Disrupting “Results” using remote sensing technology in Small Scale Irrigation Projects: West Bengal

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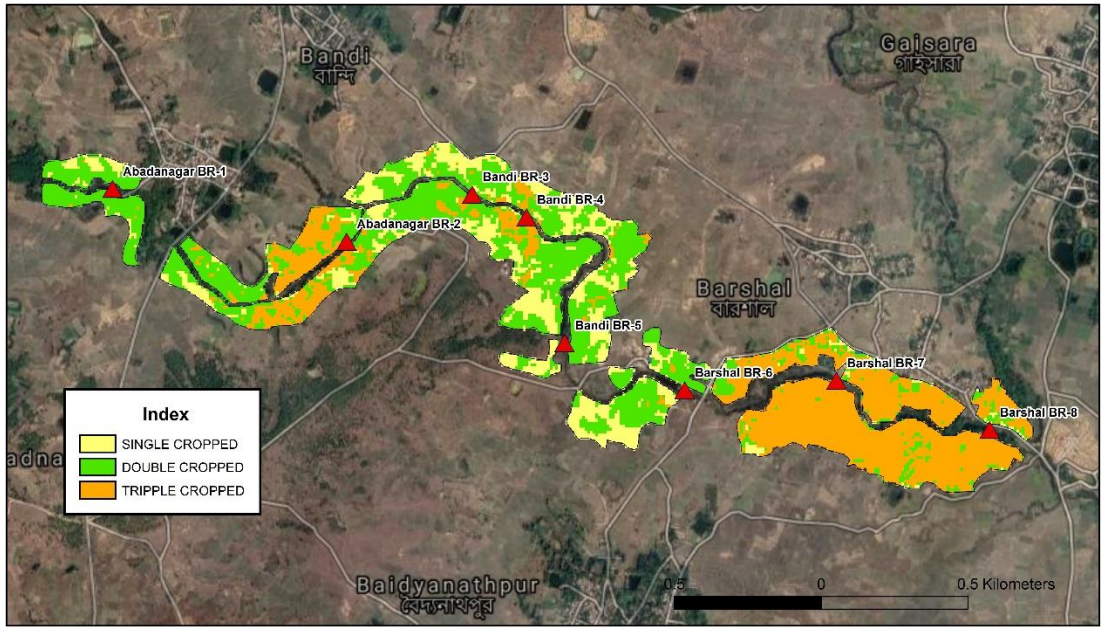


“Disrupting” Results: A Quick Overview of the Rapidly-Evolving Future

RMES
Results Peer Learning Series

THE WORLD BANK
IBRD • IDA | WORLD BANK GROUP
Operations Policy & Country Services

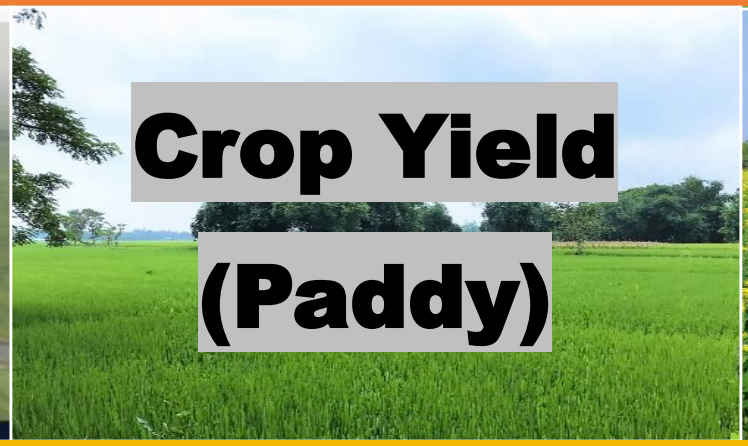
IFC International Finance Corporation
WORLD BANK GROUP
Creating Markets, Creating Opportunities

MIGA Multilateral Investment Guarantee Agency
WORLD BANK GROUP

IEG WORLD BANK GROUP
World Bank • IFC • MIGA

Results

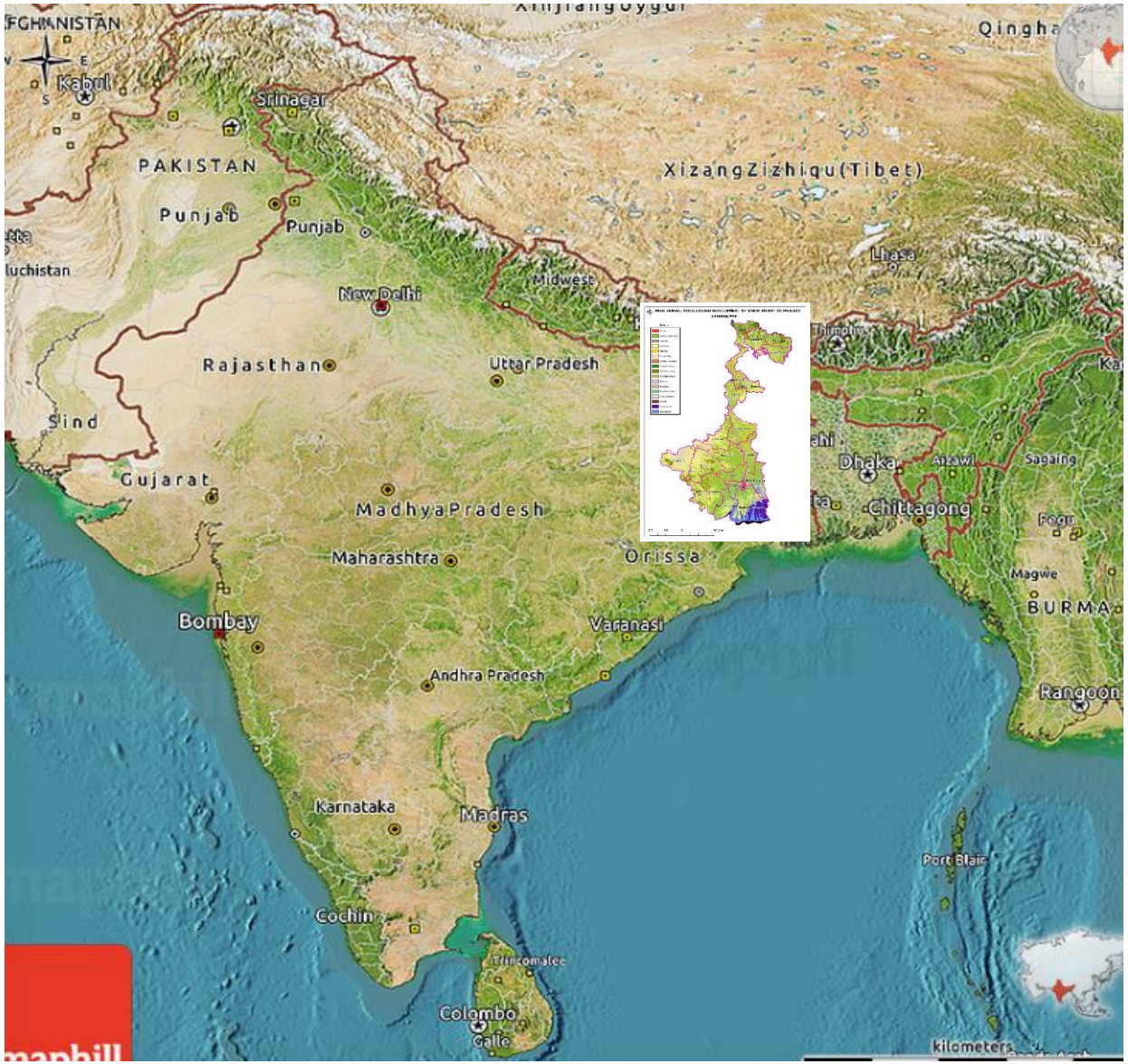
Agricultural Production

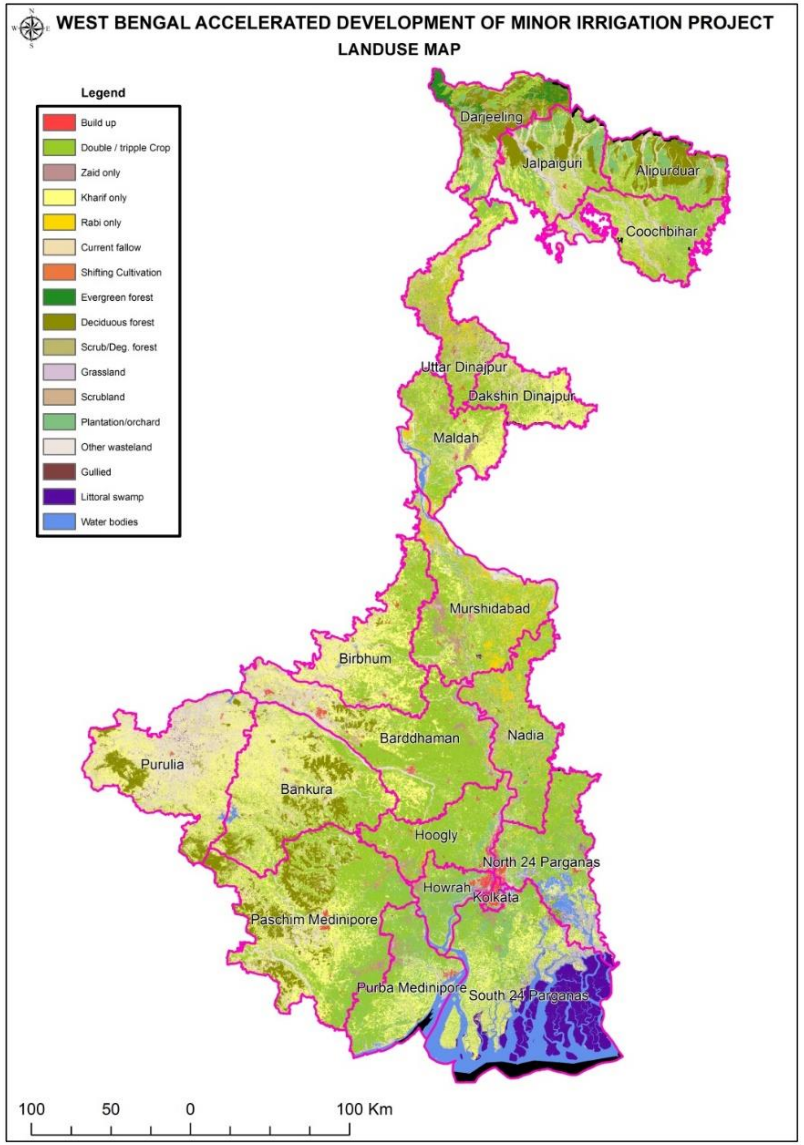


Real time farm level monitoring (<0.1 ha)

WORLD BANK GROUP
Water

India: West Bengal





Project Objective

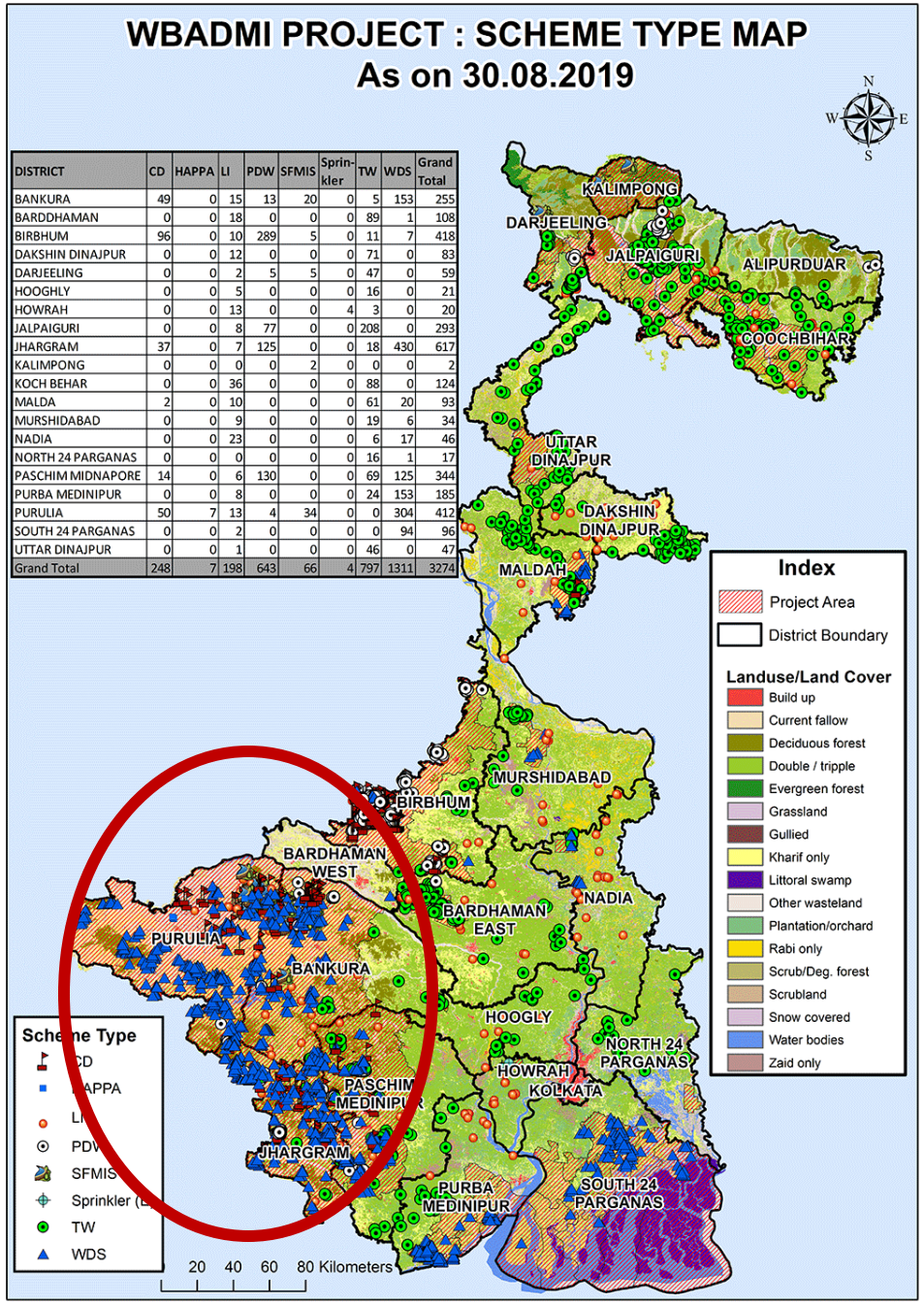
(2011-2019, USD 153 M)

To enhance agricultural production:

- 75,000 ha rainfed area
- 100,000 small and marginal farmers

Small scale irrigation systems (2 -25 ha)

https://www.wbadmip.org/



DISTRICT	CD	HAPPA	LI	PDW	SFMIS	Sprin-kler	TW	WDS	Grand Total
BANKURA	49	0	15	13	20	0	5	153	255
BARDDHAMAN	0	0	18	0	0	0	89	1	108
BIRBHUM	96	0	10	289	5	0	11	7	418
DAKSHIN DINAJPUR	0	0	12	0	0	0	71	0	83
DARJEELING	0	0	2	5	5	0	47	0	59
HOOGHLY	0	0	5	0	0	0	16	0	21
HOWRAH	0	0	13	0	0	4	3	0	20
JALPAIGURI	0	0	8	77	0	0	208	0	293
JHARGRAM	37	0	7	125	0	0	18	430	617
KALIMPONG	0	0	0	0	2	0	0	0	2
KOCH BEHAR	0	0	36	0	0	0	88	0	124
MALDA	2	0	10	0	0	0	61	20	93
MURSHIDABAD	0	0	9	0	0	0	19	6	34
NADIA	0	0	23	0	0	0	6	17	46
NORTH 24 PARGANAS	0	0	0	0	0	0	16	1	17
PASCHIM MIDNAPORE	14	0	6	130	0	0	69	125	344
PURBA MEDINIPUR	0	0	8	0	0	0	24	153	185
PURULIA	50	7	13	4	34	0	0	304	412
SOUTH 24 PARGANAS	0	0	2	0	0	0	0	94	96
UTTAR DINAJPUR	0	0	1	0	0	0	46	0	47
Grand Total	248	7	198	643	66	4	797	1311	3274

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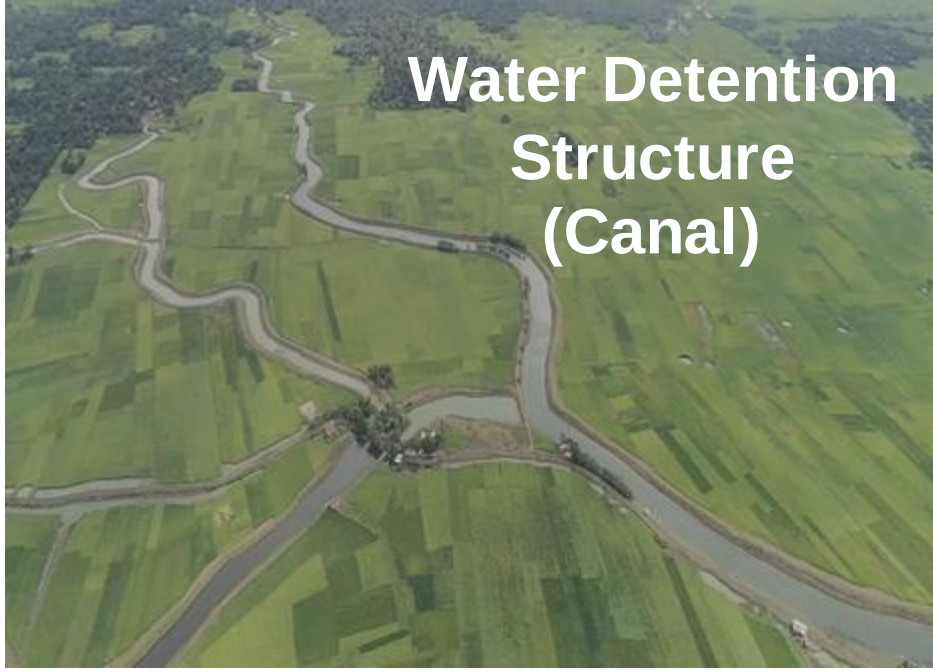
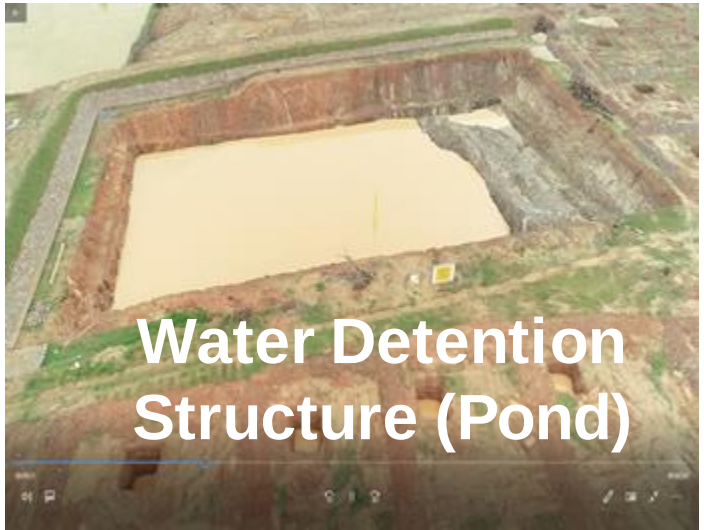
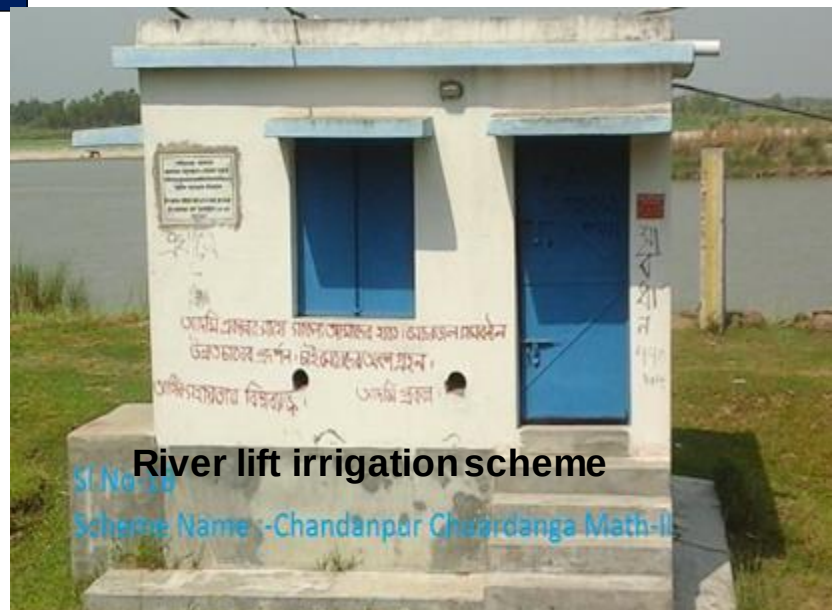
Water



