東京大学
THE UNIVERSITY OF TOKYO

Ostrom Center for the Advanced study in Natural-resource-governance
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ESTIMATIONING ABOVE GROUND BIOMASS IN SUB-TROPICAL BUFFER ZONE COMMUNITY FOREST, NEPAL, USING SENTINEL-2 DATA

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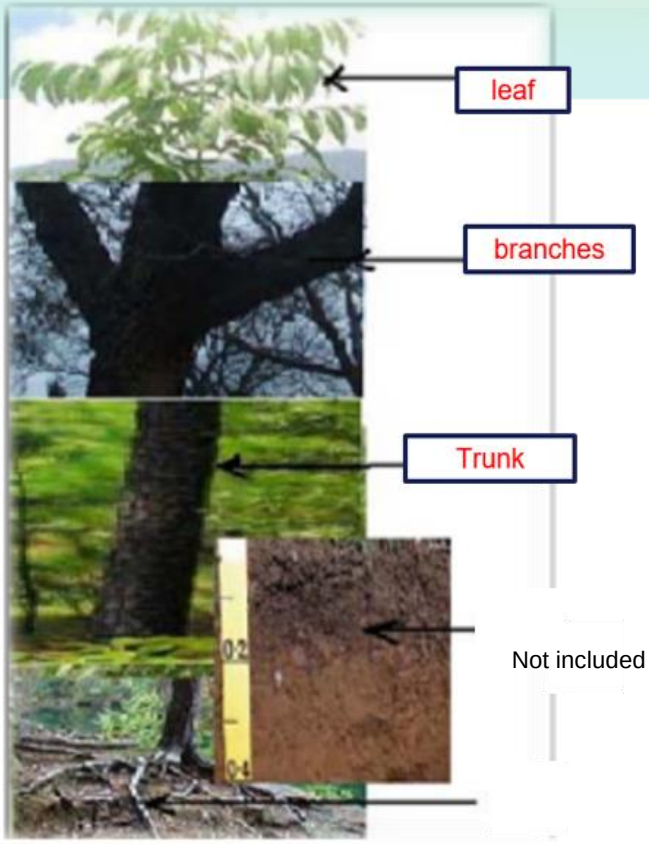
OUTLINES OF THE PRESENTATION

- INTRODUCTION
- STUDY AREA
- METHODS AND METHODOLOGY
- RESULT/
- DISCUSSION
- CONCLUSION



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Why Above-ground biomass?

- Important indicator of biophysical process.
- Valuable in understanding and monitoring ecosystem responses and its contribution in terrestrial carbon accounting.
- Also, AGB accounts for 70-90% of total forest biomass.

Objective of the study

To investigate the performance of spectrally-derived indices using Sentinel-2 MSI combined with field measurements for estimating AGB in the sub-tropical buffer zone community forest of Parsa National Park, Nepal.

- Additionally, variable selection is considered as a key step required to generate the smallest subset of input variables in the RF algorithm.
- And to map the predicted biomass

Rationale of the study

Why is Buffer Zone area?

Shift from "Protectionist" to "people-oriented" approaches still exist debate and conflict between biodiversity conservation and human welfare.

