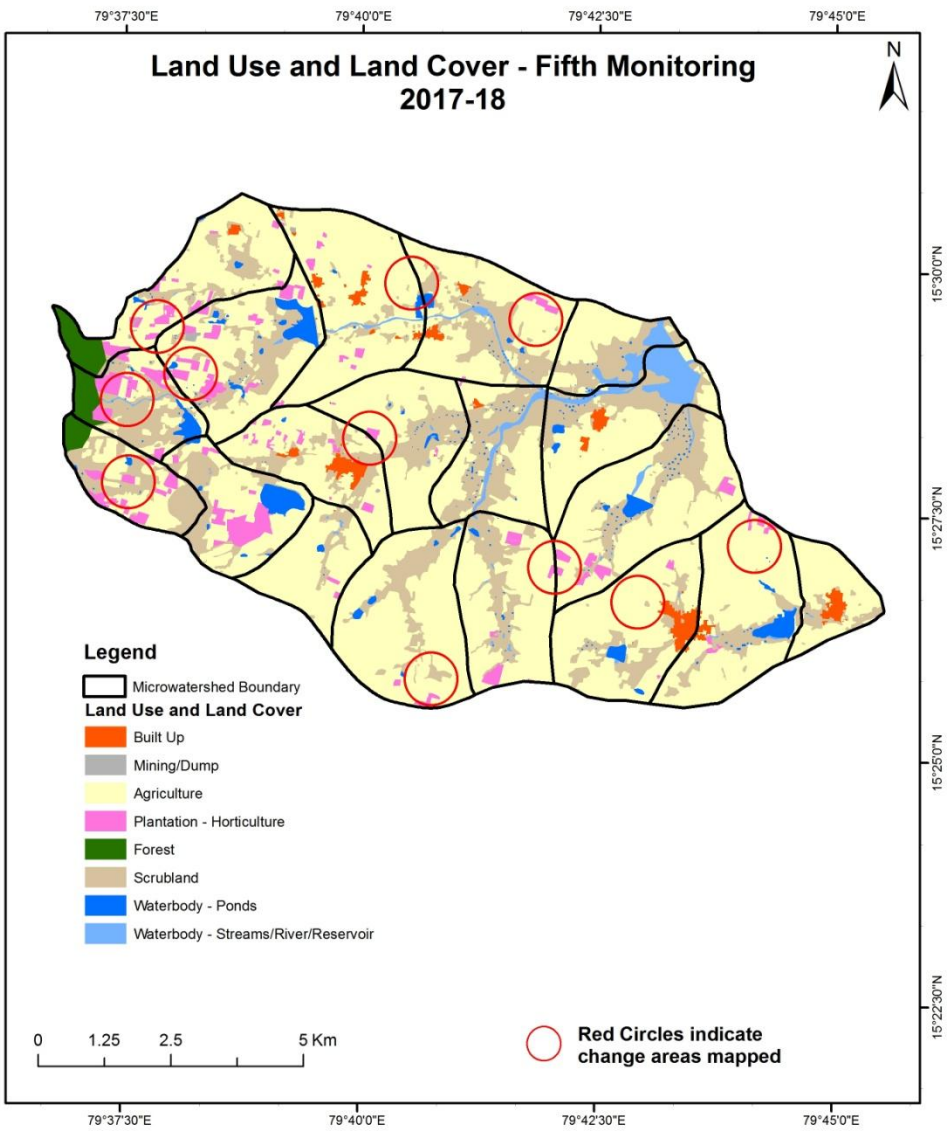


# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

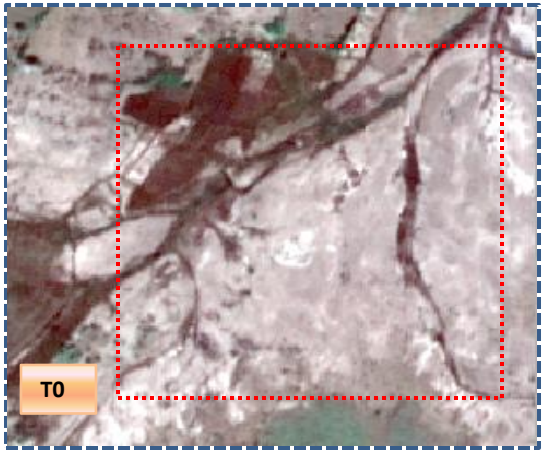
Scale: 1:10000



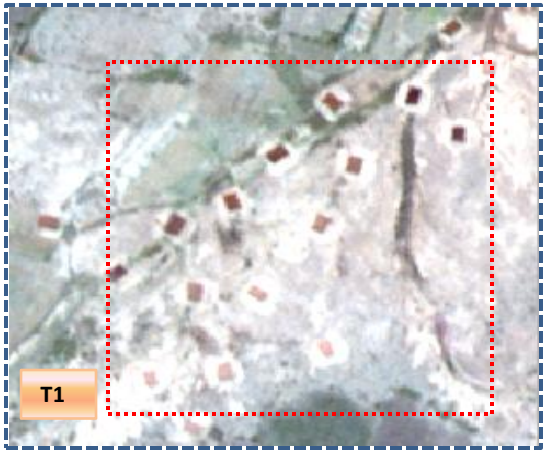



**Land Use and Land Cover changes for Pre and Post treatment dates**

Scrub to Water body




T0: 2009-10




T1: 23 May 2013

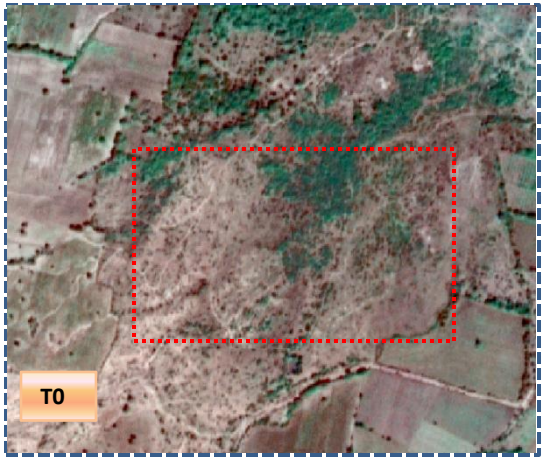
Scrub to Built up


T0: 2009-10


T1: 23 May 2013

**Land Use and Land Cover changes for Pre and Post treatment dates**

Scrub to Plantation




T0: 2009-10


T1: 23 May 2013

Agriculture to Plantation


T0: 2009-10


T1: 23 May 2013

**Table showing change matrix depicting Land cover transitions during study period-2009-10 to 2013-14**

| 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 | 126.27 | | | | | | | | | | **126.27** |
| Mining/dump | | 4.50 | | | | | | | | | **4.50** |
| Agriculture | 1.93 | | 6231.94 | 24.08 | | | | 0.20 | | 0.92 | **6259.09** |
| Plantation Horticulture | | | 8.53 | 61.06 | | | | | | | **69.59** |
| Forest | | | | | 129.31 | | | | | | **129.31** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | 0.16 | | 10.93 | 58.29 | | | | 2300.82 | 0.14 | 11.76 | **2382.09** |
| Waterbody-Streams/River | | | | | | | | | 177.89 | 0.97 | **178.87** |
| Waterbody – Ponds | | | | | | | | 0.35 | 3.40 | 179.44 | **183.19** |