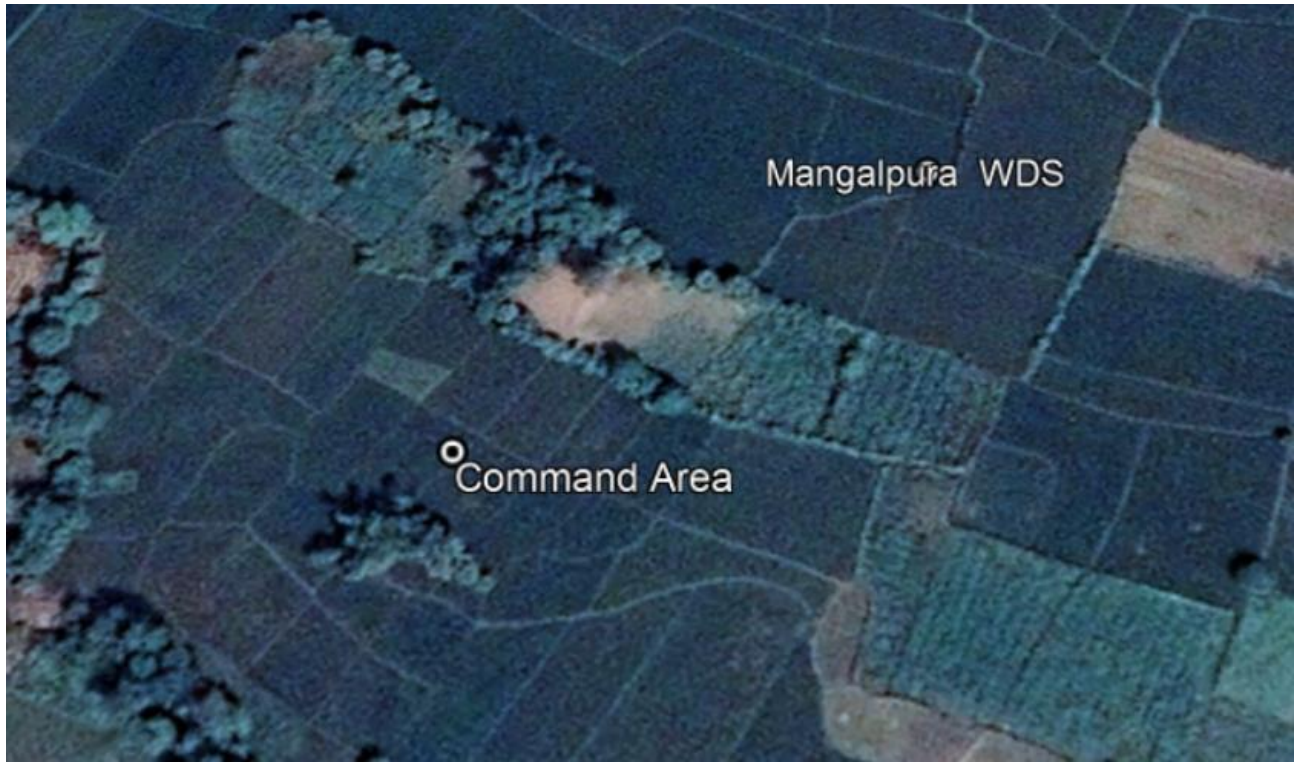
Irrigation Schemes





Planning: Rainfed area

October 2018: Monsoon crop



Jan 2016: No crop during Rabi or summer season in April

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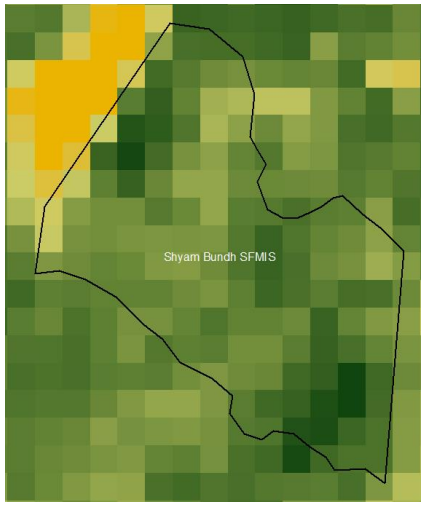
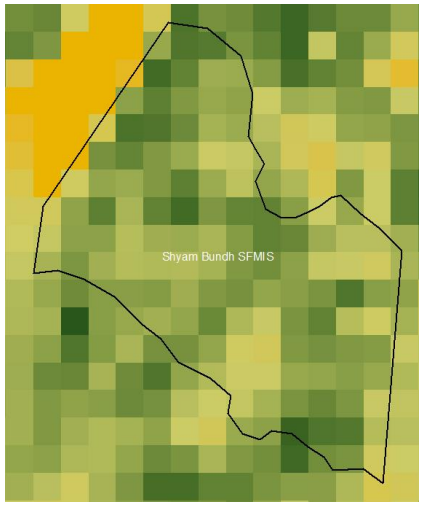
Water

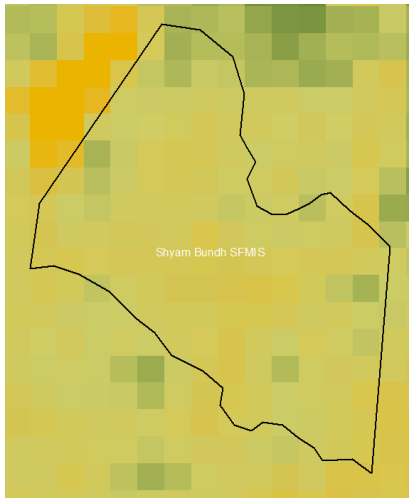
Shyam Bundh (SFMIS) – Kharif NDVI



23 Oct 2013



22 Oct 2014



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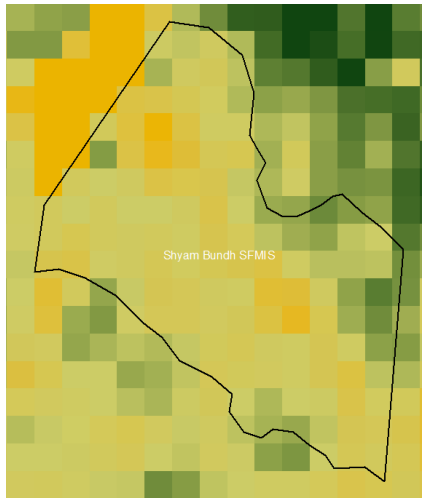
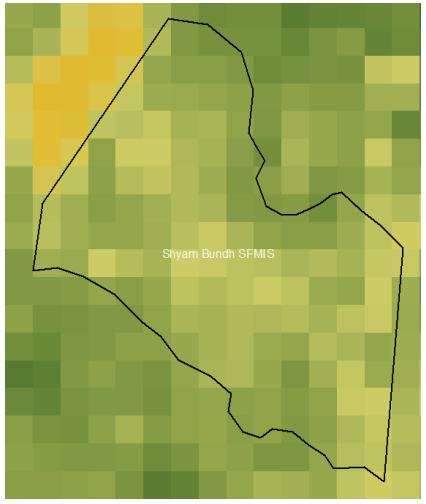
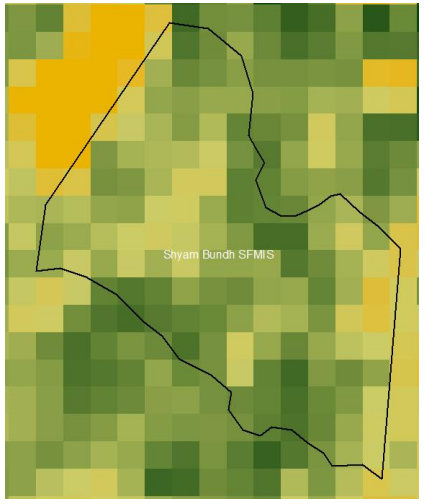


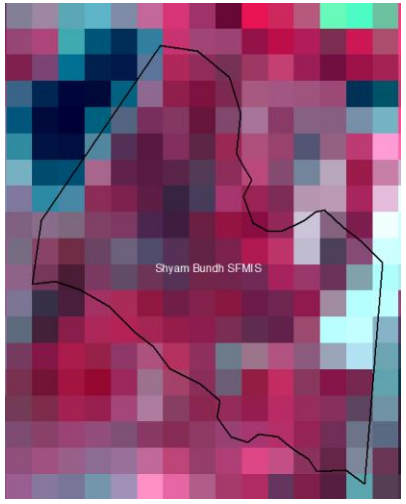
11 Oct 2016



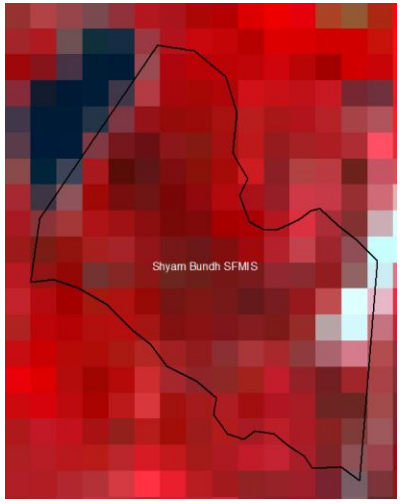
12 Sep 2017



01 Oct 2018



12 Sep 2017 -FCC



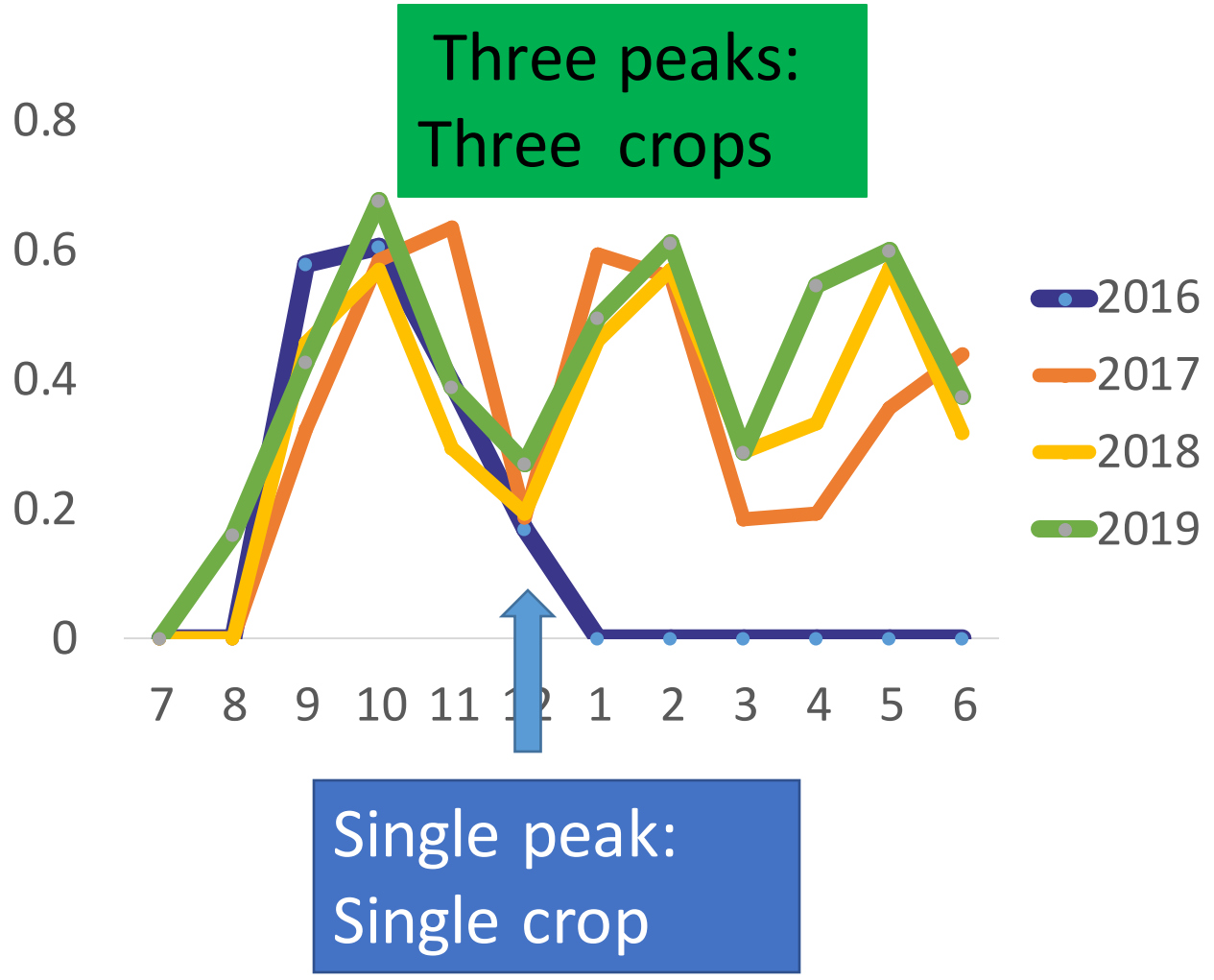
01 Oct 2018 -FCC

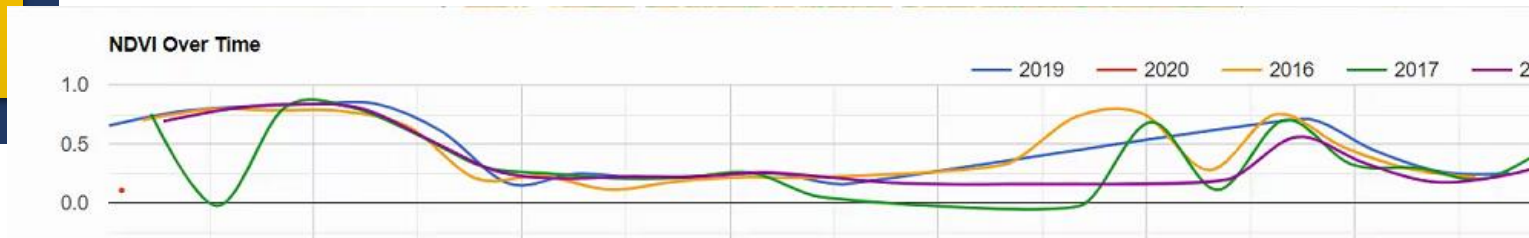
WORLD BANK GROUP
Water

Rainfed area: Cropping intensity

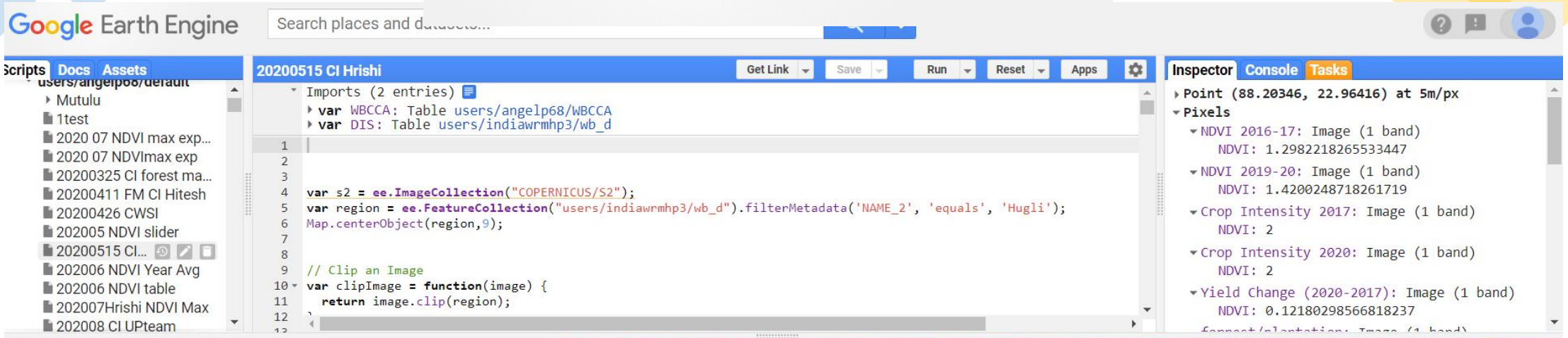
No of peaks represent number of crops in a year.

