Crop Mapping in the Hindu-Kush Himalaya Region

Mir Matin

Faisal Mueen Qamer

Haqiq Rahmani

Krishna Vadrevu

Lee Ellenburg

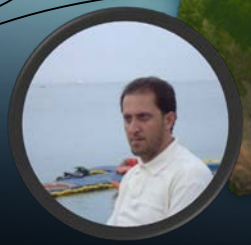
NASA

Begum Rabeya Rushi

ICIMOD

Varun Tiwari

Nabin Kumar Yadav



MAIL, GIRoA

Noorullah Stanikzai & Team

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Crop Mapping in the Hindu-Kush Himalaya Region

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Agriculture, value added (% of GDP)

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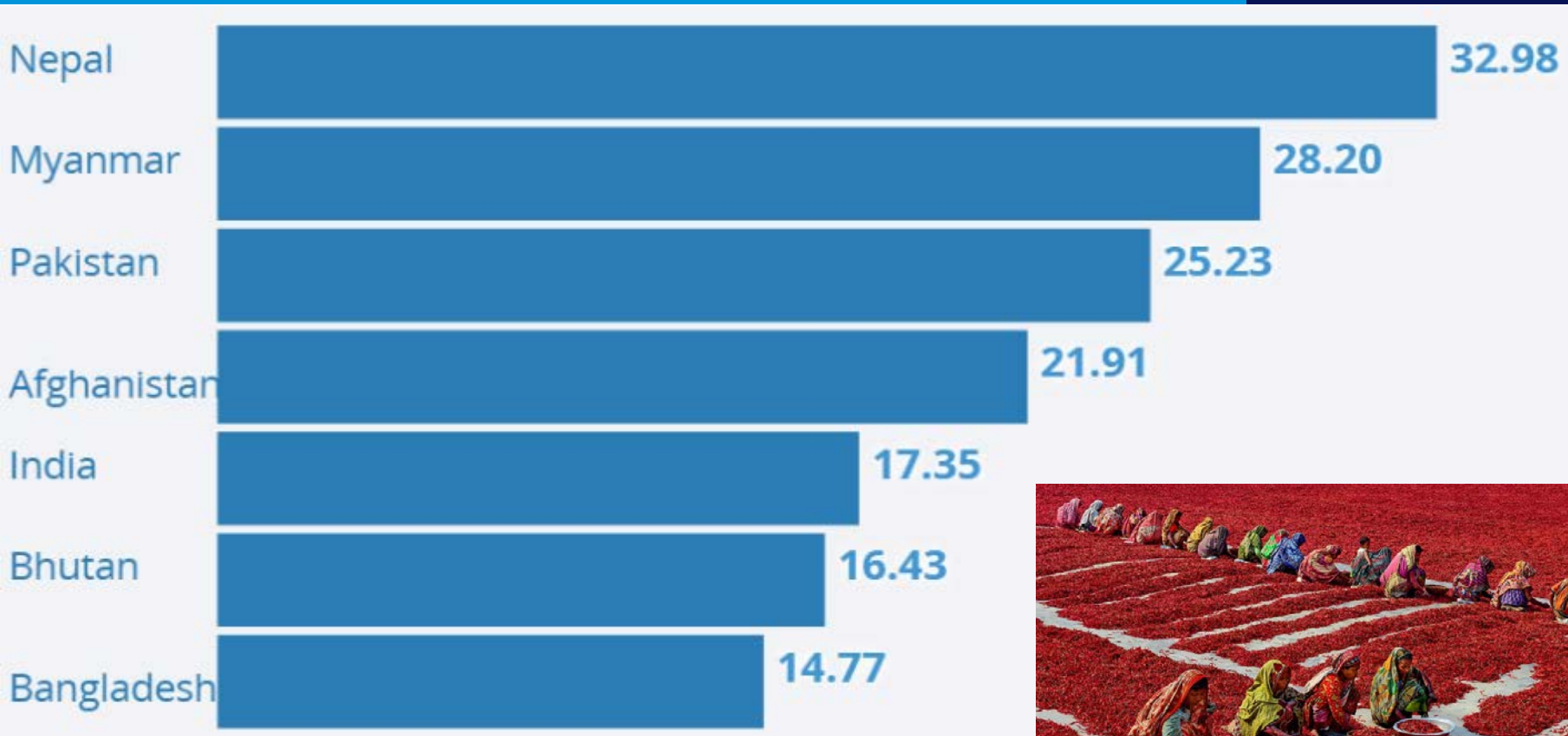

Bangladesh: Rice imports and exports

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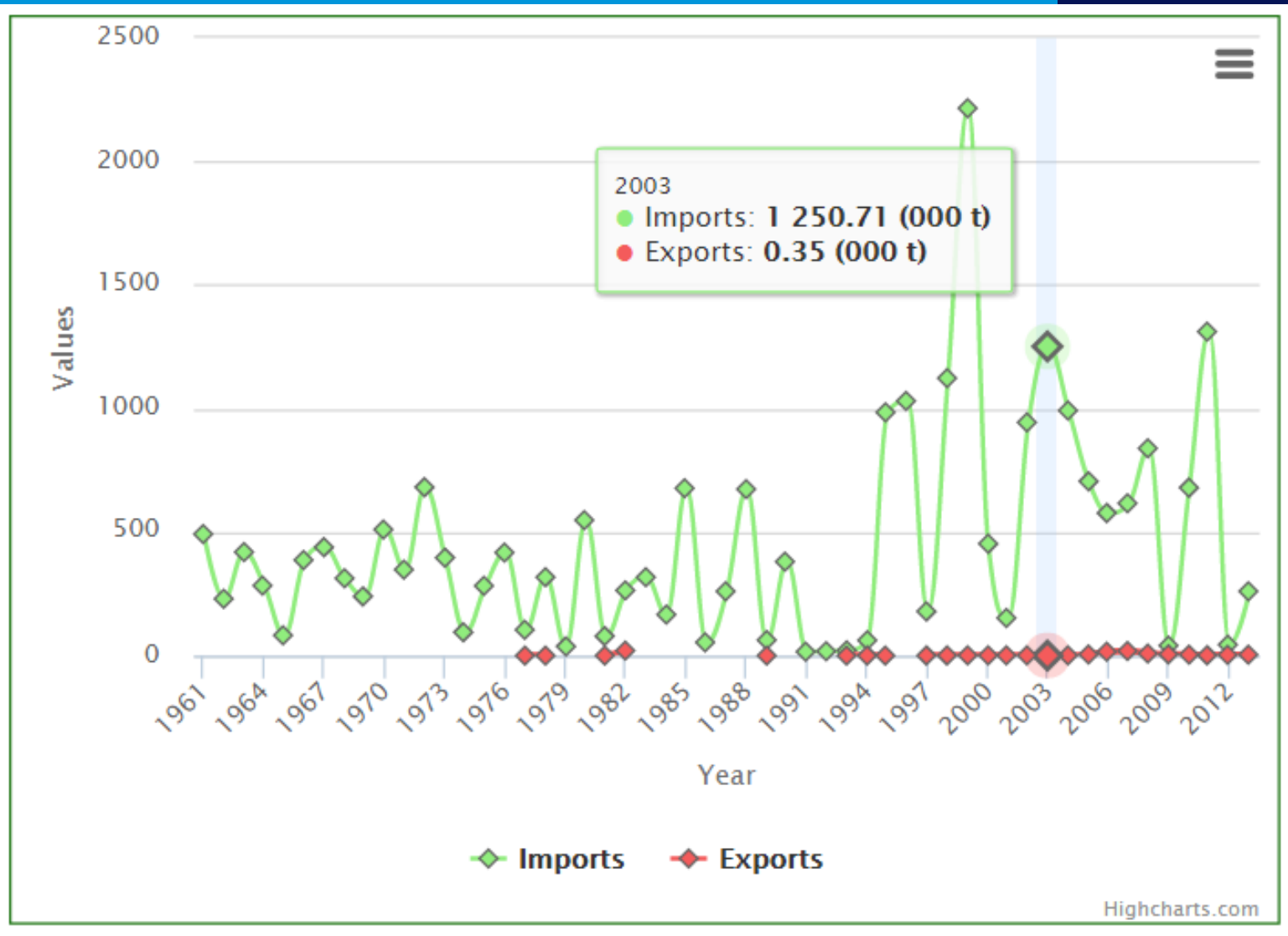