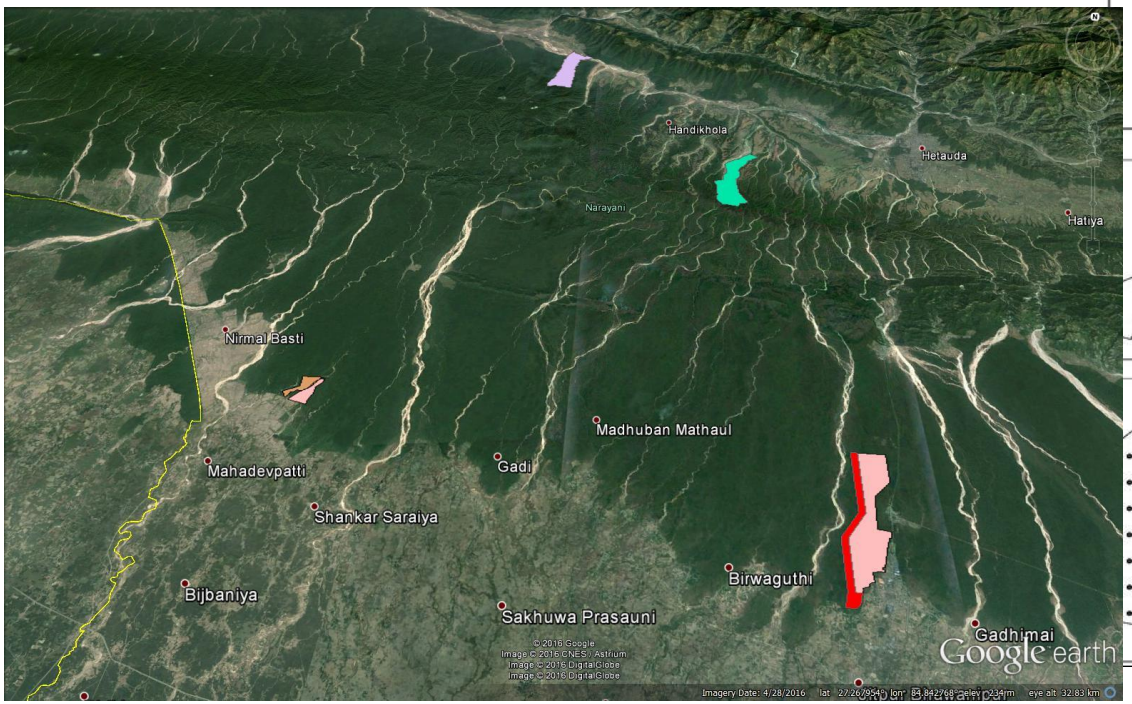
Lack of sound database at forest productivity and resource access.

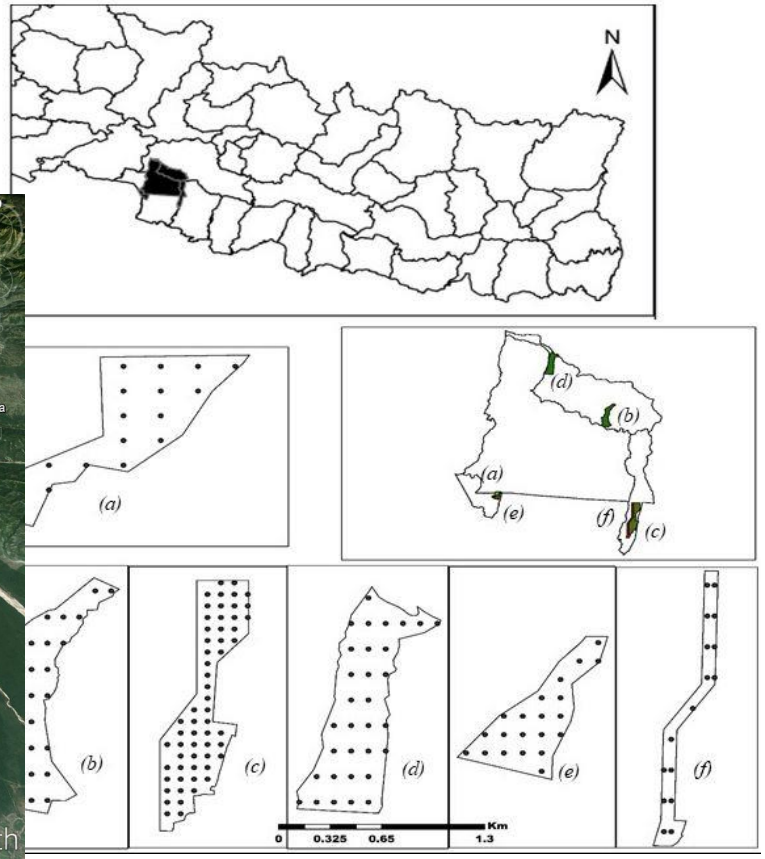
Why Remote Sensing?

It provides an alternative to traditional methods which gives spatially explicit information and enable repeated monitoring, even in remote location, in a cost-effective way.