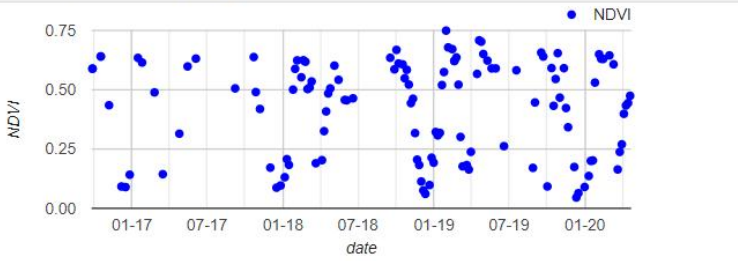
Single/ Multiple crops

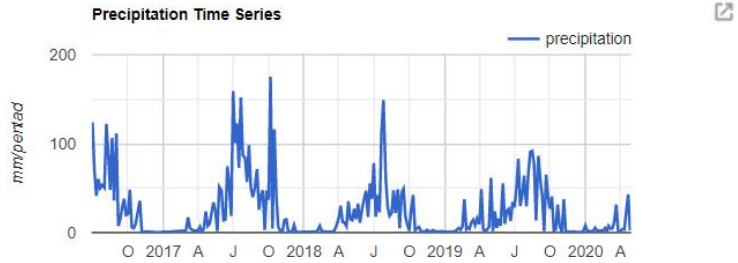


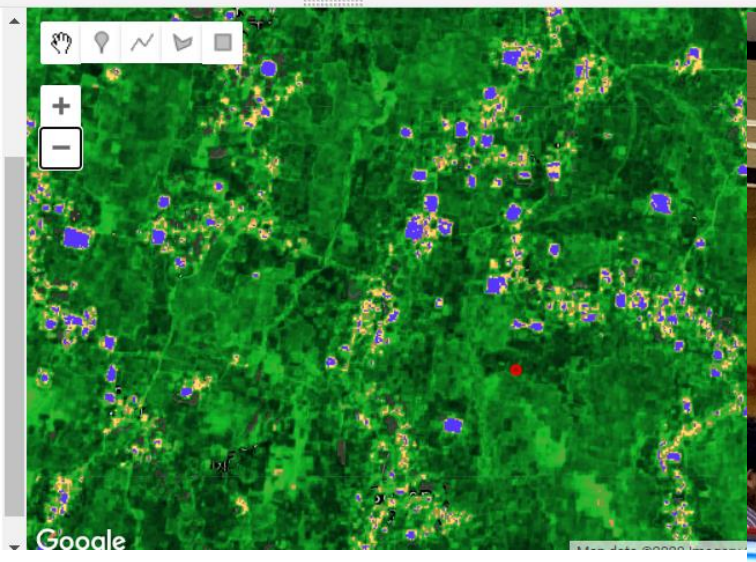


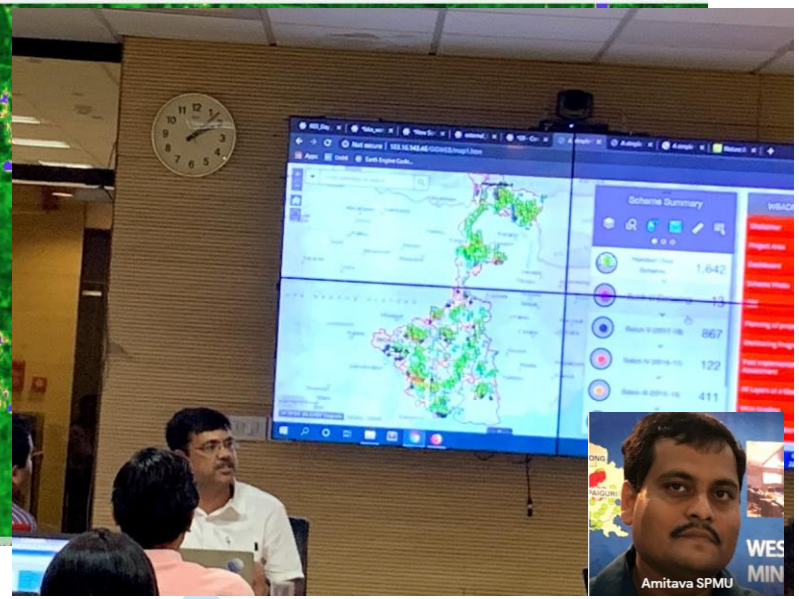
Google Earth Engine



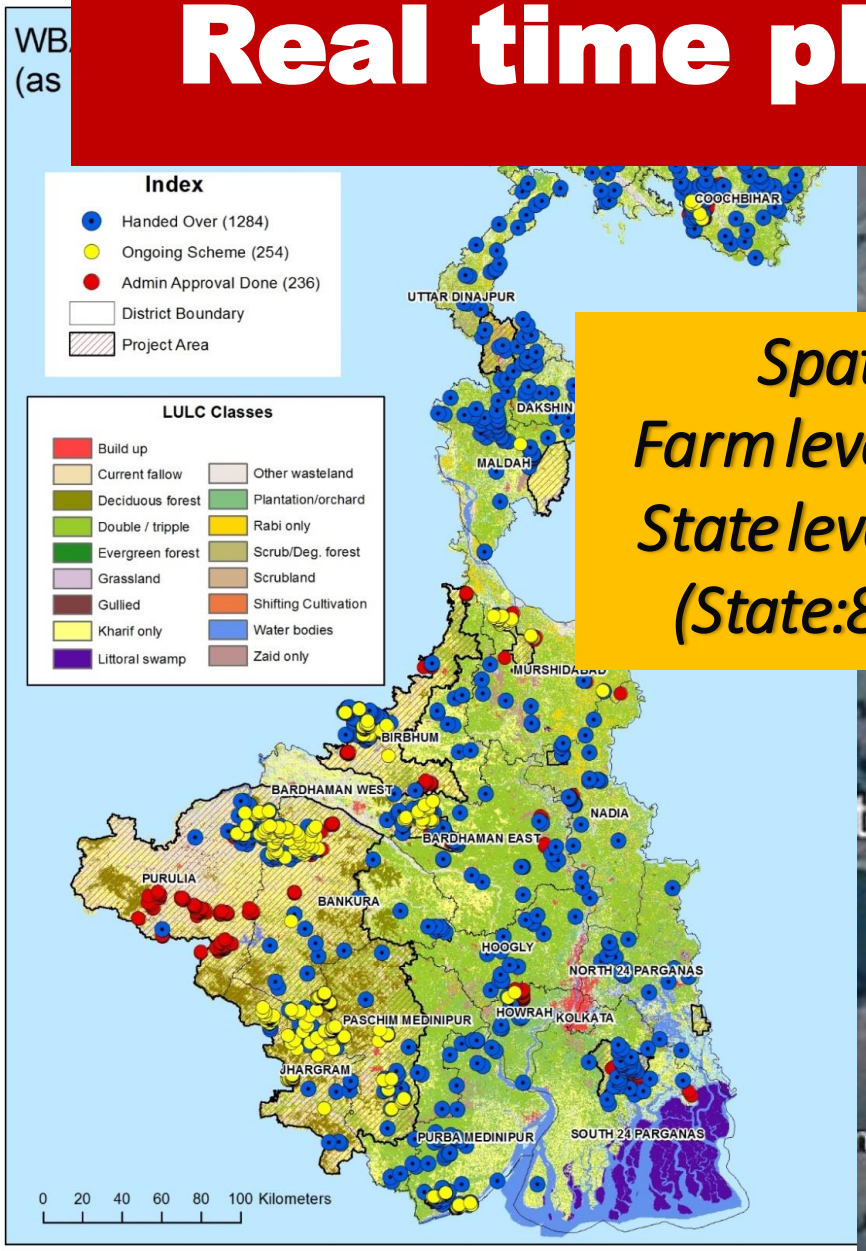




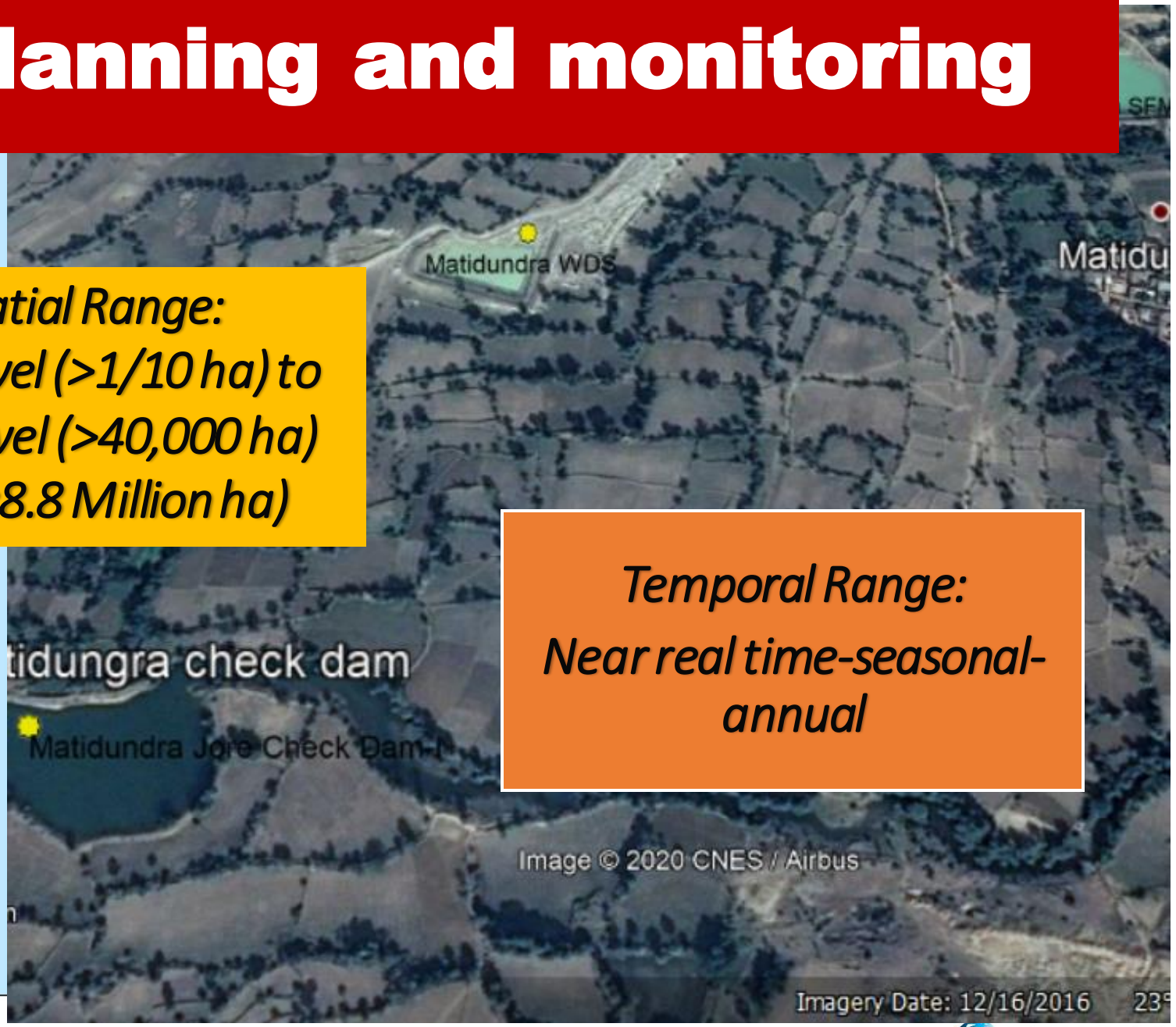




Real time planning and monitoring



Spatial Range:
Farm level (>1/10 ha) to State level (>40,000 ha) (State:8.8 Million ha)



Temporal Range:
Near real time-seasonal-annual

WORLD BANK GROUP Water

Project Planning:

Transparency in targeting

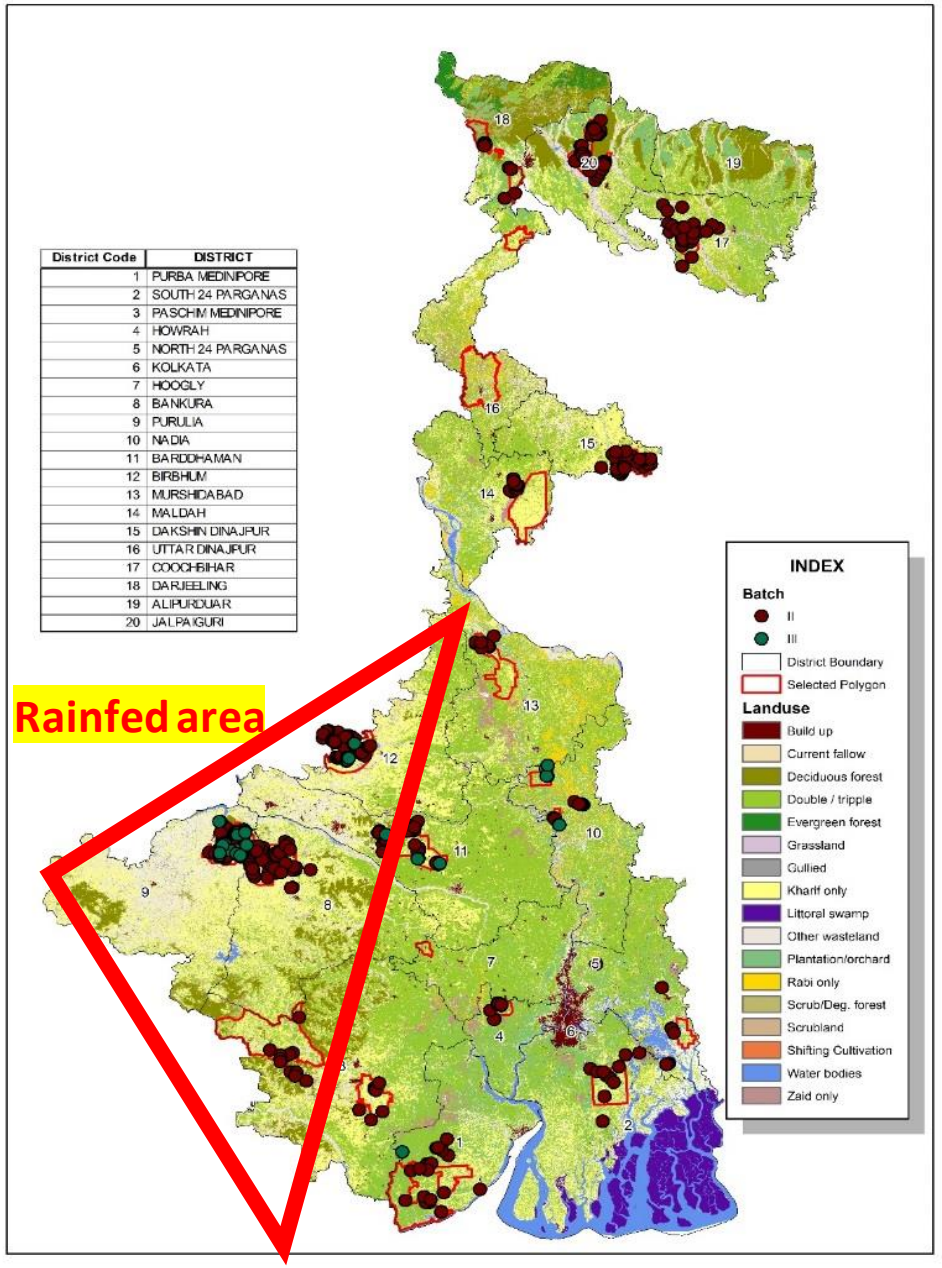
Elite capturing

↓

Evidence based

↓

Trust, Confidence



http://103.16.143.46/GISWEB/map1.htm

WORLD BANK GROUP
Water

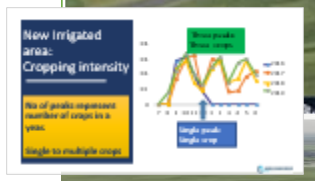
Results

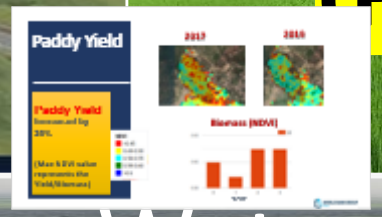
Agricultural Production

New Area with irrigation

Crop Yield (Paddy)

Crop Diversification





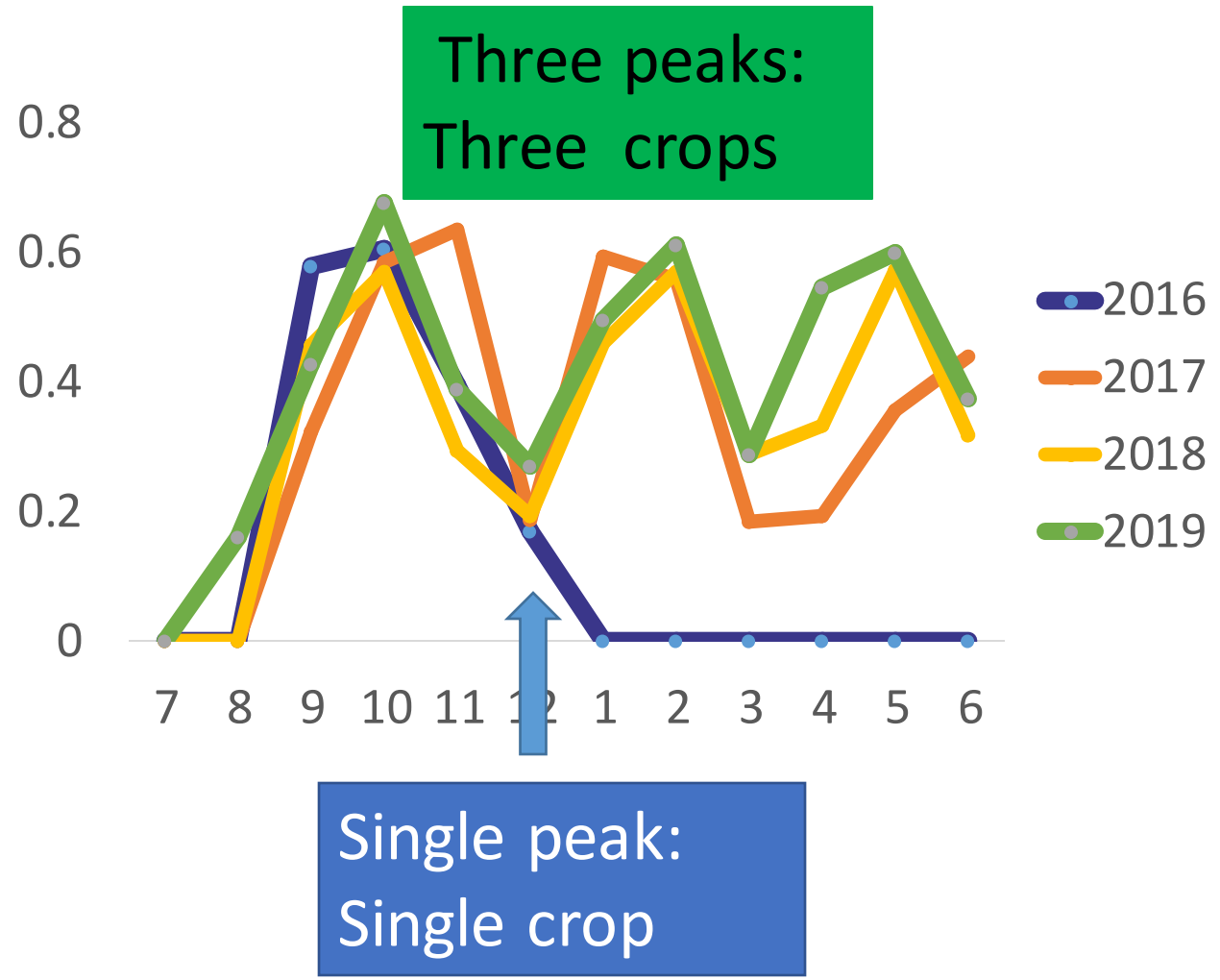
Water availability

WORLD BANK GROUP
Water

New Irrigated area: Cropping intensity

No of peaks represent number of crops in a year.