Bangladesh: Imports and exports

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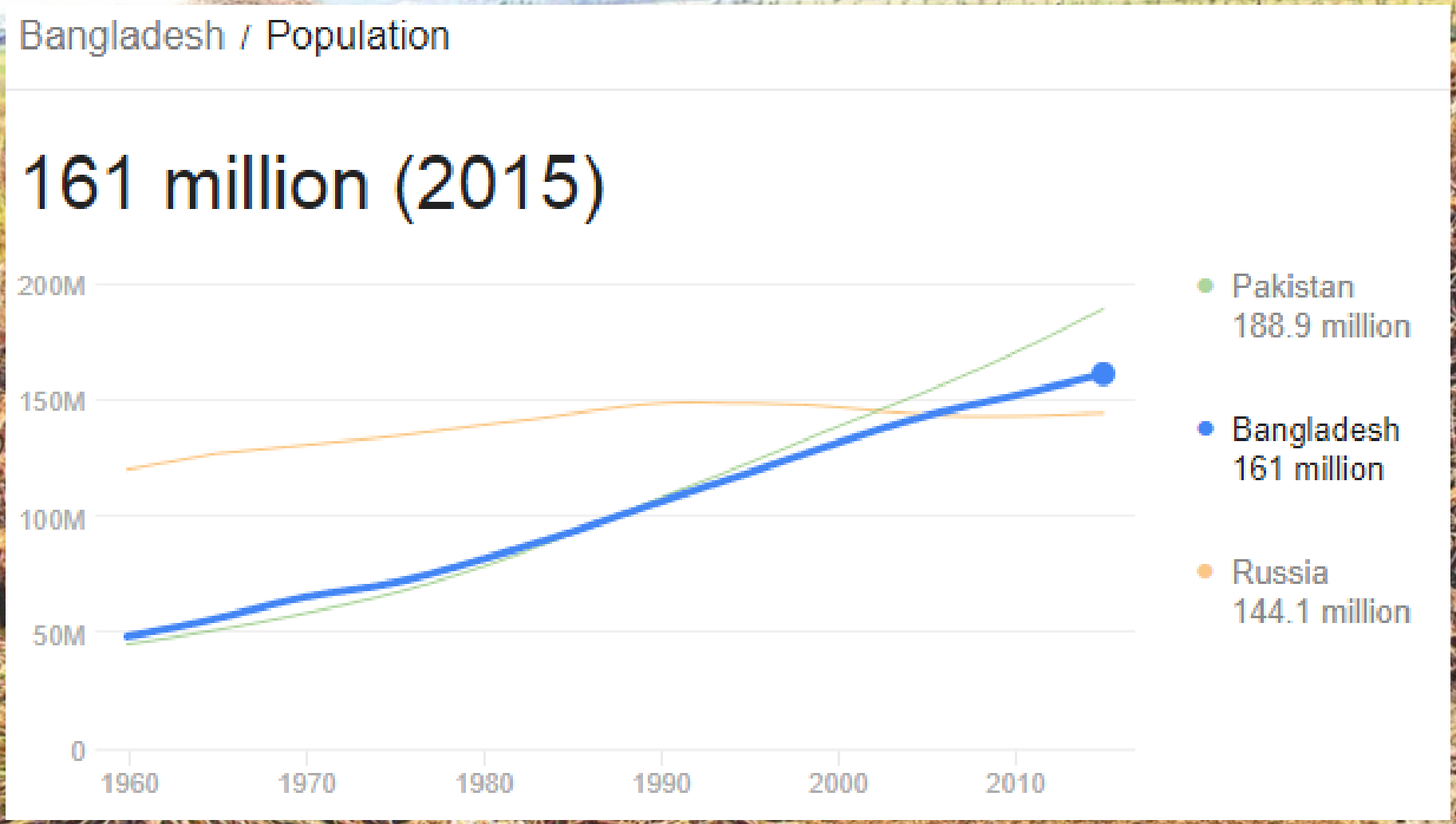

Nepal: Rice imports and exports

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Background of Crop Mapping in the Hindu-Kush Himalaya Region

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- Improving knowledge of agriculture system using remote sensing and GIS technologies to support food security related decisions
- Developing operational service to provide support on ground functional decision making related to agriculture practices
- Assess vulnerability in changing climate by integrating information on biophysical, climatic and social aspects

Operational Annual wheat area mapping for Afghanistan using Sentinel data and Google Earth Engine

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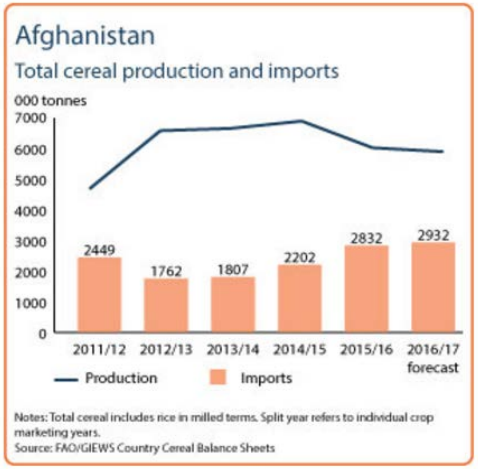
Afghanistan is a land locked country with population of 35 million among which 30% are food insecure

Wheat is a major crop and staple food with 80% of total cereal planted area

Country is not food sufficient, depended on import



Operational Annual wheat area mapping for Afghanistan using Sentinel data and Google Earth Engine

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From 2008, MAIL, FEWSNet, WFP conducting pre-harvest survey for area estimation

Current estimation is qualitative. More accurate and timely estimation is required for better planning

Background of Crop Mapping in the Hindu-Kush Himalaya Region

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AFGHANISTAN - PRODUCTION OF PRINCIPAL CROPS*

Crop	Gov't Statistics 1976		Estimated 1999	
	Area '000 ha	Productivity kg/ha	Area '000 ha	Productivity kg/ha
Wheat	3 404	1 316	1196	1 660
Barley	320	1 200	180	1 200
Maize	484	1 612	160	1 500
Rice	210	2 071	140	2 000
Cotton	112	1 429	Not available	
Sugarcane	4	15 000	Not available	
Orchards	140	Not available	Not available	
Vegetables	92	7 830	Not available	

Source: Food Security Through Sustainable Crop Production in Afghanistan, AG:DP/AFG/96/004, Field Document 1 (1999)

Methods

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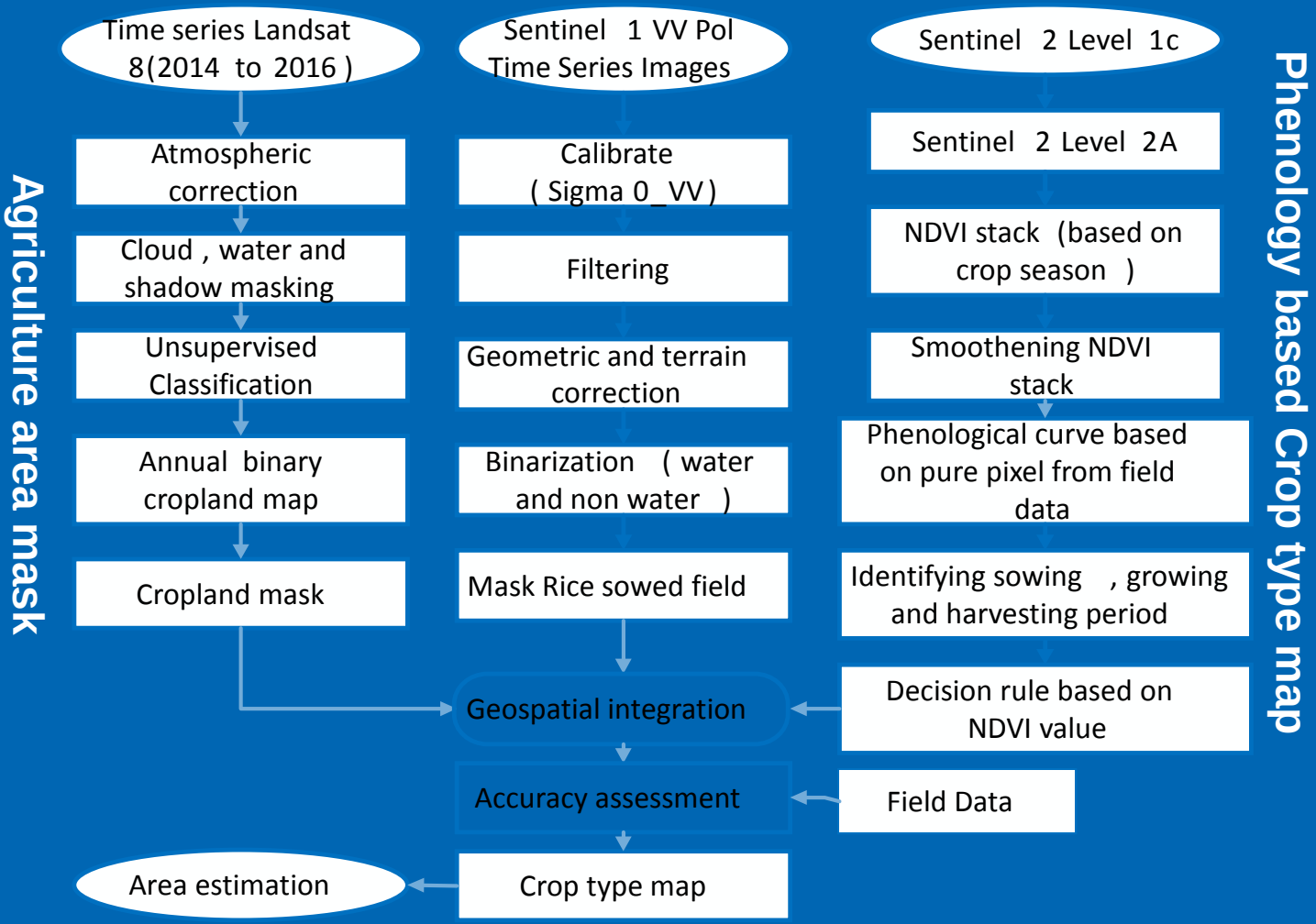