| Grand Total | **128.36** | **4.50** | **6251.40** | **143.43** | **129.31** | | | **2301.38** | **181.43** | **193.10** | **9332.91** |

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T0 27 ha of agriculture are decreased and it is converted into built-up, plantation, scrub and water body and in T1.
- In T1 19 ha of agriculture are increased from plantation and scrubland of T0.
- The additional agriculture are coming from waterbody in T1 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period-2013-14 to 2014-15**

| 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 | 128.36 | | | | | | | | | | **128.36** |
| Mining/dump | | 4.50 | | | | | | | | | **4.50** |
| Agriculture | 3.59 | | 6072.40 | 1.21 | | | | 166.75 | 5.37 | 2.07 | **6251.40** |
| Plantation Horticulture | | | | 140.39 | | | | 3.04 | | | **143.43** |
| Forest | | | | | 129.31 | | | | | | **129.31** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | | | 62.88 | | | | | 2224.23 | 10.34 | 3.93 | **2301.38** |
| Waterbody-Streams/River | | | | | | | | | 181.43 | | **181.43** |
| Waterbody – Ponds | | | | | | | | | | 193.10 | **193.10** |
| Grand Total | **131.95** | **4.50** | **6135.28** | **141.60** | **129.31** | | | **2394.02** | **197.15** | **199.09** | **9332.91** |