Single to multiple crops



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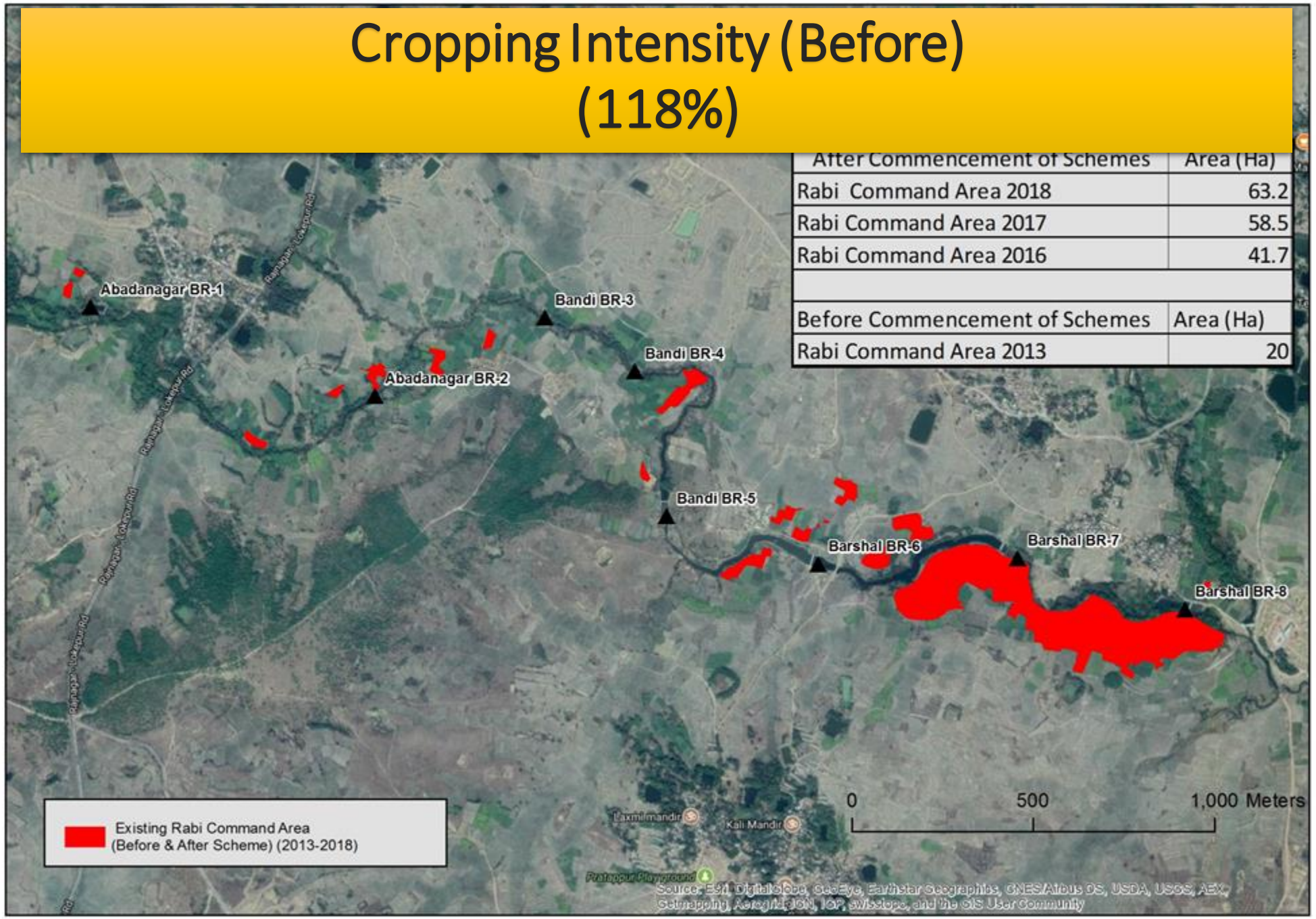
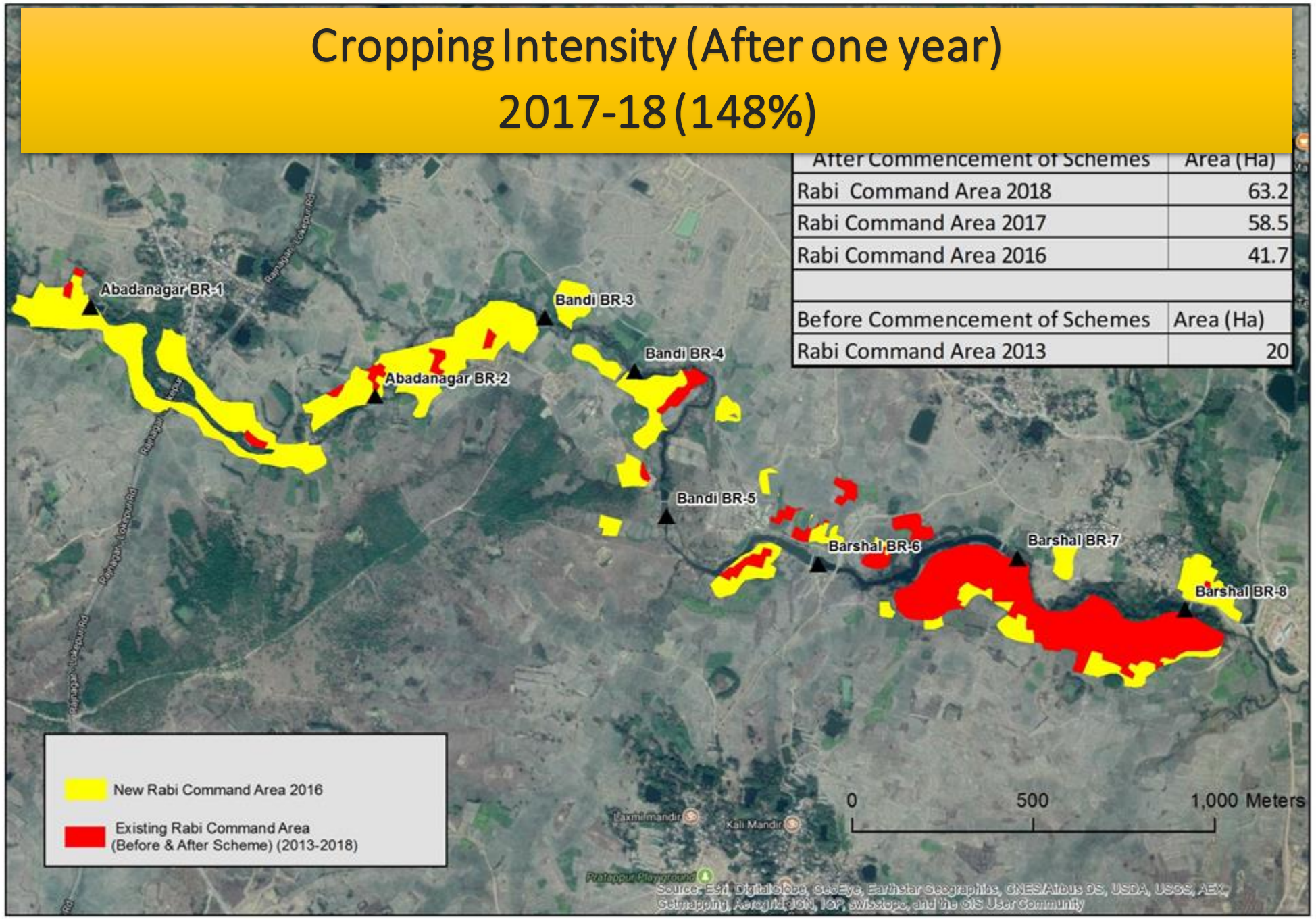
Water

Cropping Intensity (Before) (118%)



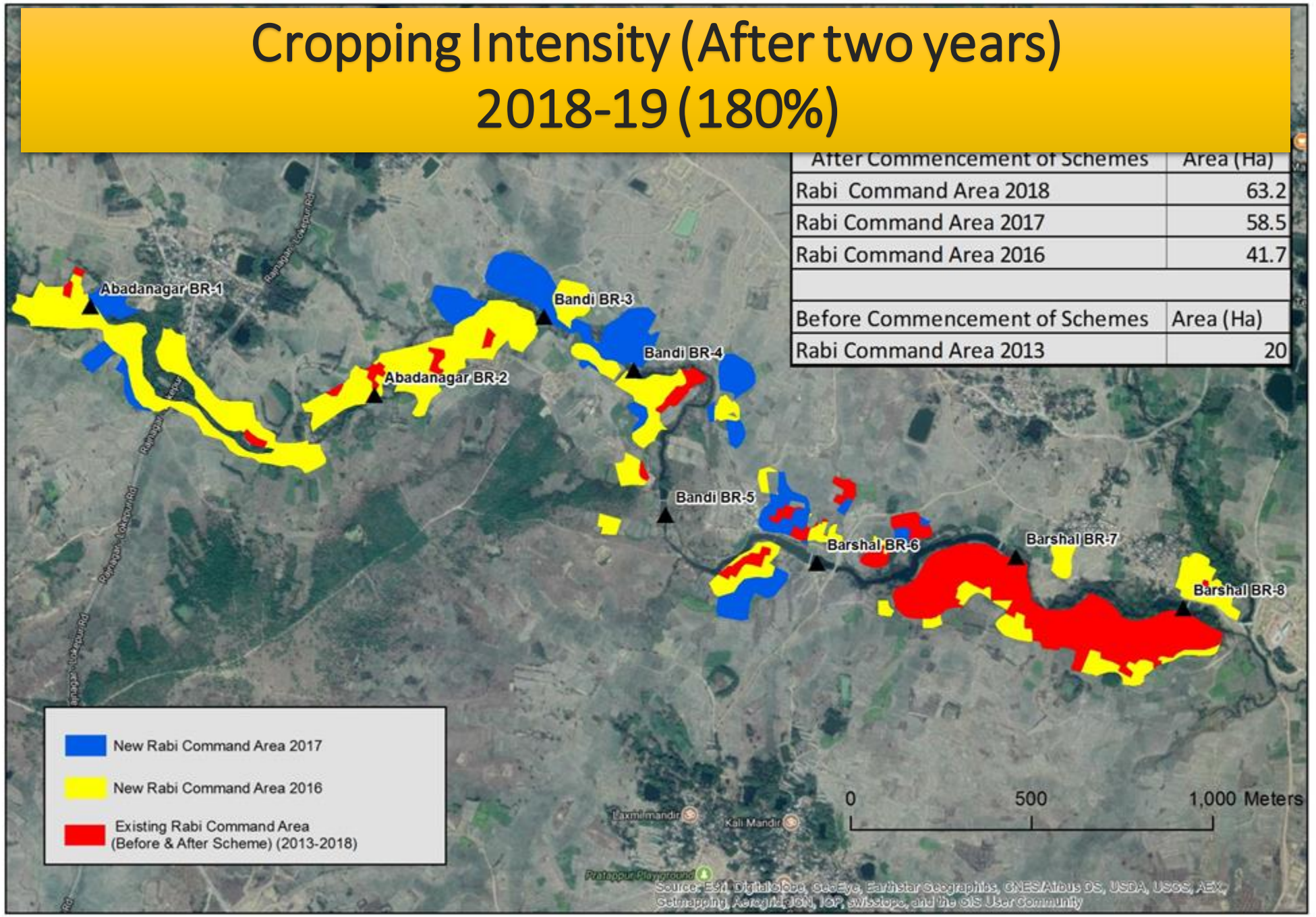
After Commencement of Schemes	Area (Ha)
Rabi Command Area 2018	63.2
Rabi Command Area 2017	58.5
Rabi Command Area 2016	41.7
Before Commencement of Schemes	Area (Ha)
Rabi Command Area 2013	20

Cropping Intensity (After one year)
2017-18 (148%)



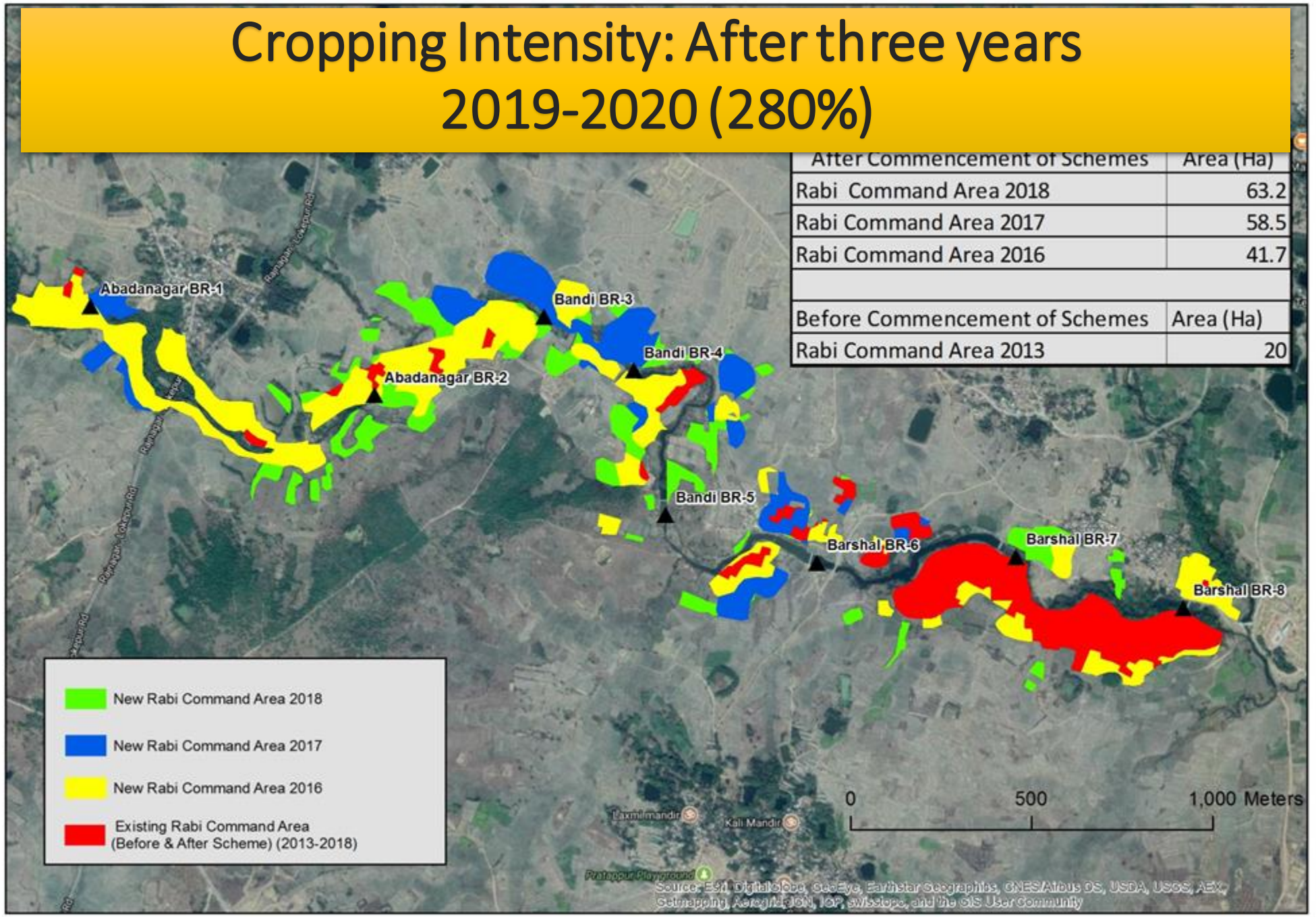
After Commencement of Schemes	Area (Ha)
Rabi Command Area 2018	63.2
Rabi Command Area 2017	58.5
Rabi Command Area 2016	41.7
Before Commencement of Schemes	Area (Ha)
Rabi Command Area 2013	20

Cropping Intensity (After two years)
2018-19 (180%)



After Commencement of Schemes	Area (Ha)
Rabi Command Area 2018	63.2
Rabi Command Area 2017	58.5
Rabi Command Area 2016	41.7
Before Commencement of Schemes	Area (Ha)
Rabi Command Area 2013	20

Cropping Intensity: After three years 2019-2020 (280%)