Methodology – Crop calendar

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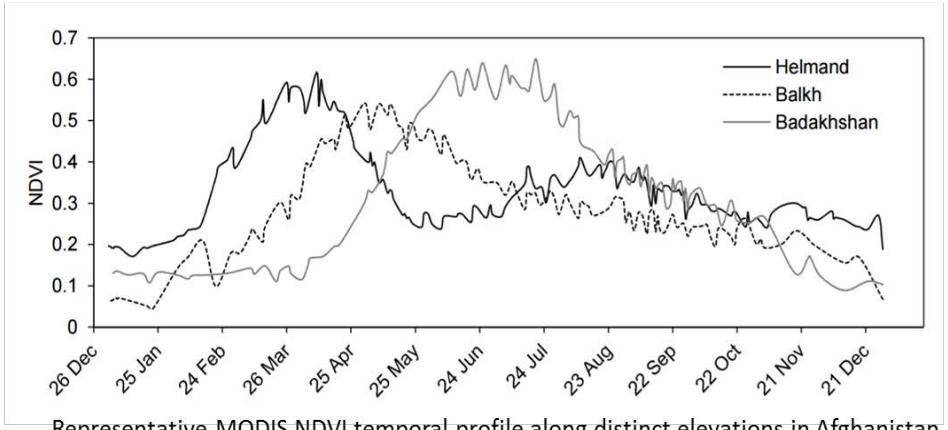
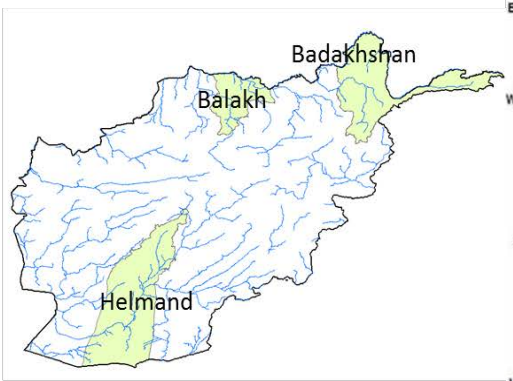
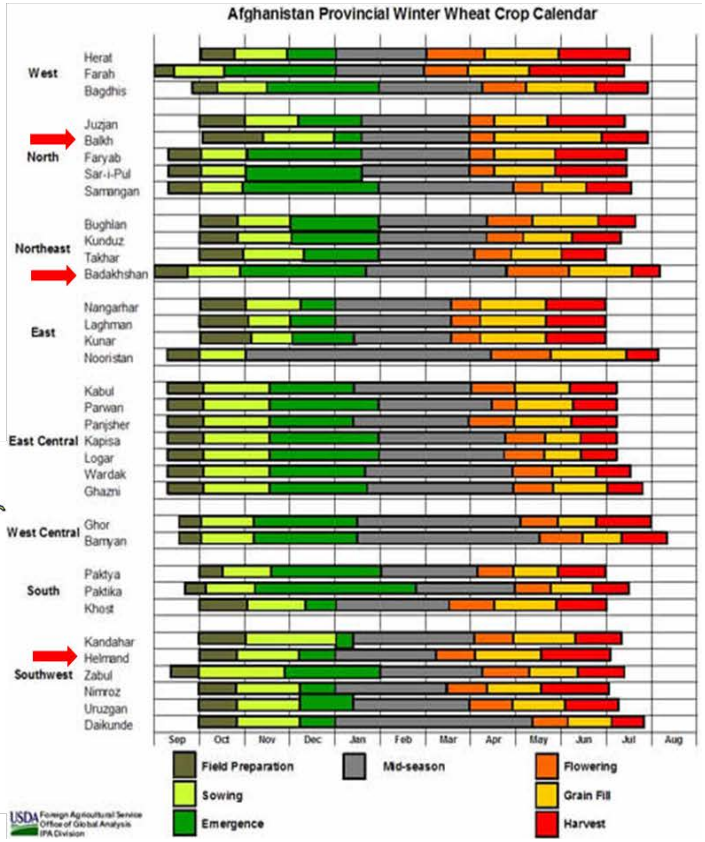


Representative MODIS NDVI temporal profile along distinct elevations in Afghanistan

In December – January crop emergence is limited thus remote sensing data can only be effectively used from March mid-**February** to end-**August**





Foreign Agriculture service office of global analysis IFA Division**

Summary of field data collection

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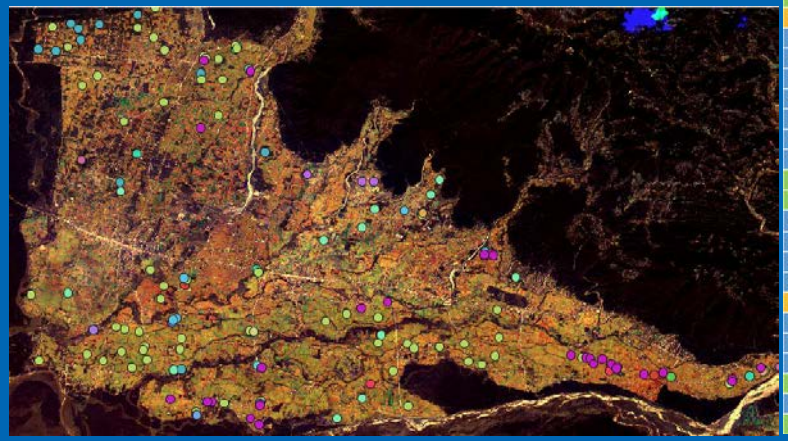
Field work

- Field survey was carried out during Dec 2016.Around 263 points were collected.
- Out of 263 points pure pixel(4×4 pixel) for major crops were used for interpreting NDVI profile.
- These profiles were used for identifying phenological changes of crop and threshold value for crop type mapping.
- Questionnaire and focus group discussion were carried out to update crop cycle calendar and identify crop pocket area



Crop type	Number
Banana plantation	13
Bare soil	3
Black Eyed Beans	1
Black mustard	1
Buck Wheat	1
Carrot	0
Fallow land	1
Grass land	1
Kidney beans	2
Maize	5
Mustard	62
non cultivated land	1
Pea	2
Phapher	1
Pigeon pea	1
Pond	2
Potato	3
Rajma	1
Red lentils	4
Rice	16
Vegetable cultivation	0
Wheat	31