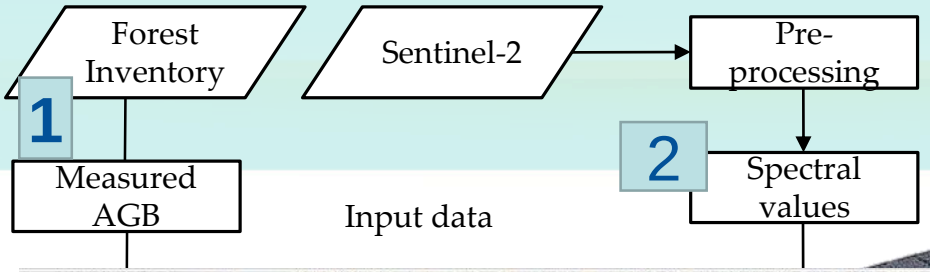
STUDY AREA

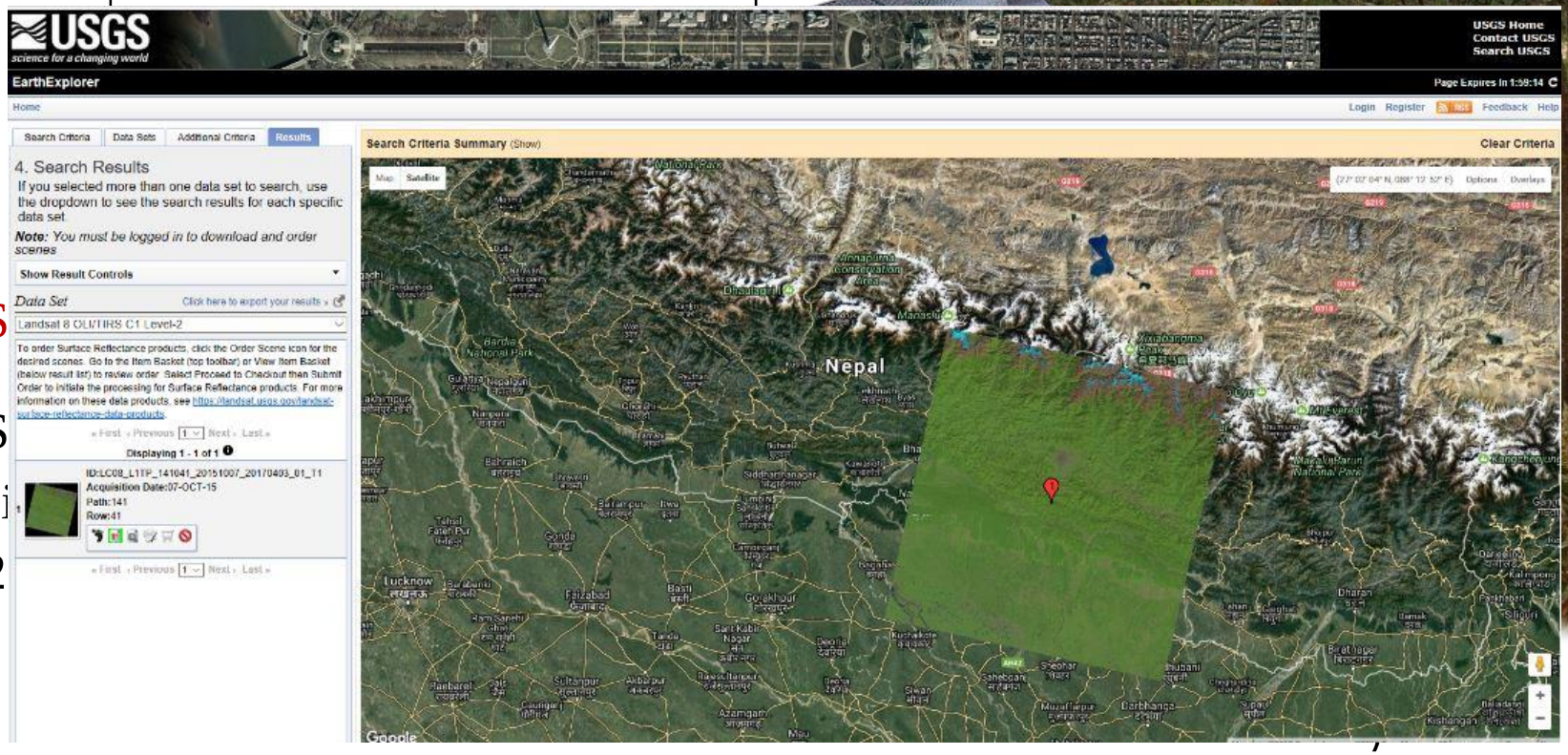
- Latitude 27°28′00″N Longitude 84°20′00″E.
- Flat topography
- Alluvial Soil- lower gravel and conglomerates as elevation increases
- Sub-tropical climatic condition where predom