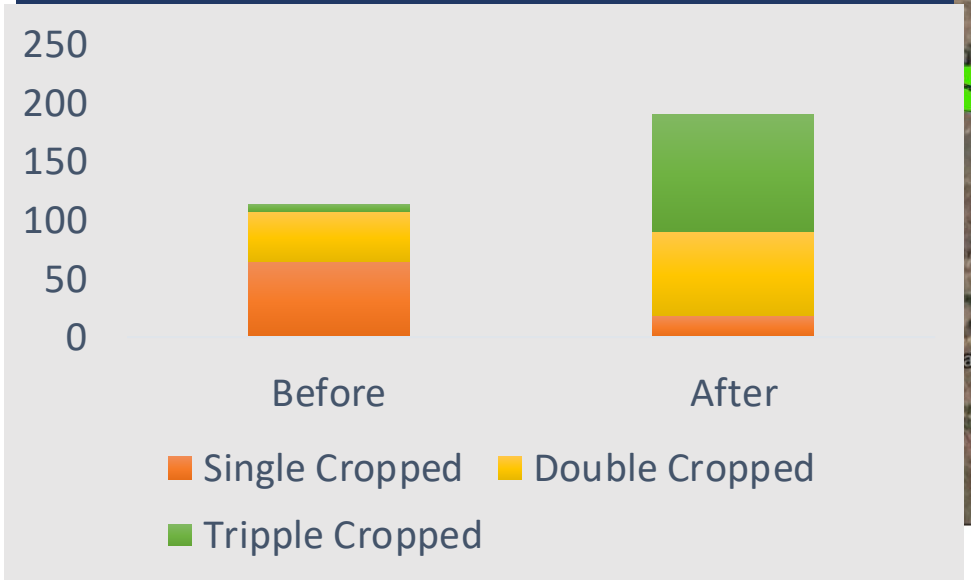


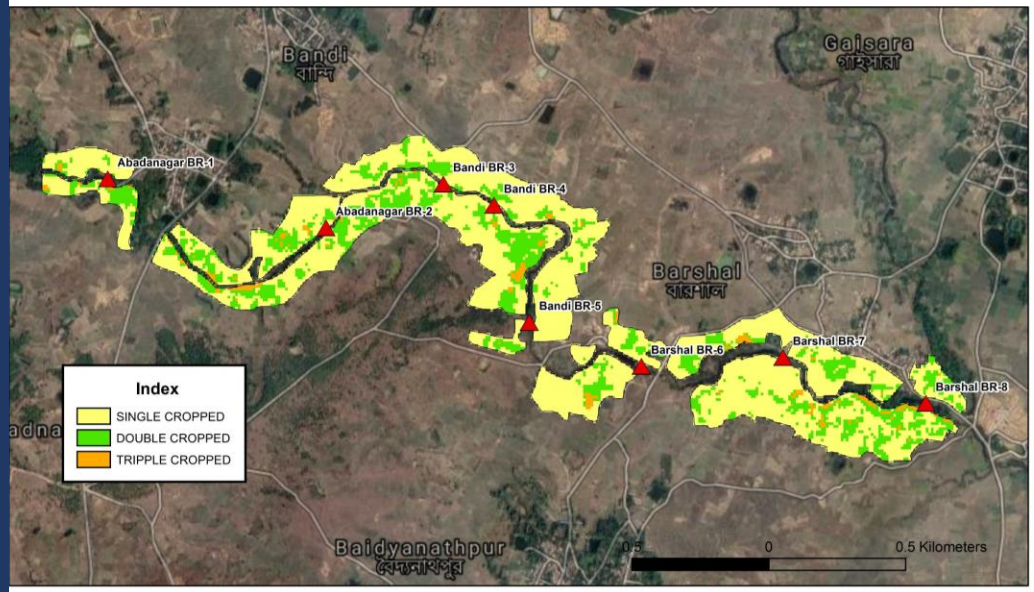
After Commencement of Schemes	Area (Ha)
Rabi Command Area 2018	63.2
Rabi Command Area 2017	58.5
Rabi Command Area 2016	41.7
Before Commencement of Schemes	Area (Ha)
Rabi Command Area 2013	20

D BANK GROUP

Cropping intensity:

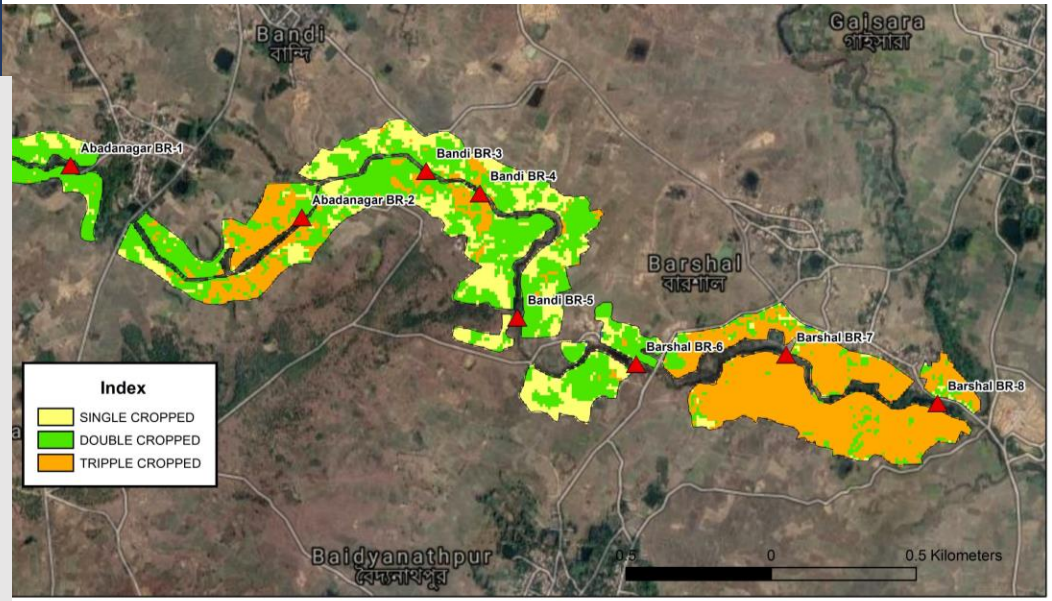
Increased from 118% to 218%,





Cropping intensity

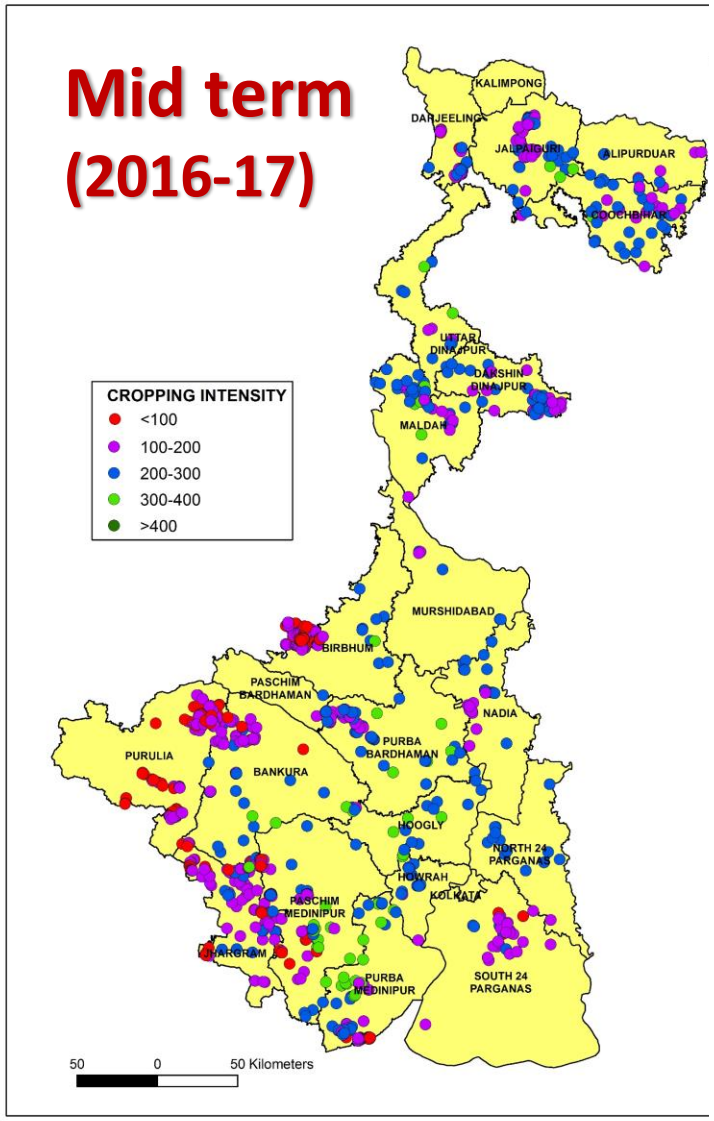
2017-18 (118%)

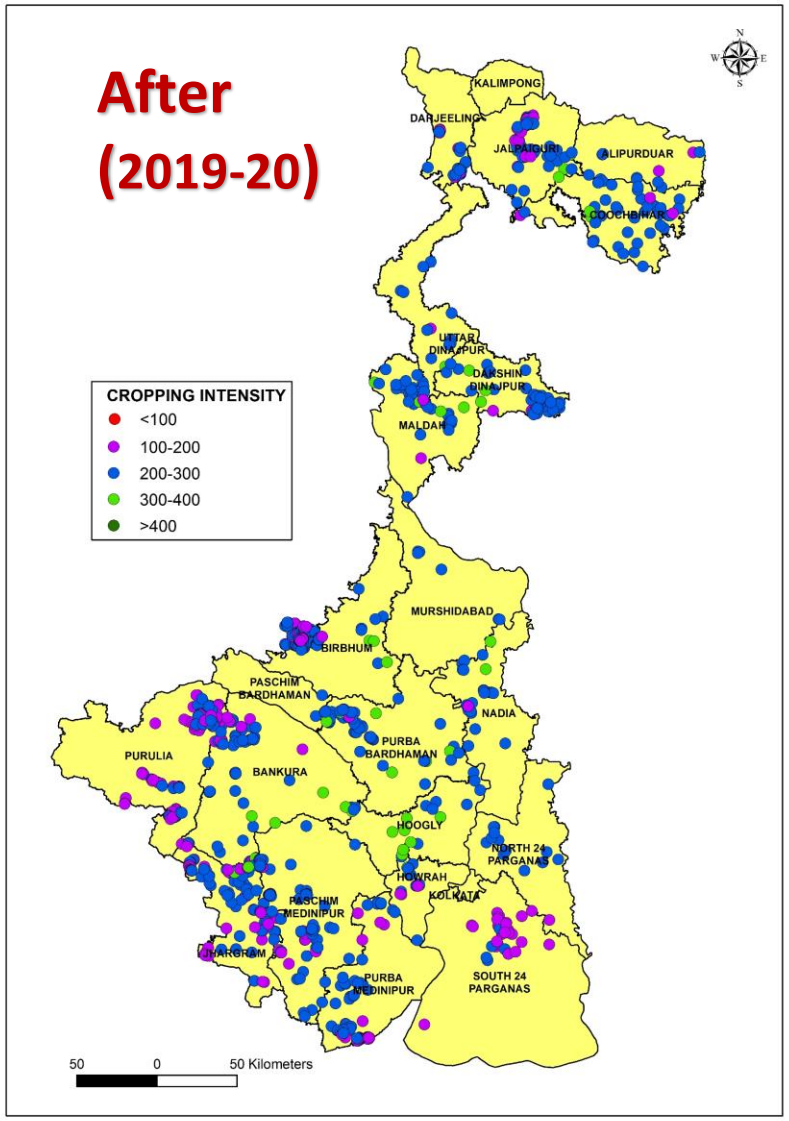


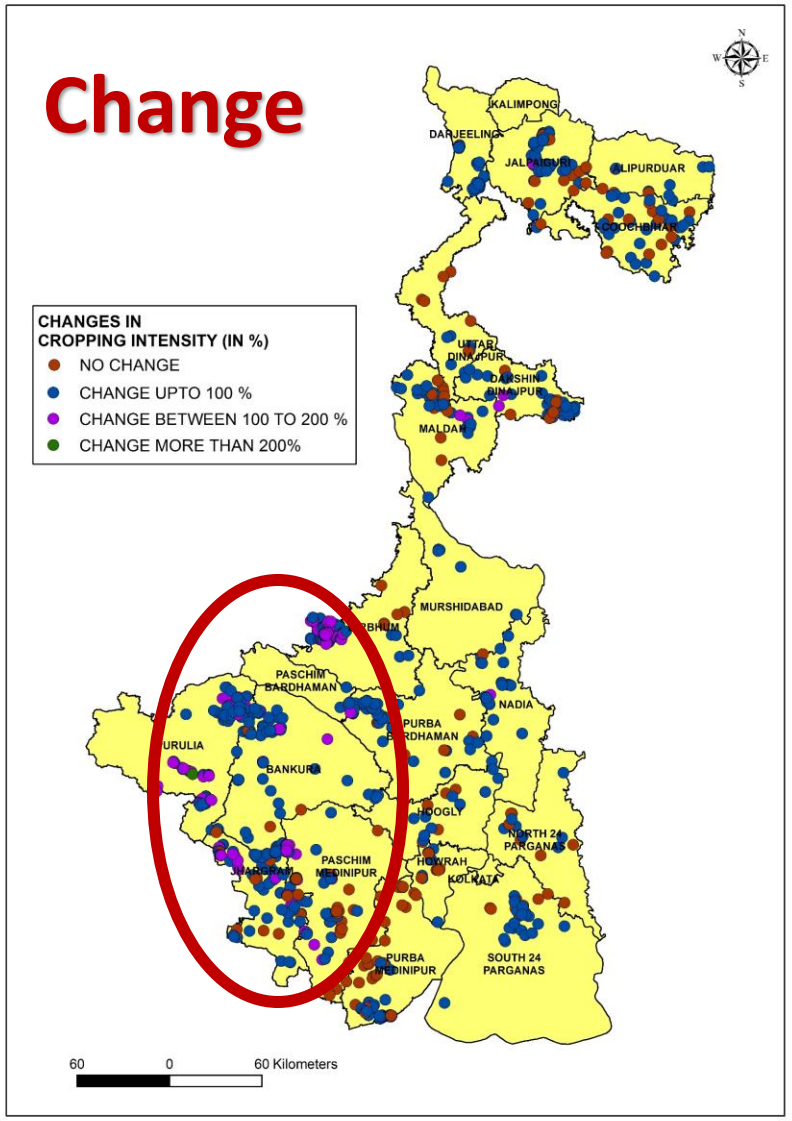
2019-20 (218%)

WORLD BANK GROUP
Water

Cropping Intensity 110-190%





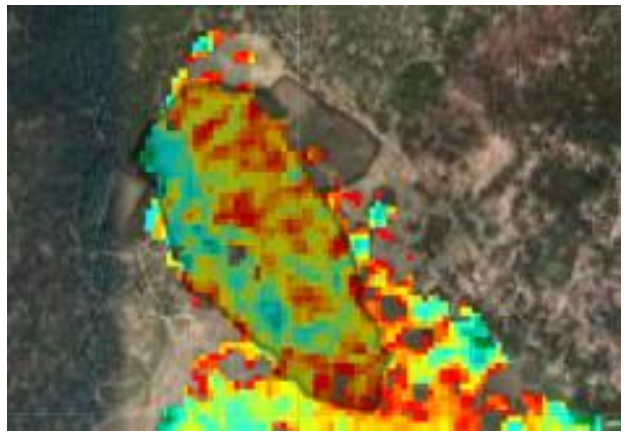


P

Paddy Yield

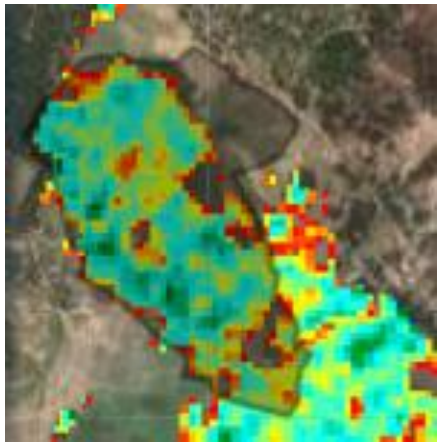
Paddy Yield increased by 20%

(Max NDVI value represents the Yield/Biomass)

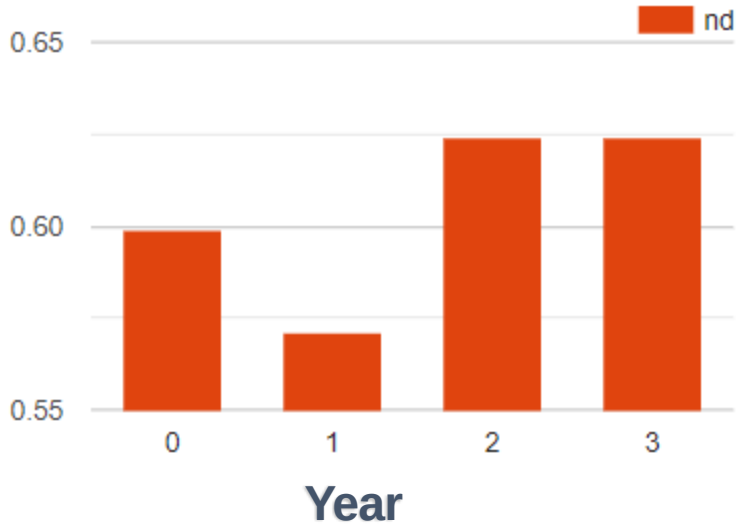


2017

2019



Biomass (NDVI)