Crop calendar based on agronomy expert and focus group discussion

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Field work

Crop type	Type	Sowing	Harvesting	Remarks
Maize	1. Main season	May/Jun	Sep/Oct	90 days crop cycle
	2. Winter Season	Oct/Nov	Mar/April	
	3.Spring Season	Feb/Mar	May/Jun	
Wheat		Nov/Dec	Apr/May	120 days crop cycle
Rice	1.Boro rice	Feb	May	
	2.Spring rice	Mar	June/July	
	3.Main season	July/Aug	Nov	
Mustard	1. *Brassica compestris* (Tori)	Oct/Nov	Mar/Feb	90 days
	2. *Bassica juncea* (Rayo)	Nov	Mar/April	120 days crop cycle
	3. *Bassica compestris* (Rar Yellow Sarson)	Oct	March	

		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Maize	1. Main season												
	2. Winter Season												
	3.Spring Season												
Wheat													
Rice	1.Boro rice												
	2.Spring rice												
	3.Main season												
Mustard	1. Brassica compestris (Tori)												
	2. Bassica juncea(Rayo)												
	3. Bassica compestris(Rar Yellow Sarson)												

Time Series SAR Backscatter

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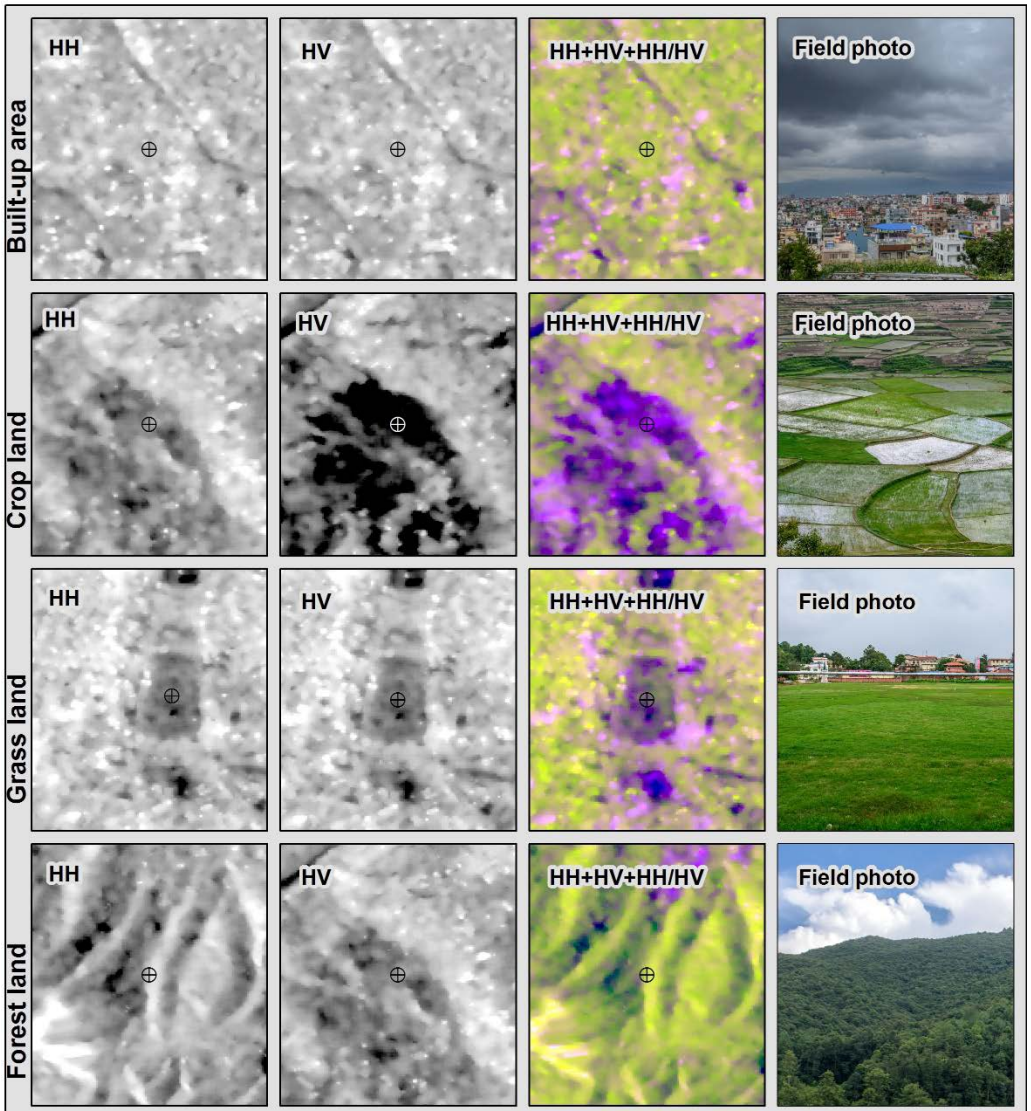

Mapping Rice

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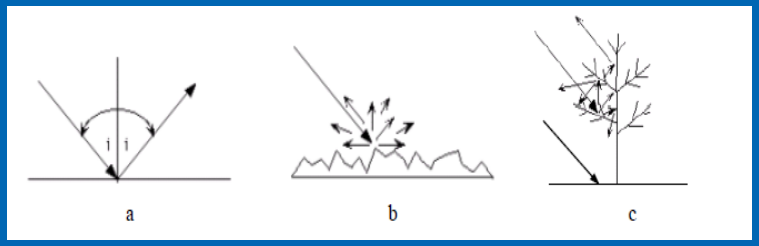
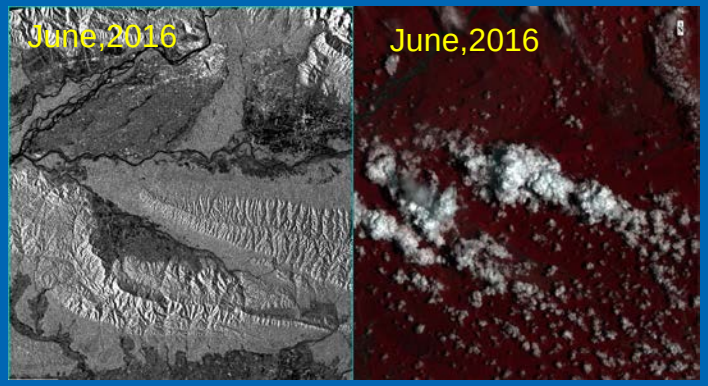
Methods

- Radar can see through all weather conditions – essential in cloud-prone and is highly sensitive to changes in waterlogged ground such as rice paddies.
- During the sowing period of rice field is flooded with standing water in the month of July –August. This results in very low backscatter.