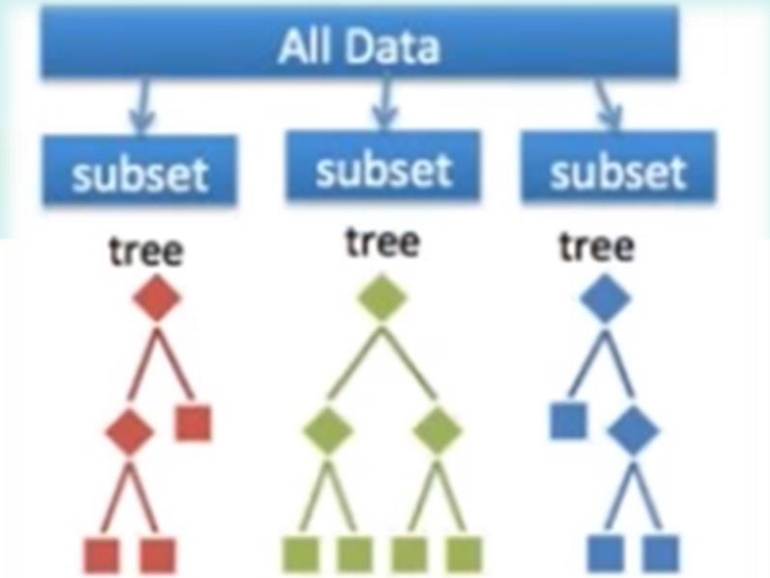
General Layout





Statistical Analysis

- Random Forest is one of the most powerful and popular non-parametric approaches.
- It uses decision trees to come with the final outcome.



Advantages

- Can be used for both Regression and Classification.
- Handle the missing values and maintains accuracy for missing data.
- Wont over fit the model.
- Handel large data set with higher dimensionality.

Two parameters, *mtryand *ntree** need to optimize to achieve the desirable prediction.**

Effectiveness of RF in predicting AGB

10 fold cross-validation was employed to assess the estimation of AGB model.

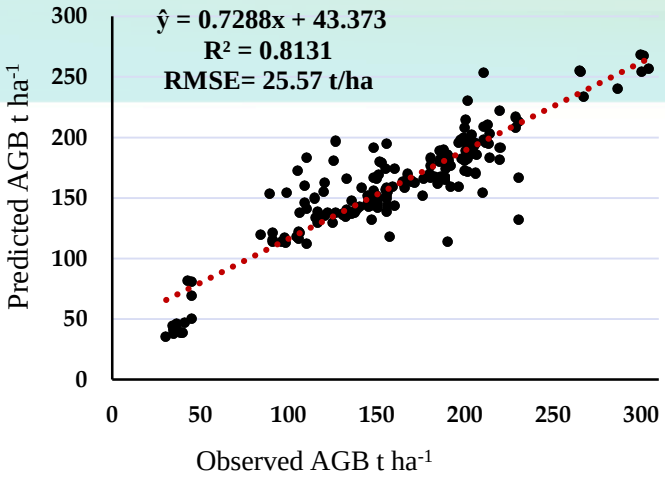
In addition, the co-efficient of determination (r2), root mean square (RMSE) and relRMSE was calculated.