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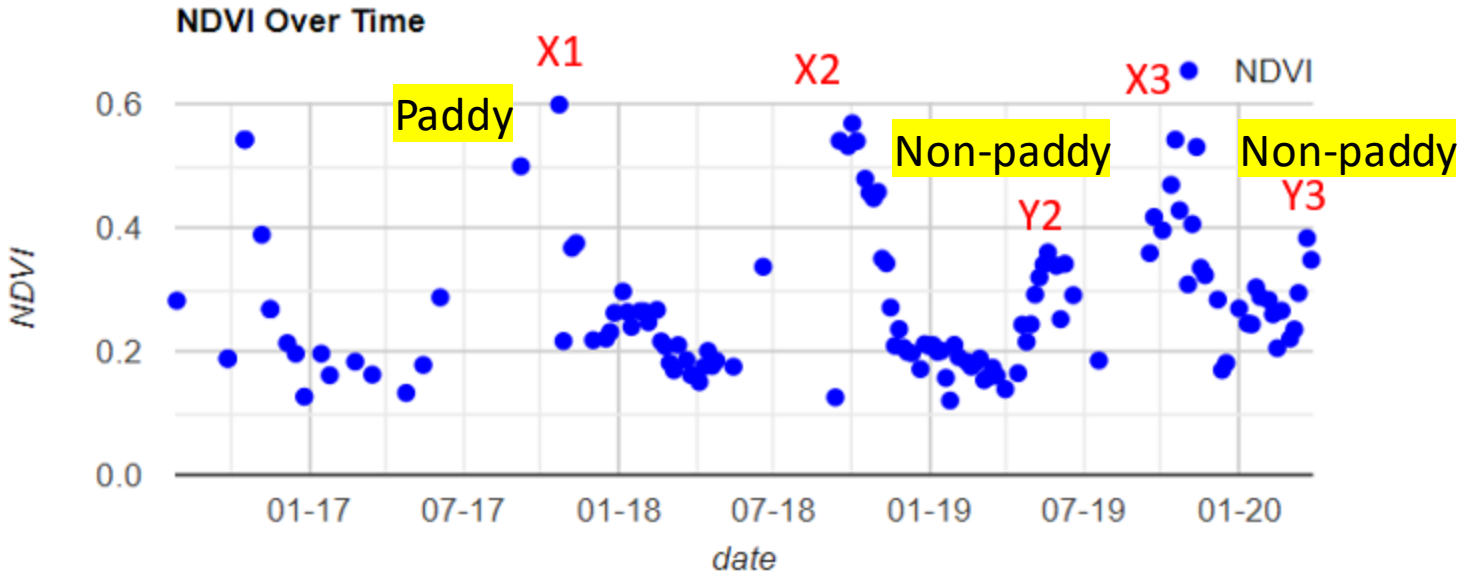
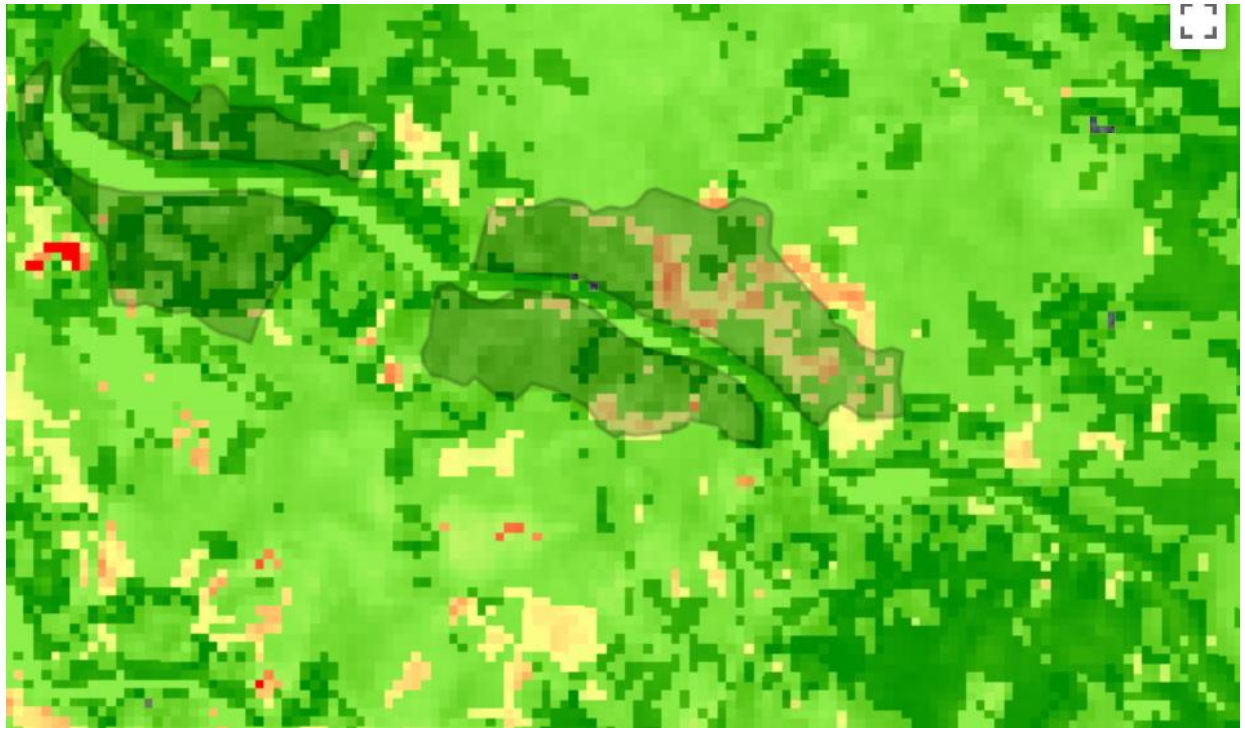
Water

Crop Diversification

Change in NDVI (from >0.6 to 0.40-0.50)





WORLD BANK GROUP Water

Monitoring:
Earthwork in ponds/tanks

Use of DGPS and 3D software to map pre-post ground levels for estimating earthwork in ponds.

DGPS provides elevation and position to map the ground levels

WORLD BANK GROUP
Water

Monitoring structures:

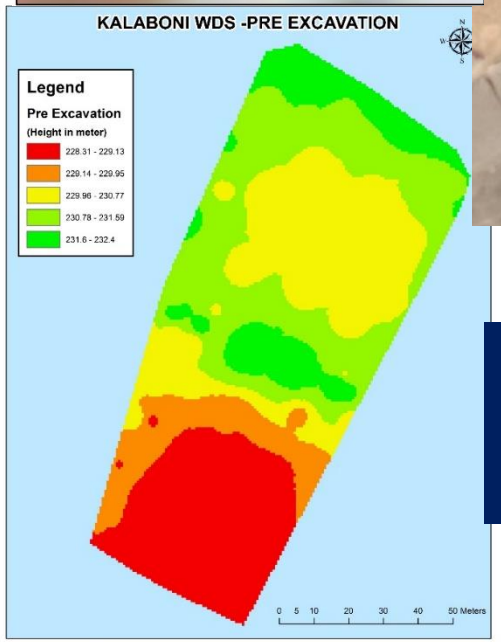
Earthwork in ponds/tanks

Depth of excavation is ranging from 1-3 m

Before

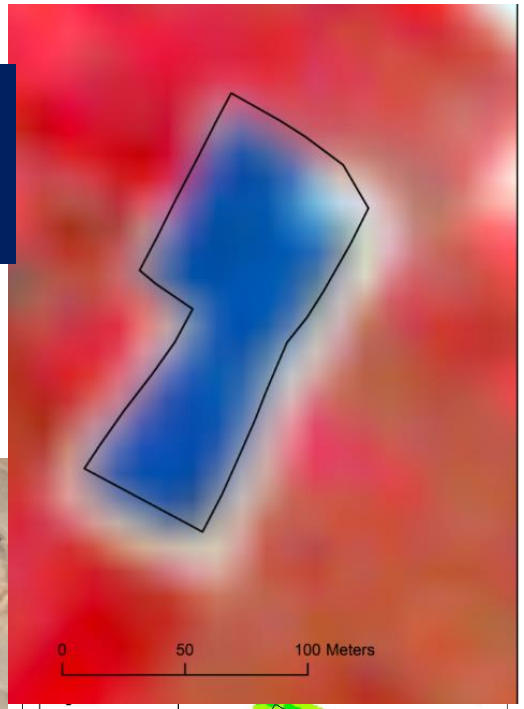
Remote Sensing

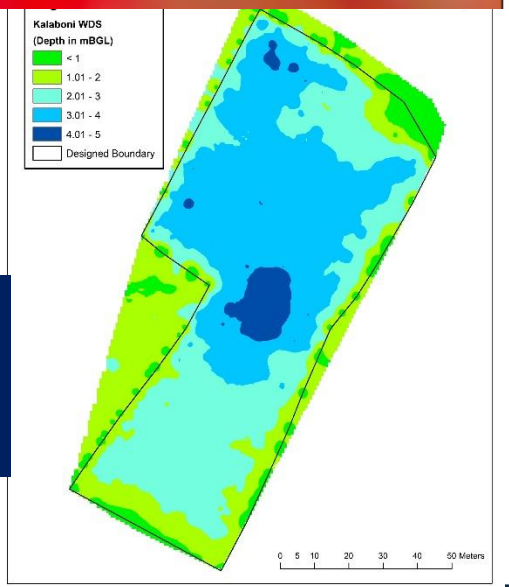
16 Dec 2010



Site survey

After

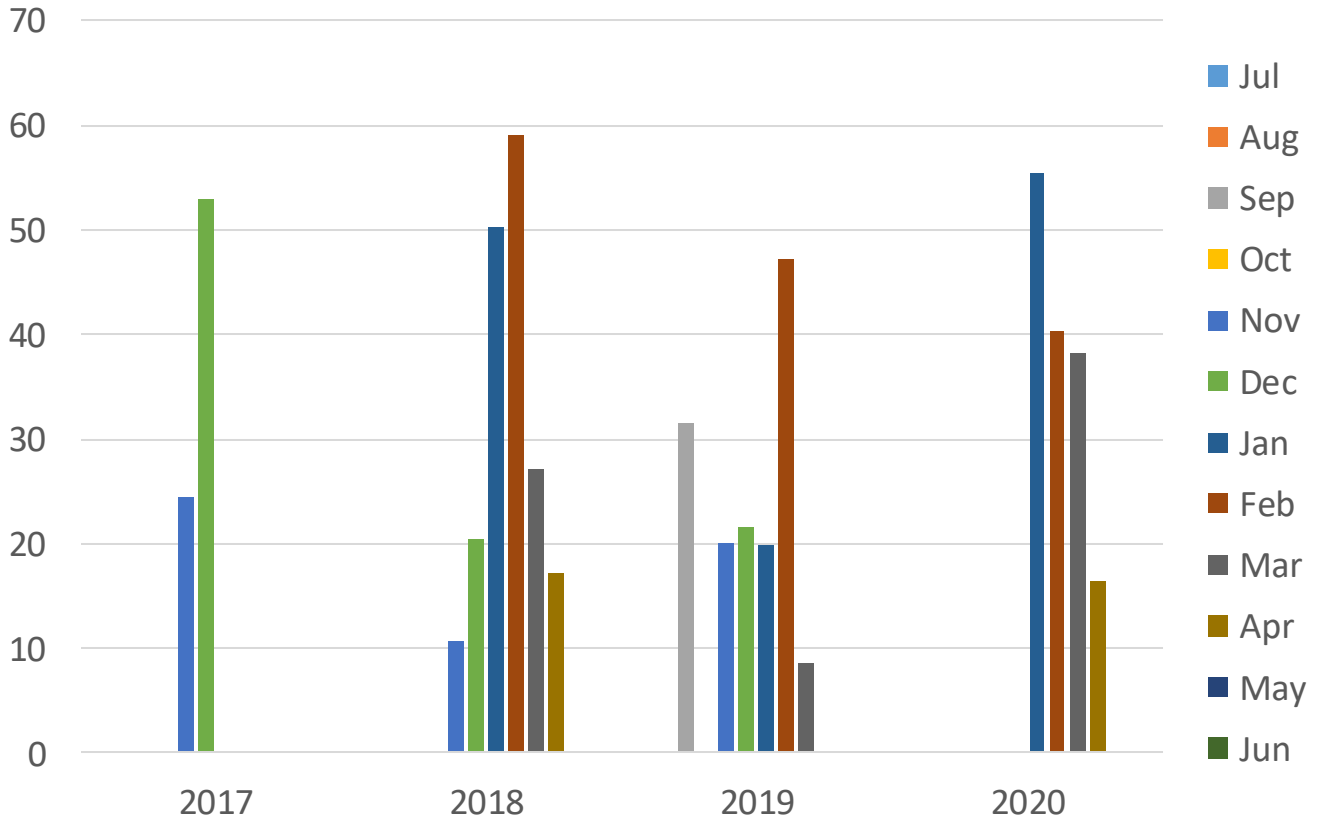




Monitoring structures:

Water Spread Area (NDWI)

Monthly Water Availability



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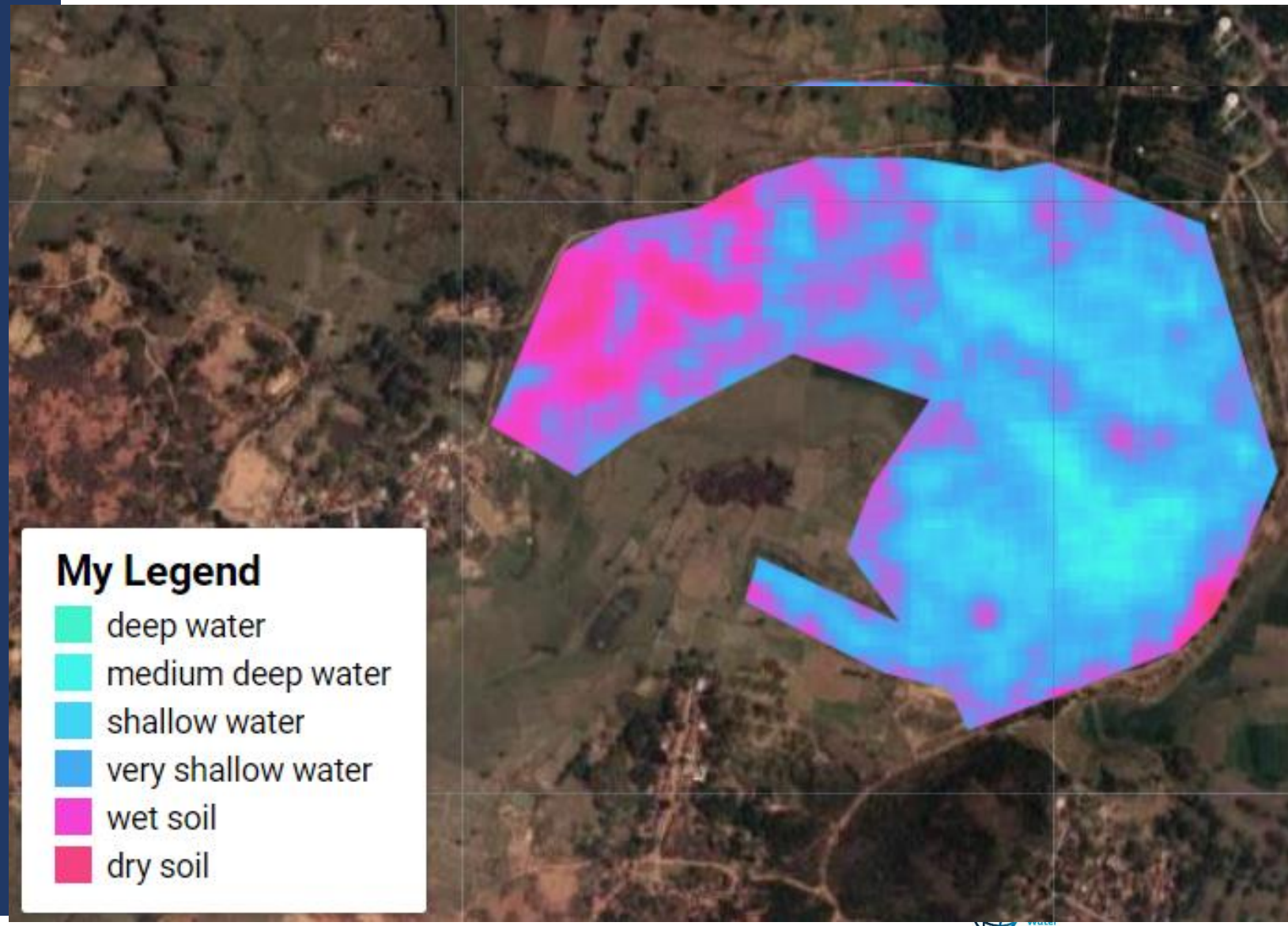
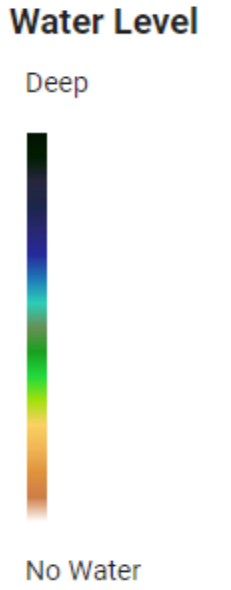
Water

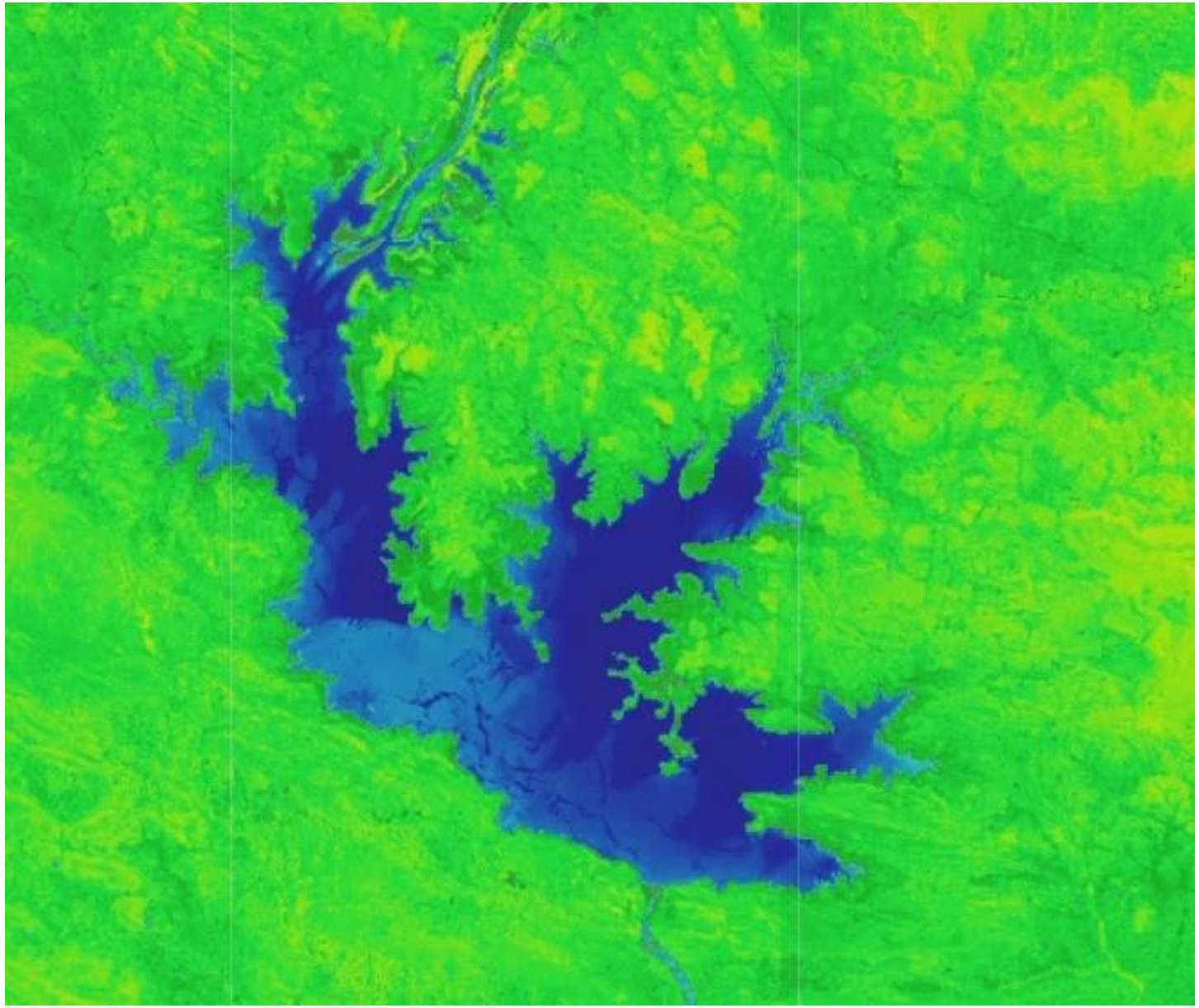
Monitoring:
Water pattern in ponds/tanks

Based on Remote sensing (Sentinal SAR)