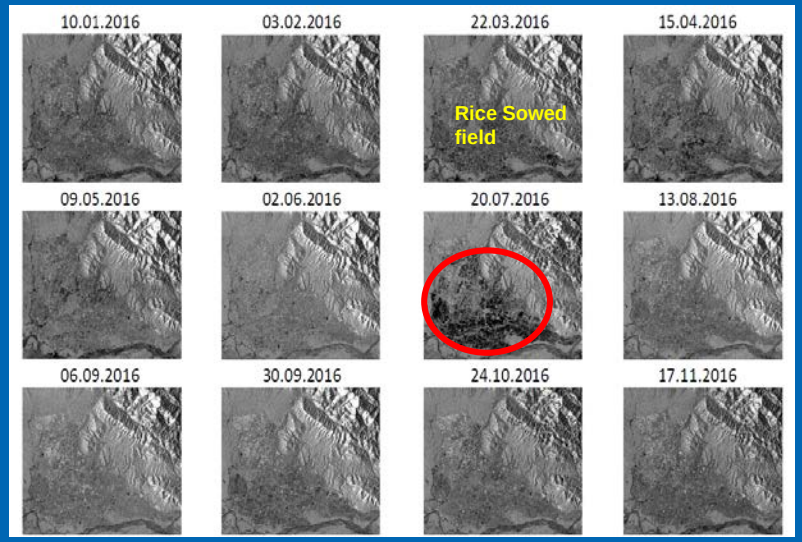


Figure : Monthly processed Backscattering sentinel 1 images

Mapping Rice sowed field

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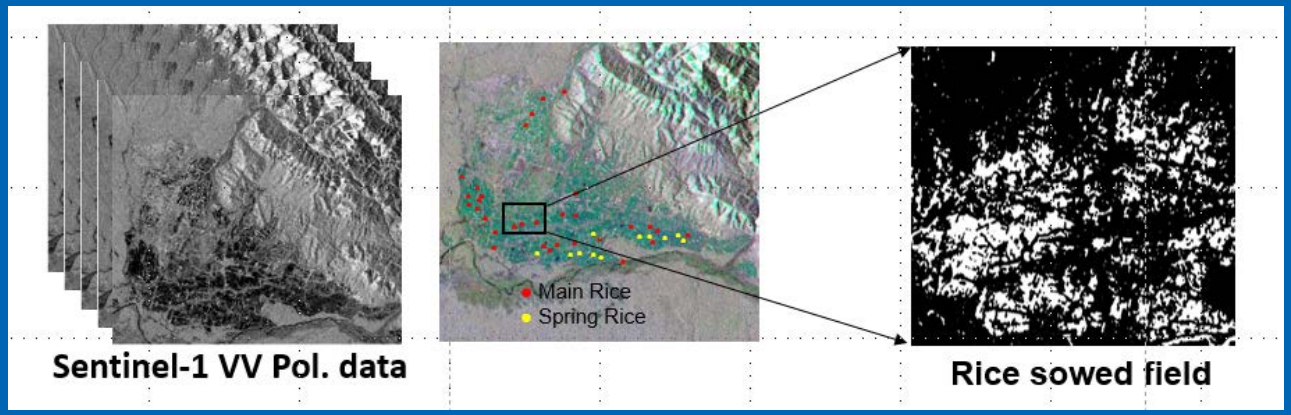
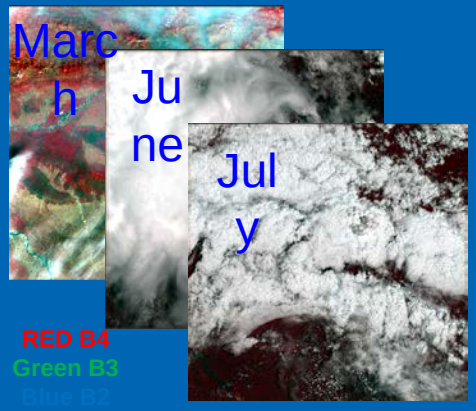
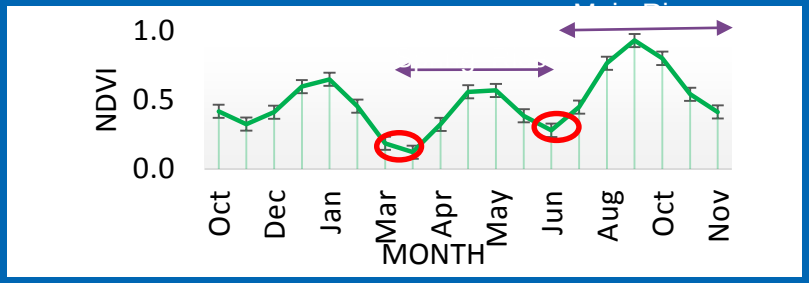
Methods



Sentinel-2 MSI False- Color Infrared





		Jan	Feb	Mar	Apr	May	Jun	July	Aug	Sep	Oct	Nov	Dec
Rice	1.Spring rice												
	2.Main season												

Temporal cropping patterns and defining decision rule

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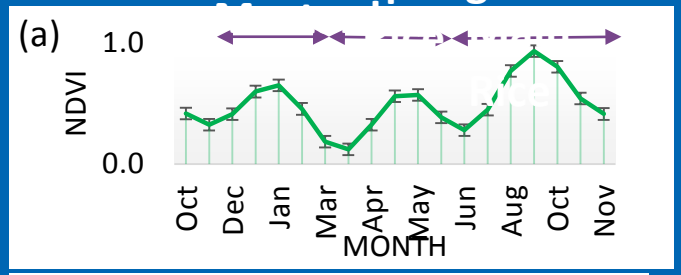
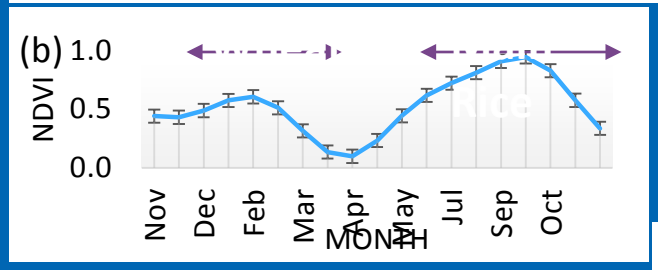
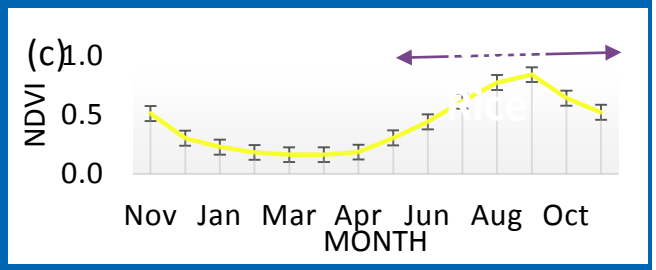
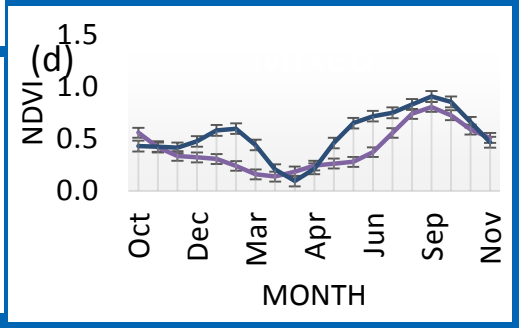


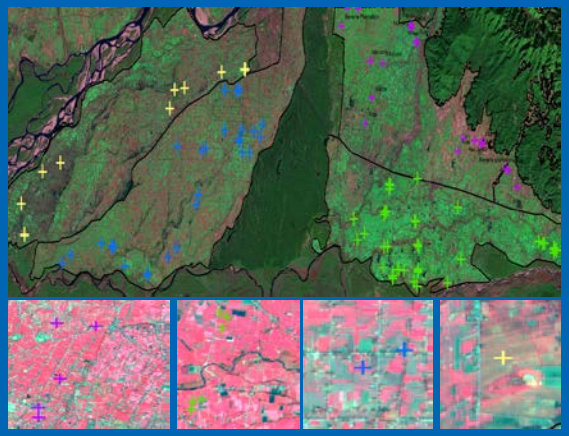




Decision rules

Crop Type	Sowing	NDVI	Growing	NDVI	Harvesting	NDVI
Rice	June	0.10-0.455	Sep	0.66-0.98	Nov/Dec	0.33-0.60
Mustard	Nov	0.2-0.46	Jan	0.45-0.77	Mar	< 0.25
Wheat	Nov/Dec	< 0.45	Jan	0.4-0.70	Apr	<0.4