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T1 179 ha of agriculture are decreased and it is converted into built-up, plantation, scrubland and water body in T2.
- In T2 62 ha of agriculture are increased from scrub land a area of T1.
- The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period-2014-15 to 2015-16**

| 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 | 131.95 | | | | | | | | | | **131.95** |
| Mining/dump | | 4.50 | | | | | | | | | **4.50** |
| Agriculture | 1.40 | | 6078.28 | 36.94 | | | | 14.56 | 0.53 | 3.58 | **6135.28** |
| Plantation Horticulture | 0.04 | | 1.19 | 140.37 | | | | | | | **141.60** |
| Forest | | | | | 129.31 | | | | | | **129.31** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | 0.38 | | 76.40 | | | | | 2304.25 | 0.33 | 12.66 | **2394.02** |
| Waterbody-Streams/River | | | | | | | | | 197.15 | | **197.15** |
| Waterbody – Ponds | | | | | | | | | | 199.09 | **199.09** |
| Grand Total | **133.77** | **4.50** | **6155.86** | **177.31** | **129.31** | | | **2318.81** | **198.01** | **215.33** | **9332.91** |

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T2 57 ha of agriculture are decreased and it is converted into built-up, plantation, scrub and water body area in T3.
- In T3 77 ha of agriculture are increased from scrub land and plantation area of T2.
- The additional agriculture are coming from waterbody in T3 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period-2015-16 to 2016-17**

| 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 | 133.77 | | | | | | | | | | **133.77** |
| Mining/dump | | 4.50 | | | | | | | | | **4.50** |
| Agriculture | 3.81 | 0.54 | 5977.28 | 174.01 | | | | | | 0.22 | **6155.86** |
| Plantation Horticulture | 0.92 | | 50.27 | 126.12 | | | | | | | **177.31** |
| Forest | | | | | 129.31 | | | | | | **129.31** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | 0.31 | 5.63 | 123.44 | 0.31 | | | | 2172.73 | 7.53 | 8.88 | **2318.81** |
| Waterbody-Streams/River | | | | | | | | | 198.01 | | **198.01** |
| Waterbody – Ponds | | 0.55 | 5.42 | 0.68 | | | | | | 208.69 | **215.33** |
| Grand Total | **138.80** | **11.22** | **6156.40** | **301.12** | **129.31** | | | **2172.73** | **205.54** | **217.79** | **9332.91** |

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T3 178 ha of agriculture are decreased and it is converted into Built-up, mining, plantation, and water body in T4.
- In T4 179 ha of agriculture are increased from scrub land, plantation and waterbody of T3.
- The additional agriculture are coming from waterbody in T4 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period-2016-17 to 2017-18**

| 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 | 138.72 | | 0.07 | 0.01 | | | | | | | **138.80** |
| Mining/dump | | 8.07 | | | | | | 2.60 | | 0.55 | **11.22** |
| Agriculture | 2.43 | | 6039.47 | 110.68 | | | | 3.75 | | 0.06 | **6156.40** |
| Plantation Horticulture | 0.08 | | 62.44 | 238.60 | | | | | | | **301.12** |
| Forest | | | | | 129.31 | | | | | | **129.31** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | 0.52 | | 134.98 | 2.95 | | | | 2028.65 | | 5.63 | **2172.73** |
| Waterbody-Streams/River | | | | | | | | 1.80 | 203.66 | 0.07 | **205.54** |
| Waterbody – Ponds | | | 3.57 | | | | | 0.31 | | 213.90 | **217.79** |
| Grand Total | **141.75** | **8.07** | **6240.53** | **352.25** | **129.31** | | | **2037.12** | **203.66** | **220.21** | **9332.91** |

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T4 116 ha of agriculture are decreased and it is converted into built-up, plantation, scrub and water body in T5.
- In T5 201 ha of agriculture are increased from built-up, scrub land, plantation and waterbody of T4.
- The additional agriculture are coming from waterbody in T5 represents seasonal agriculture.

# Conclusion

1. DPR of the project is uploaded on to Bhuvan Portal.
2. The LULC 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.
3. There is an increase of 61 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
4. There is an increase of 20, 0.5 & 84 Hectares From T2-T3, T3-T4 & T4-T5 respectively and there is a decrease of 7 & 116 hectares from T0-T1 & T1-T2 and overall decrease of 18 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a increase of 282 Hectares in plantation area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 344 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (28) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (37) verified from the portal.