WATERBODY PATTERN BRAHMANI RIVER ORISSA



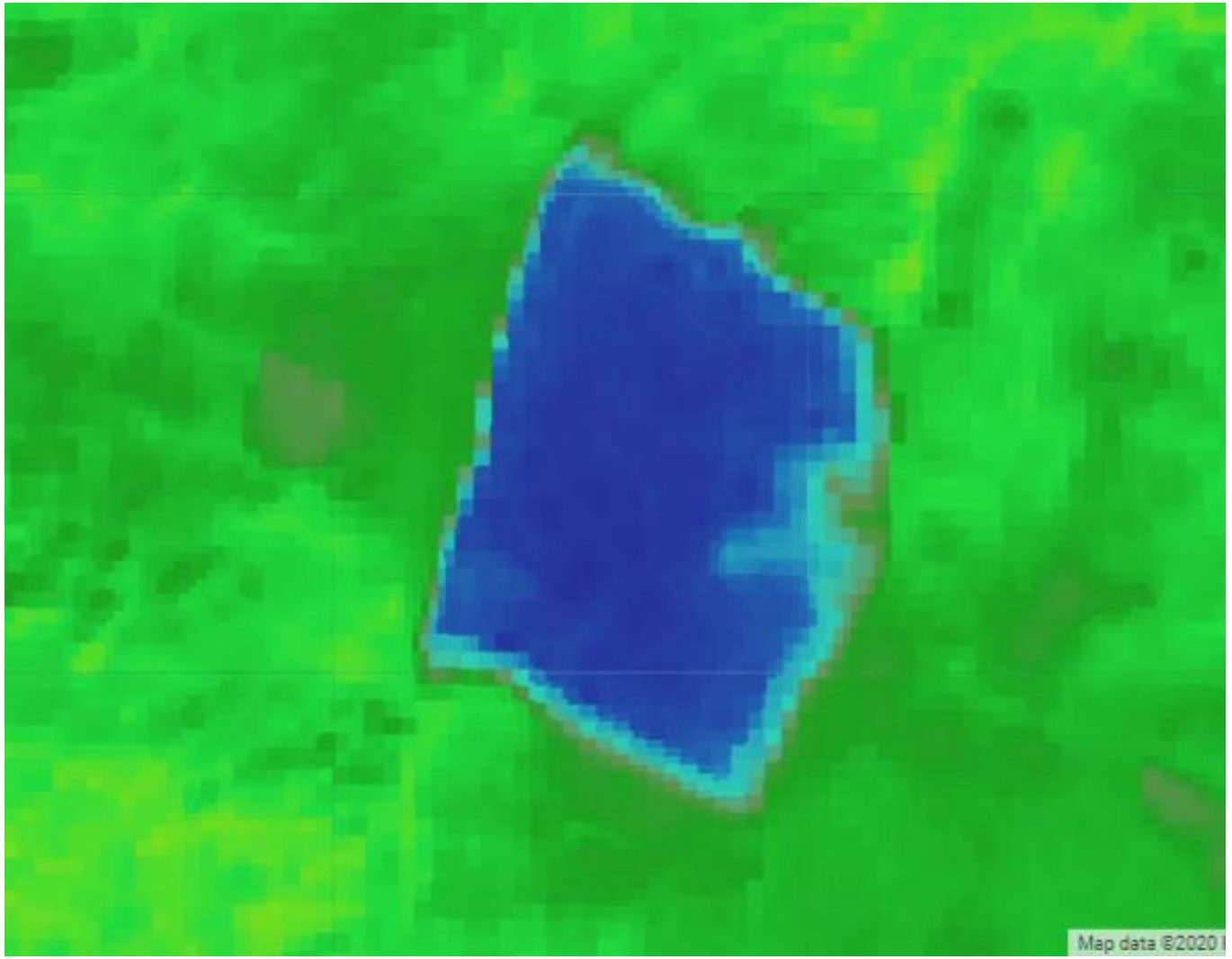


WATERBODY PATTERN of a Pond

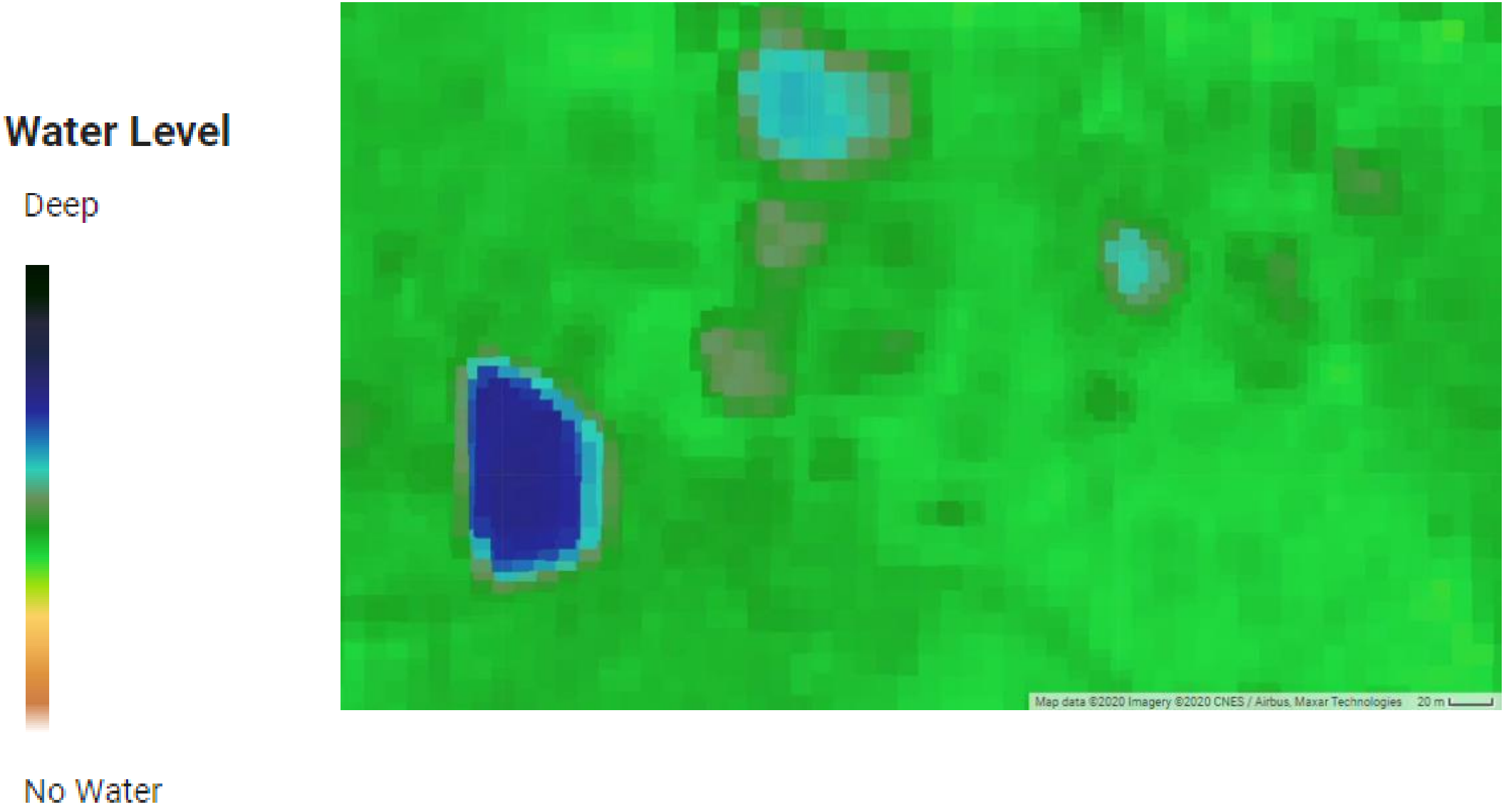
Water Level

Deep

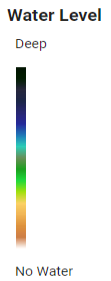
No Water

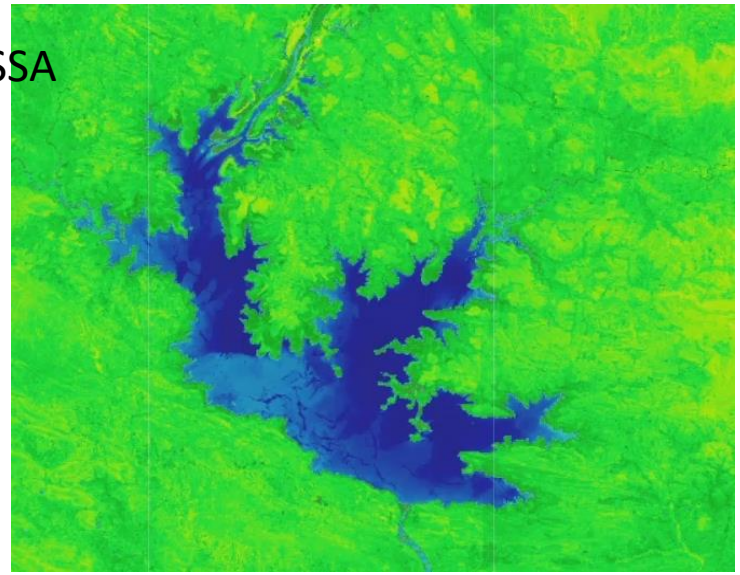


WATERBODY PATTERN of a Pond

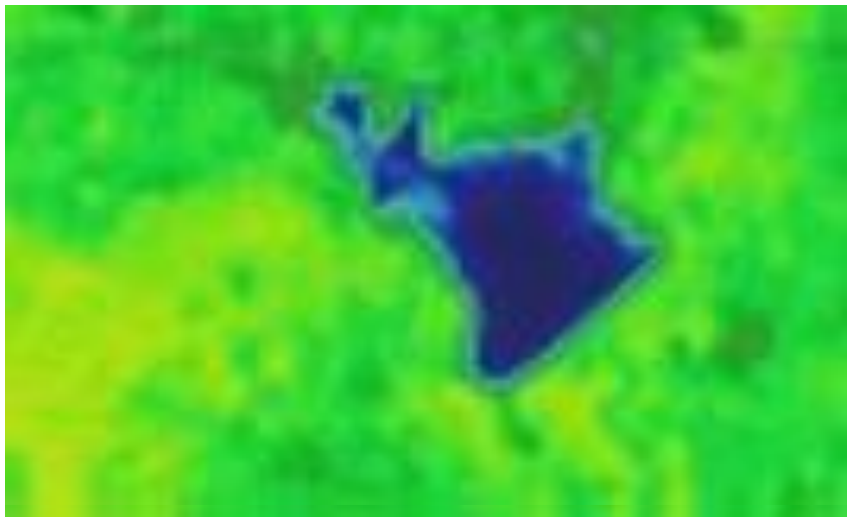


WATERBODY PATTERN
BRAHMANI RIVER ORISSA

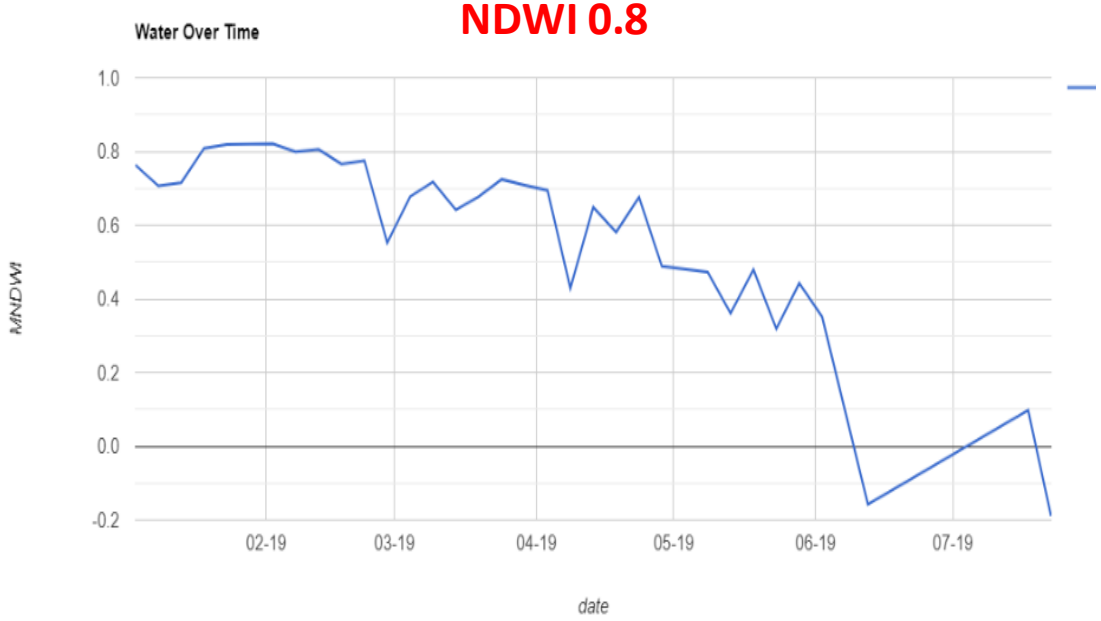


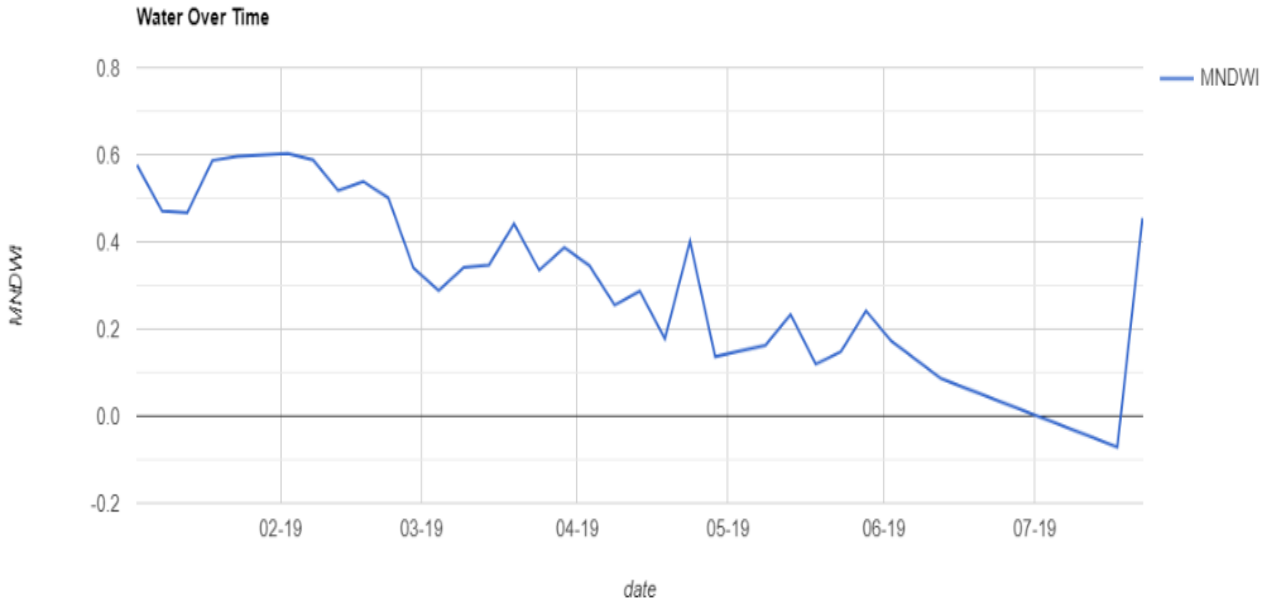


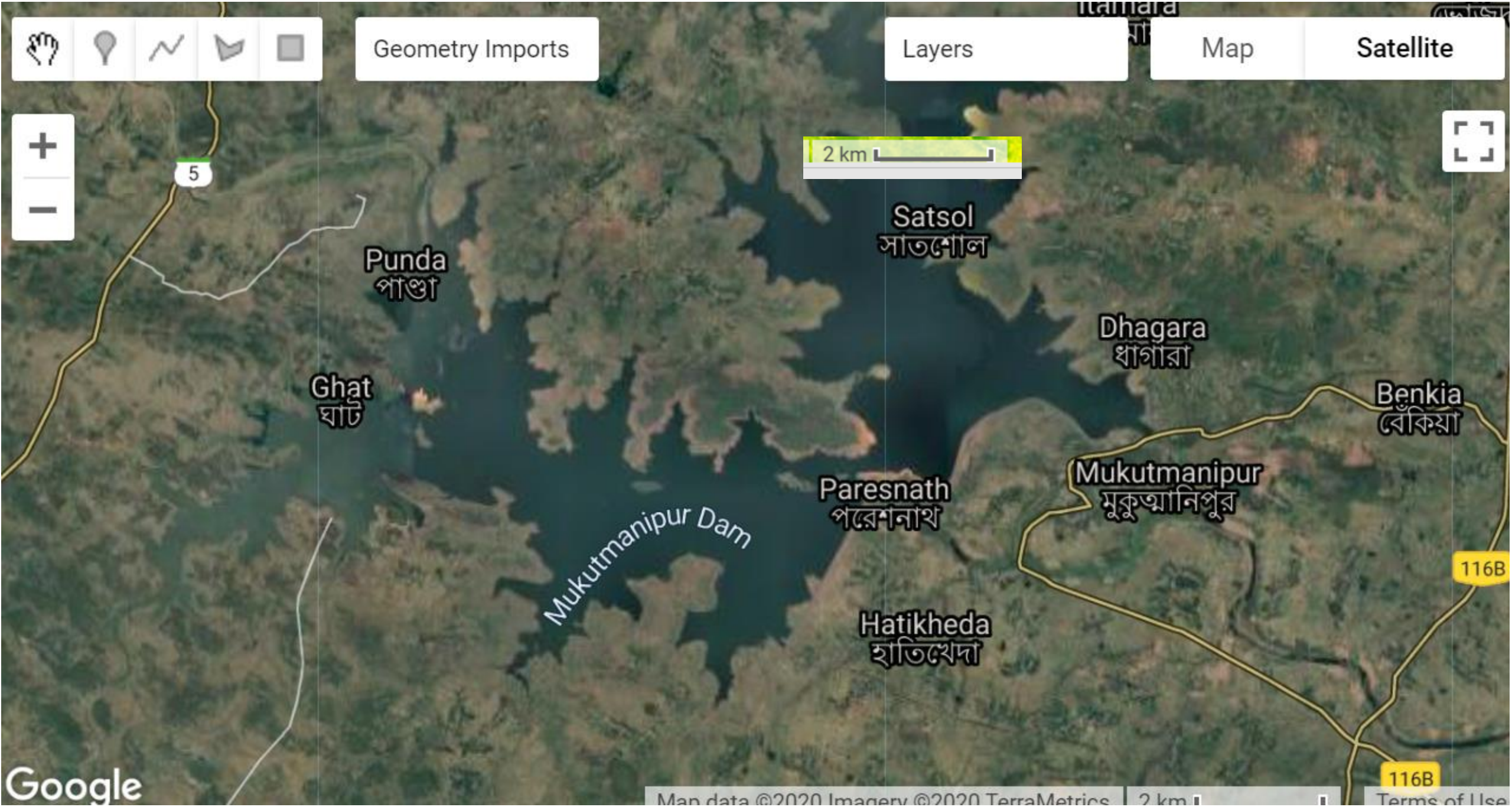
NDWI 0.8



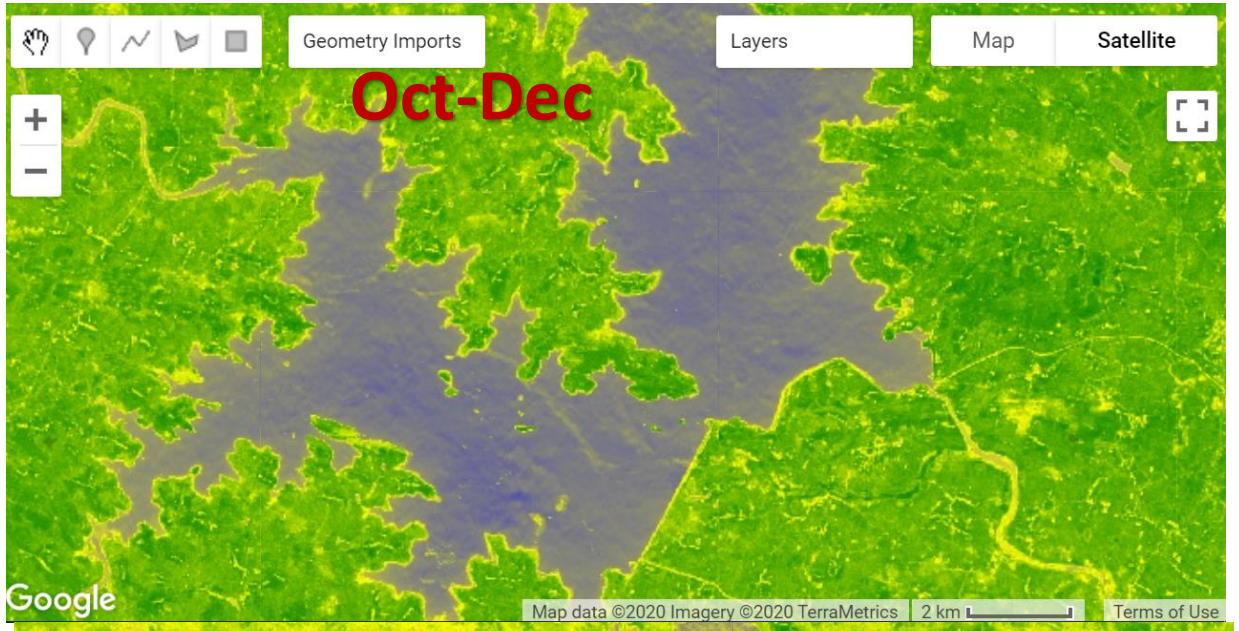
NDWI 0.6

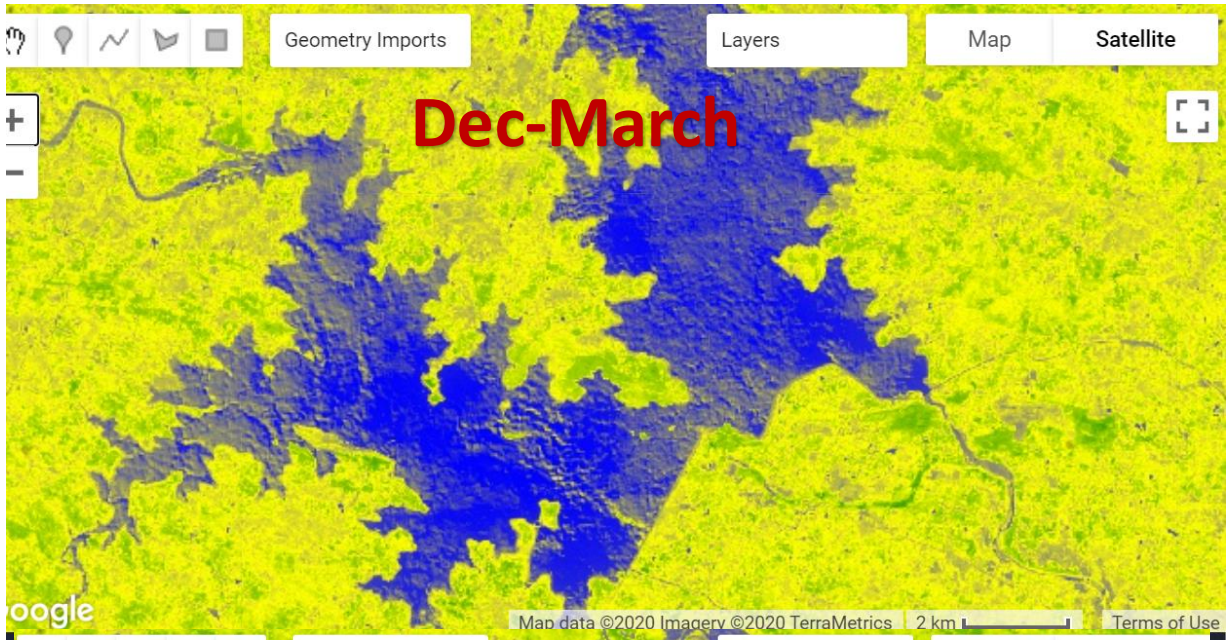


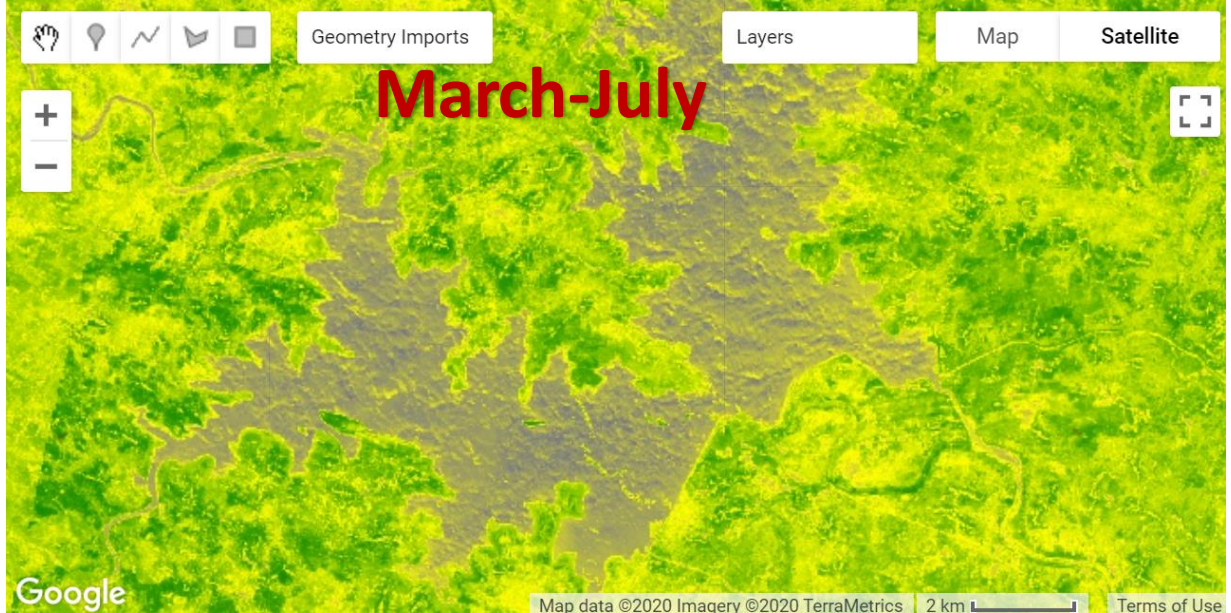


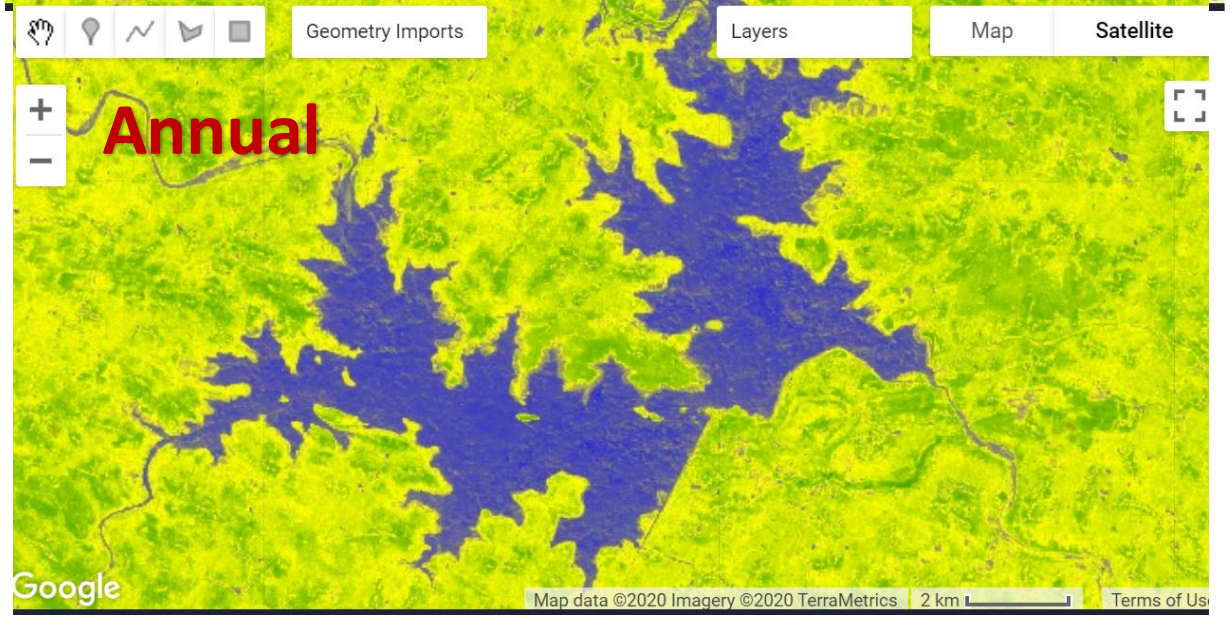

Geometry Imports
Layers
Map
Satellite
2 km
5
Satsol
সাতশোল
Punda
পাণ্ডা
Dhagara
ধাগারা
Ghat
ঘাট
Benkia
বেঁকিয়া
Mukutmanipur
মুকুটমানিপুর
Paresnath
পরেশনাথ
Mukutmanipur Dam
116B
Hatikheda
হাতিখেদা
116B
Google
Map data ©2020 Imagery ©2020 TerraMetrics
2 km
Terms of Use

Temporal Water availability: Remote sensing based









Water level in Small streams

Google earth temporal imageries and

NDVI Pattern

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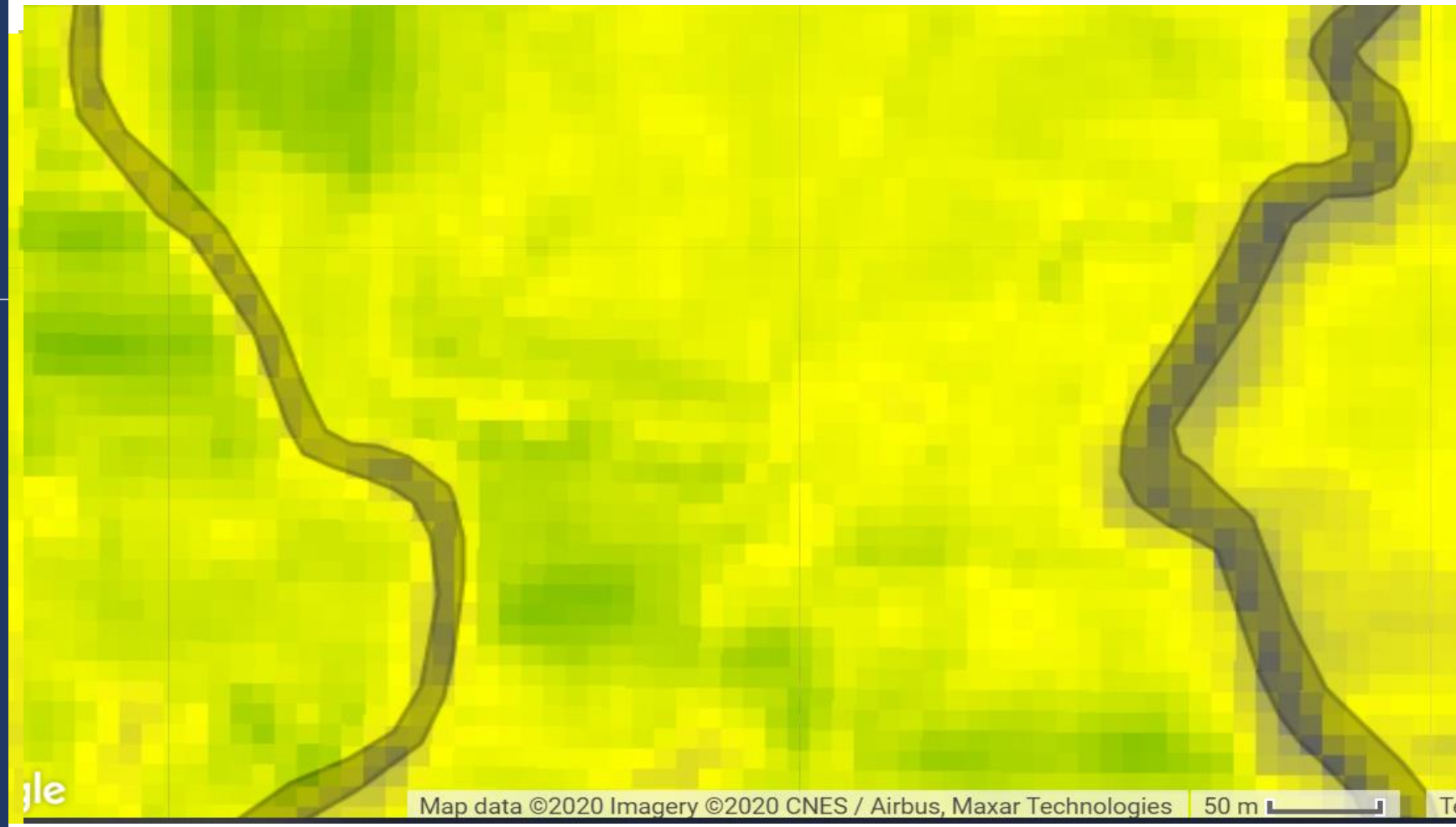
Water level in Small streams

NDVI Pattern:
-Blue color is stream
- Green color is vegetation



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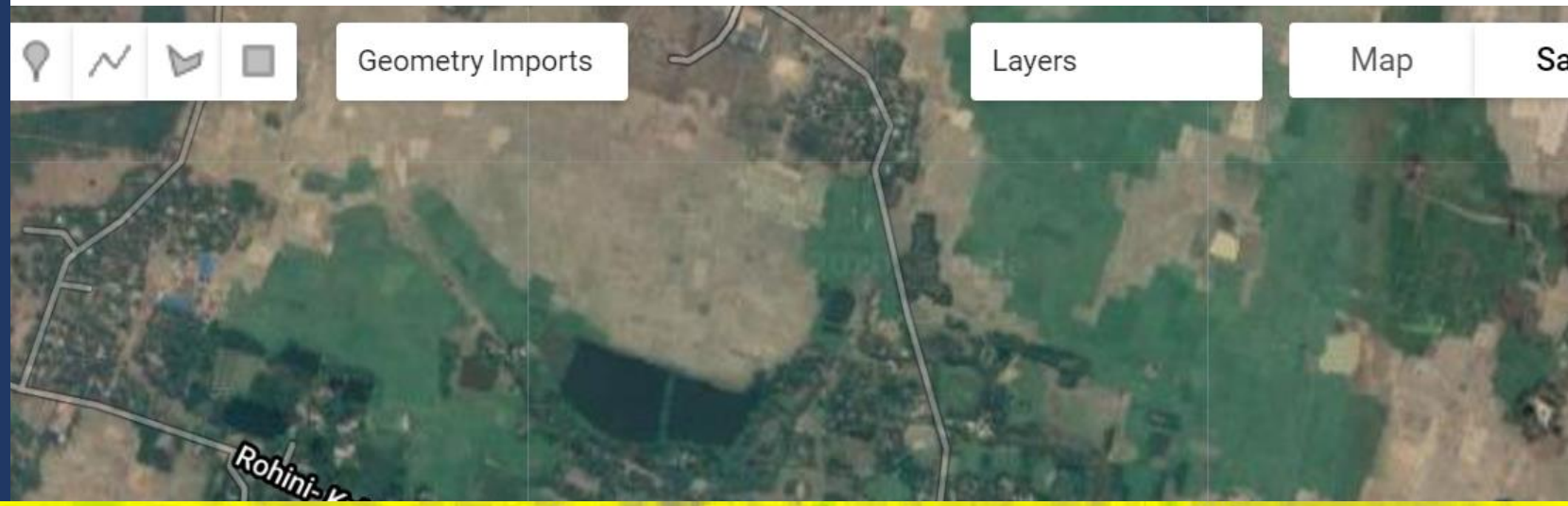
Planning for Tank desiltation

Extent of blue color is indicating depth of water level in tanks

Green color is vegetatio around tanks



Planning for lift irrigation