Excluding Fallow from Wheat + Fallow

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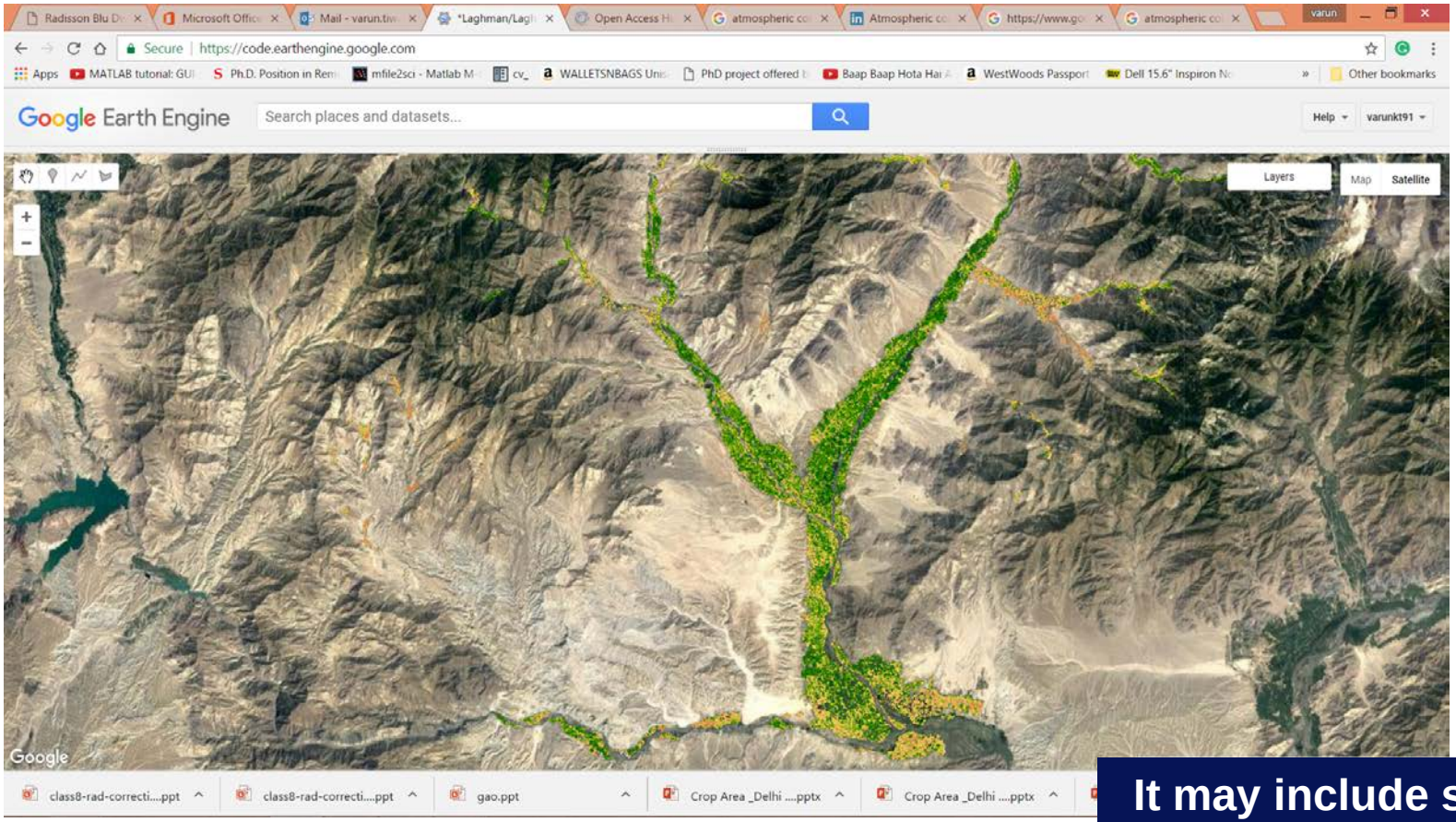
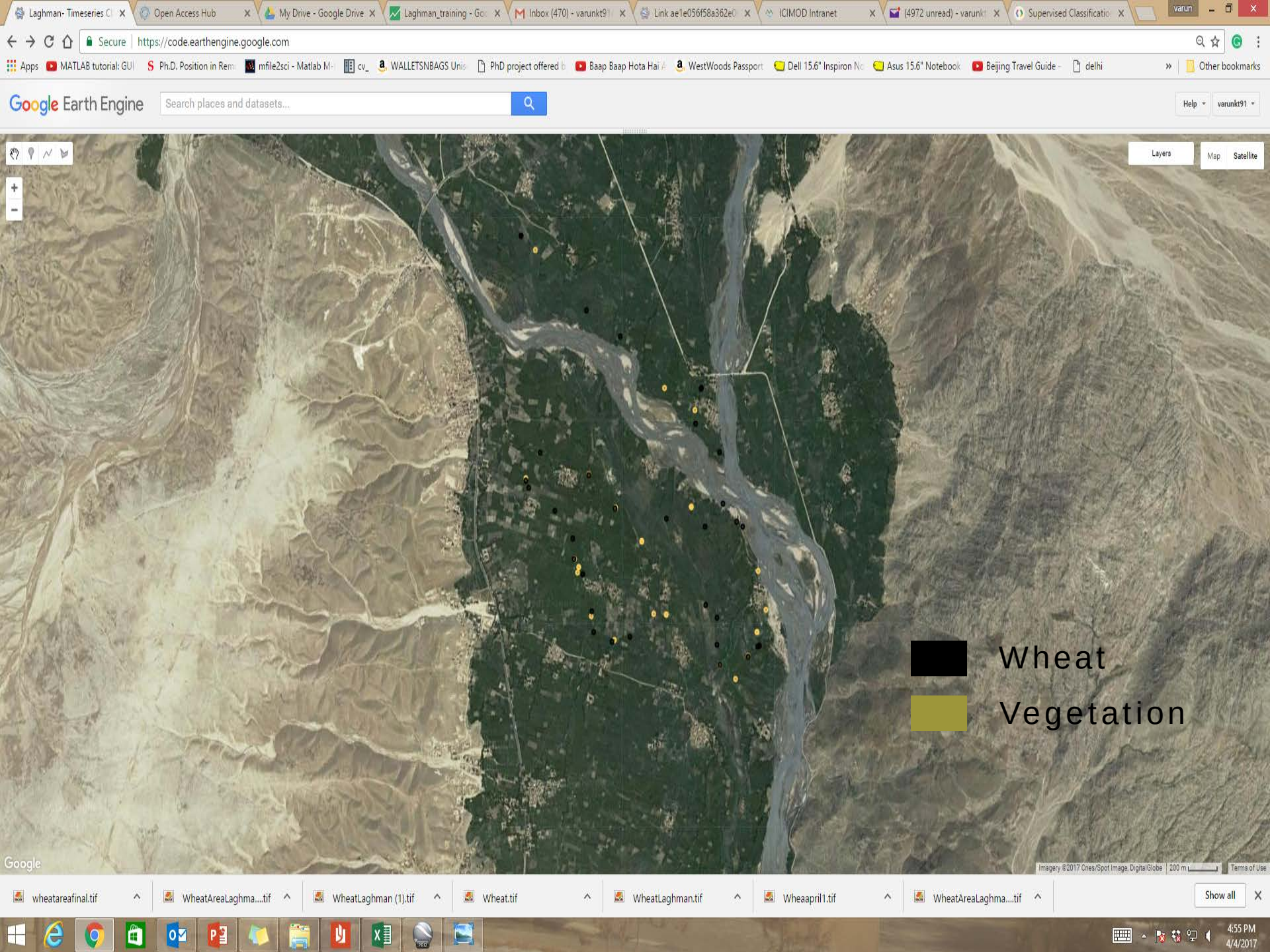


It may include some crops

Initial Results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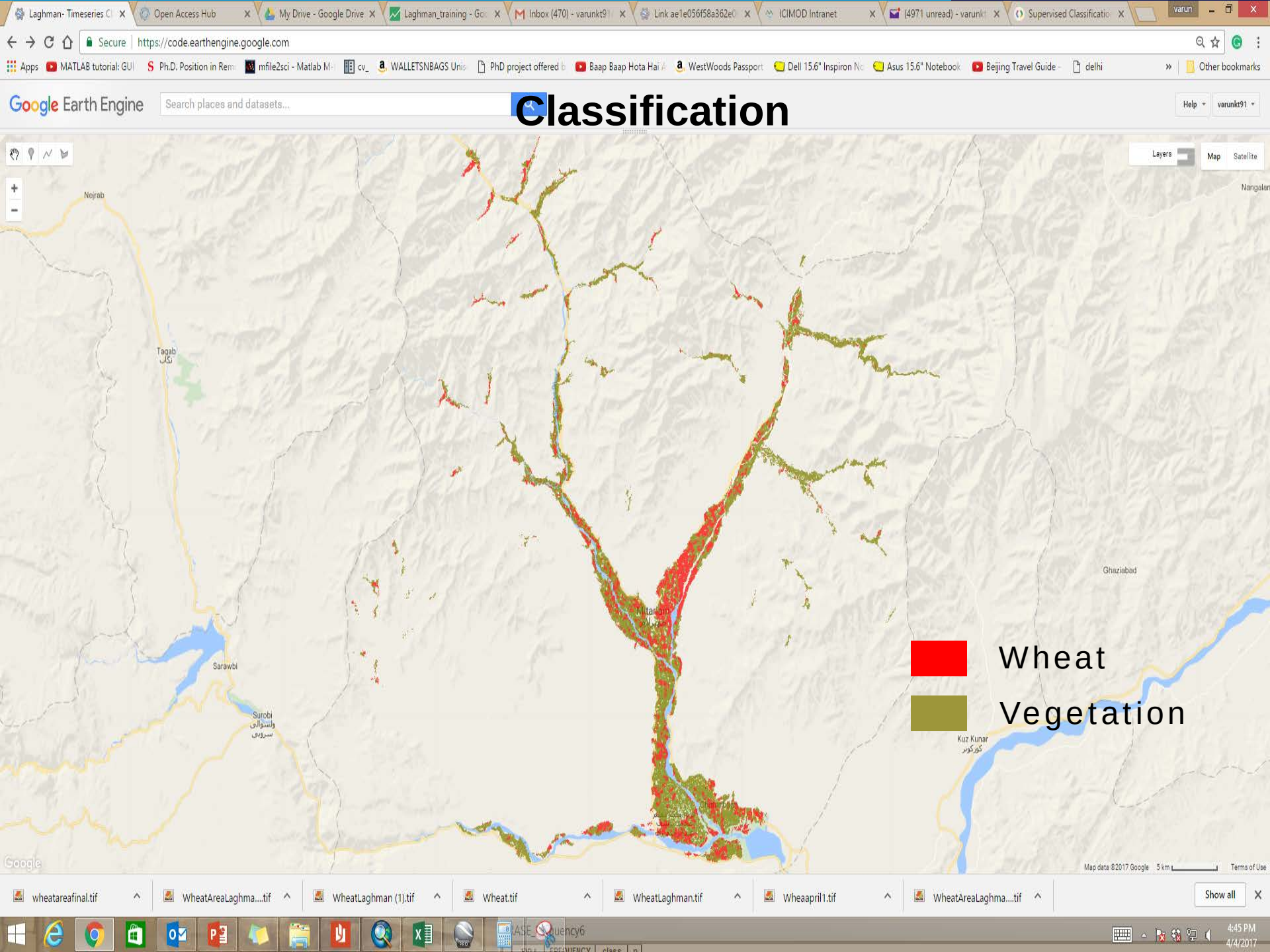
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Classification

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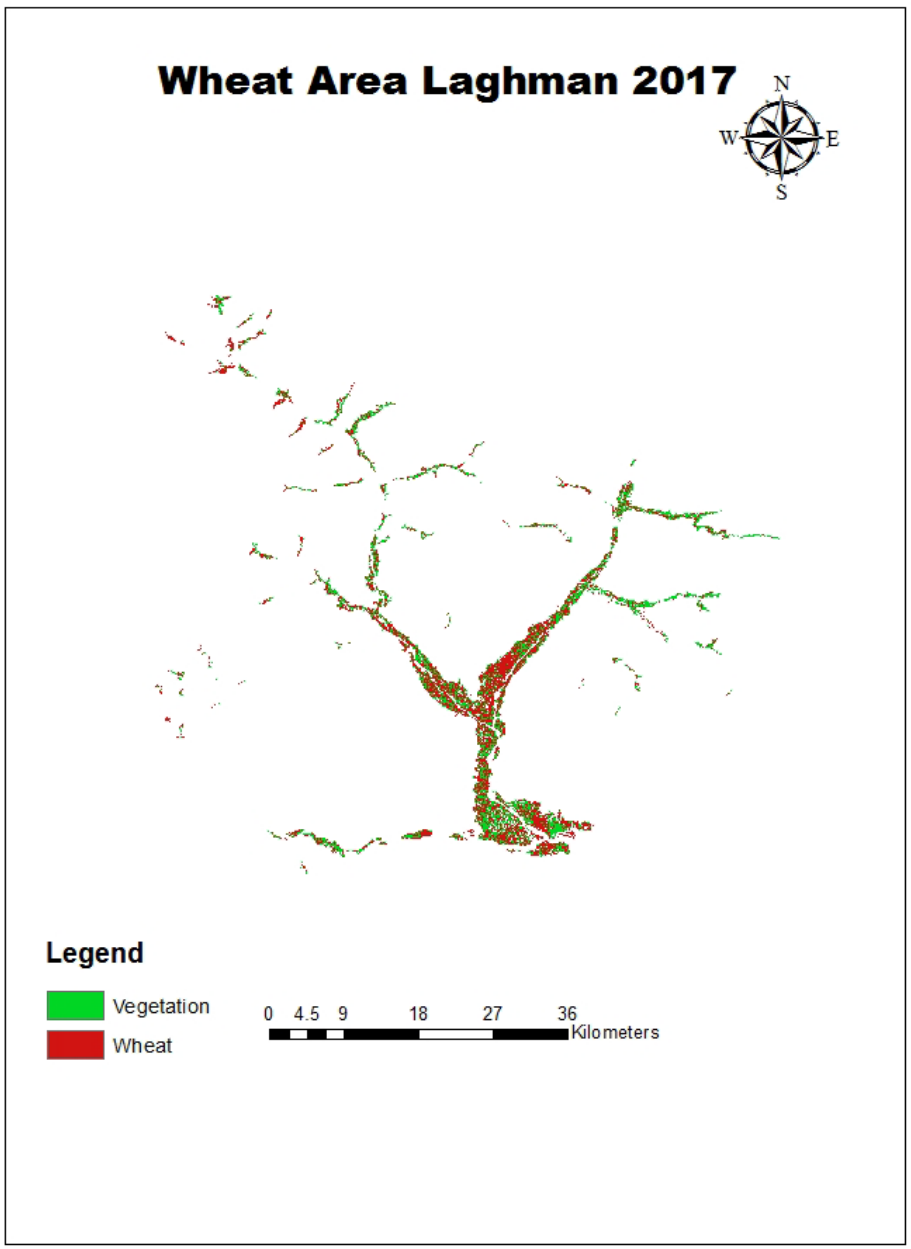

Operationalizing Agriculture monitoring system in Nepal –

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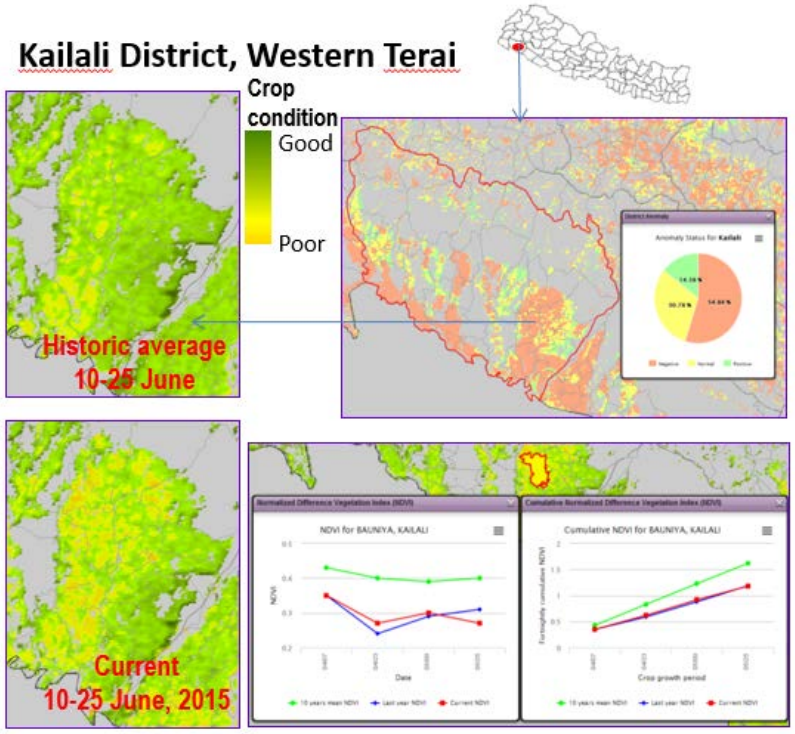
The preliminary assessment of paddy crop sown area based on MODIS NDVI data of 177 and 193 Julian days of 2015 shows that there is 3% increase in area as compared to that of 2014 and 12% decrease as compared to 2013. An additional image of August 12 can give more clear result since the transplantation process is still going on.

http://apps.geoportal.icimod.org/



Strengthening Agriculture Advisory by Establishing Agriculture Information Dashboard