Google earth timeline

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Potential for up scaling

Cloud computing tools for Planning and monitoring

to guide the investment

Planning and Monitoring tool for irrigation/ agricultural projects.

Water budgeting tool

Mobile based applications for crowd sourcing or other apps

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Support from Global team

Awareness and continued handholding to Task Team and the client

Exchange of e-tools

- Dashboard: Train in customization or share the products
- Mobile based applications for crowd sourcing or other apps

Training

- Train in advanced GIS, Remote sensing based analytical tools/applications: water budgeting
- Introduce online courses with certification system.

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Water

Thanks to Project team

Project Director, Mr. Prabhat Kumar Mishra

GIS/RS team: Mr. Joydeep Das, Mr. Amitava Mukherjee and…..

GEE apps used for monitoring seasonal change

https://www.wbadmip.org/

Dashboard: http://103.16.143.46/GISWEB/map1.htm
Rabi crop analytics:
https://jdaseeaiwridd2019.users.earthengine.app/view/rabicropareaanalytics
Kharif crop analytics :
https://jdaseeaiwridd2019.users.earthengine.app/view/kharifcropqualityanalytics
Rabi crop Quality analytics:
https://jdaseeaiwridd2019.users.earthengine.app/view/rabicropqualityanalytics

Transparency may be the most disruptive and far-reaching innovation to come out of social Media

The new influencers by Paul Gillin

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