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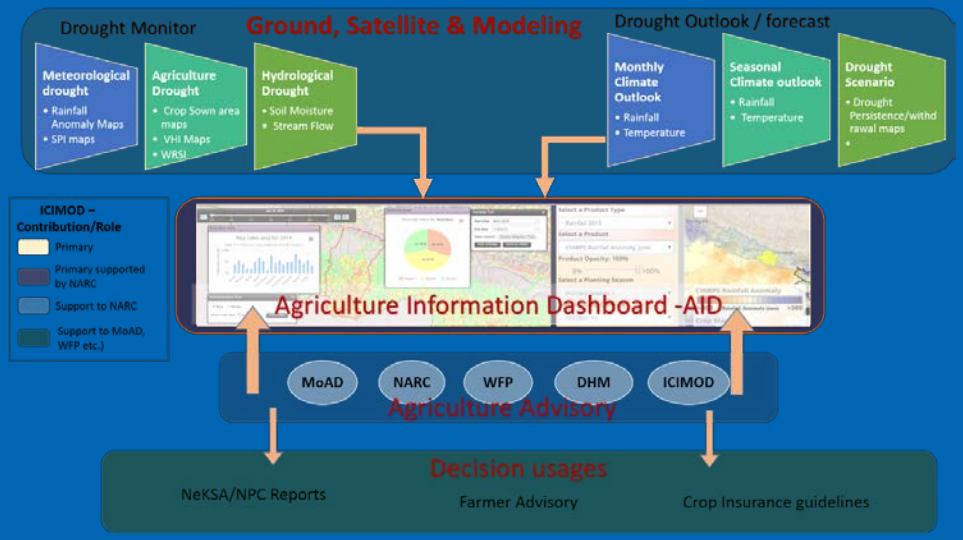
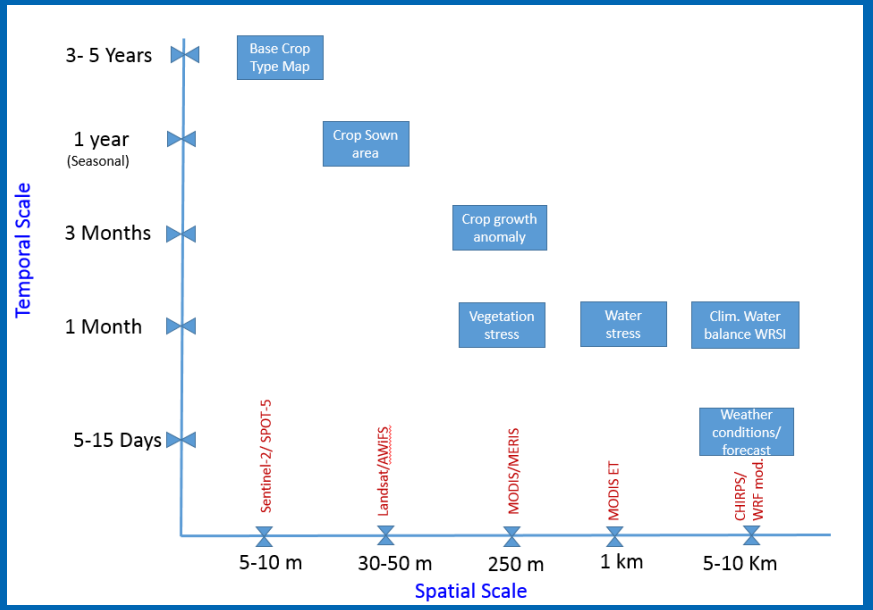
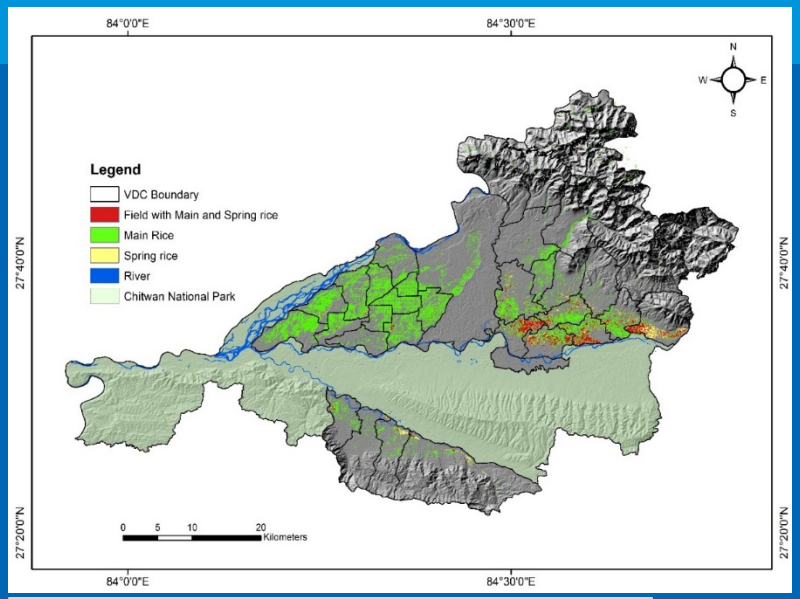




Results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Legend
VDC Boundary
Field with Main and Spring rice
Main Rice
Spring rice
River
Chitwan National Park
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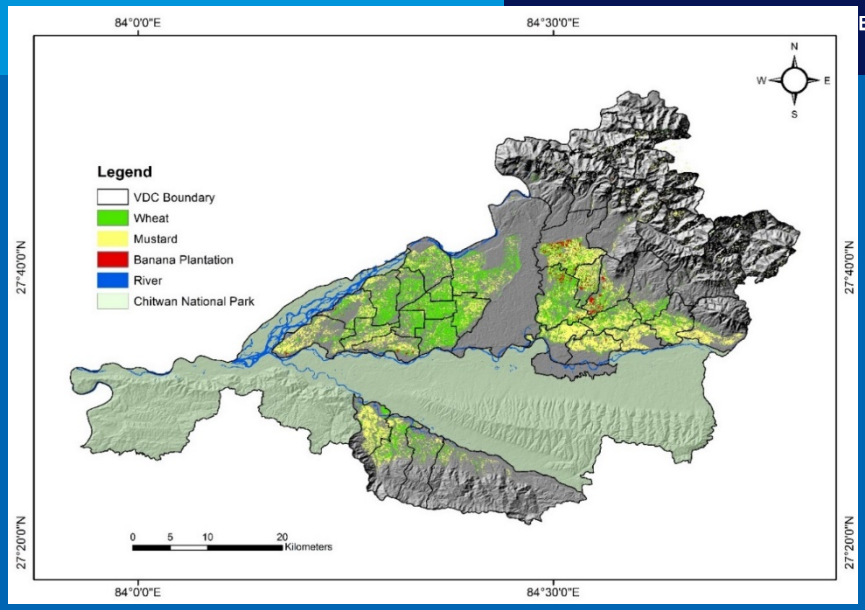
Kilometers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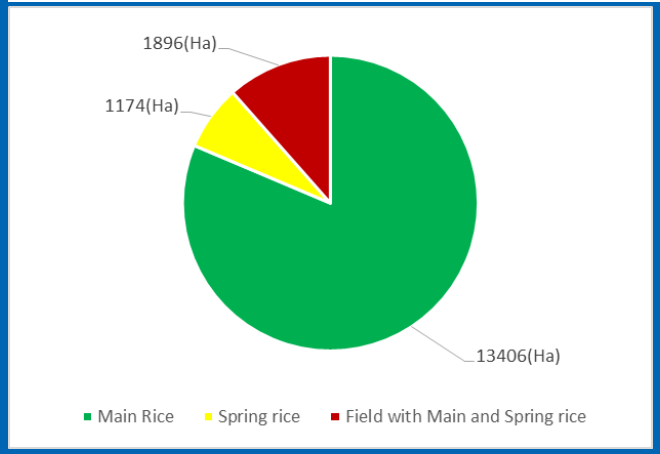
VDC Boundary
Wheat
Mustard
Banana Plantation
River
Chitwan National Park
0 5 10 20
Kilometers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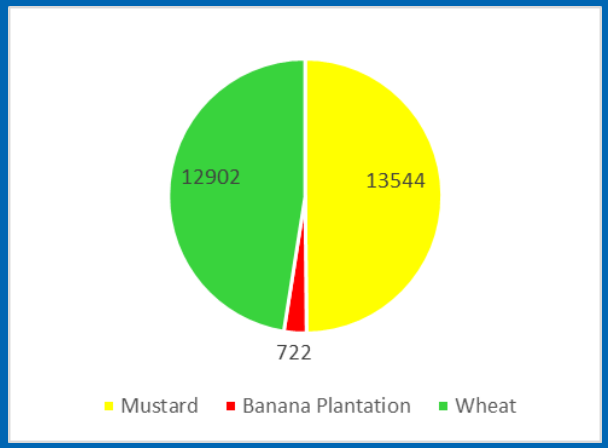
Main Rice
Spring rice
Field with Main and Spring rice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722
Mustard
Banana Plantation
Wheat

Thank You