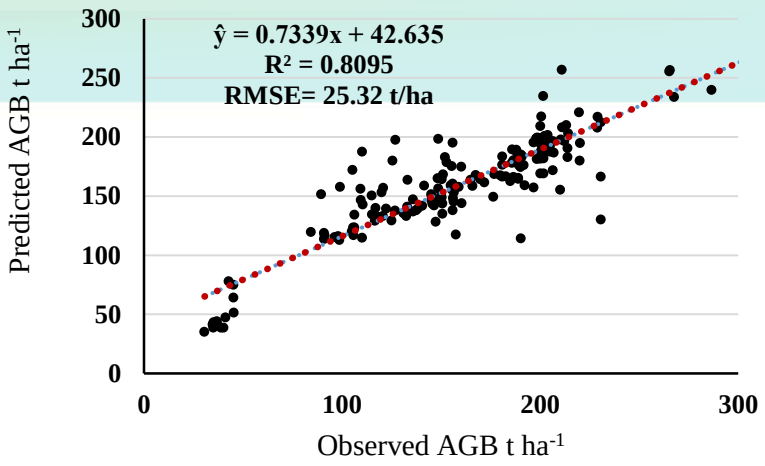
Field based Above-ground biomass

S.N	Forest Name	Total Nos. of plots	Min	Max	Mean	Std dev.
1	Ratomate Deurali BZCF	17	35.87	363.77	133.09	98.27
2	Shrijana BZCF	21	43.25	364.10	159.74	96.56
3	Musha harnimae BZCF	16	40.24	304.64	193.37	92.26
4	Radha krishna BZCF	59	35.75	373.19	149.68	104.60
5	Janahit BZCF	30	54.95	281.75	138.45	52.11
6	Jyamire BZCF	30	62.81	235.57	106.10	31.51

There are not much differences in the average AGB from the field and the value is consistence to the report of MoFSC.

Random Forest Model





Positive values indicates for the small AGB, RF is over predicting.

RESULT AND DISCUSSION

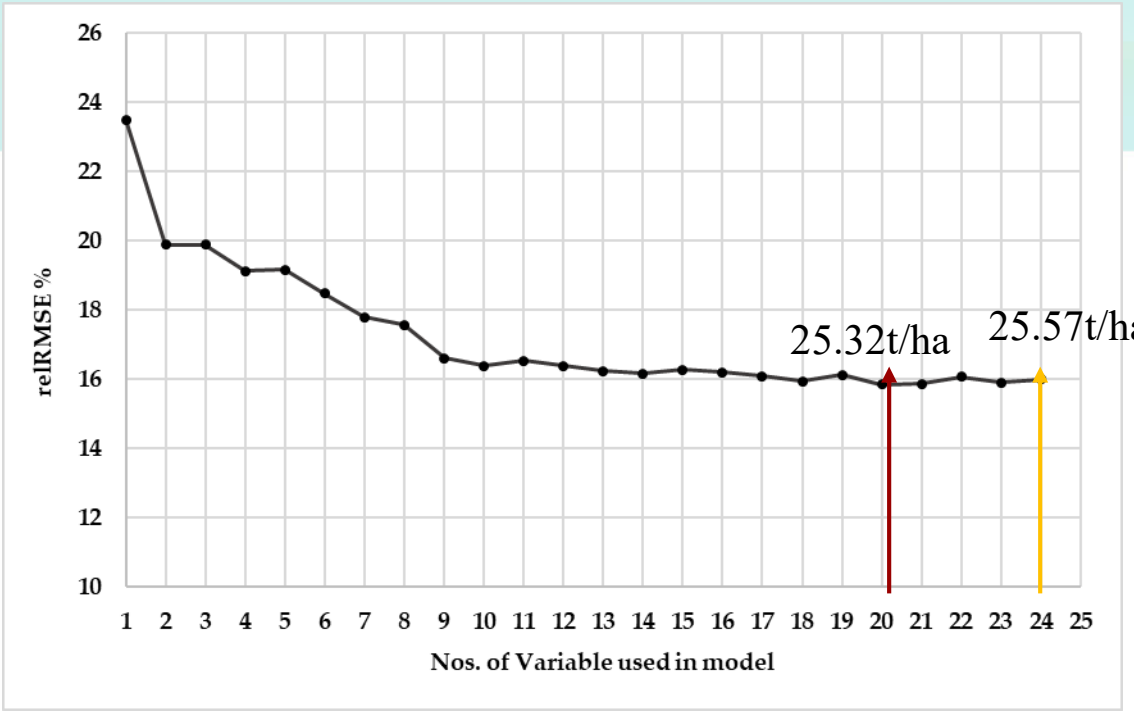
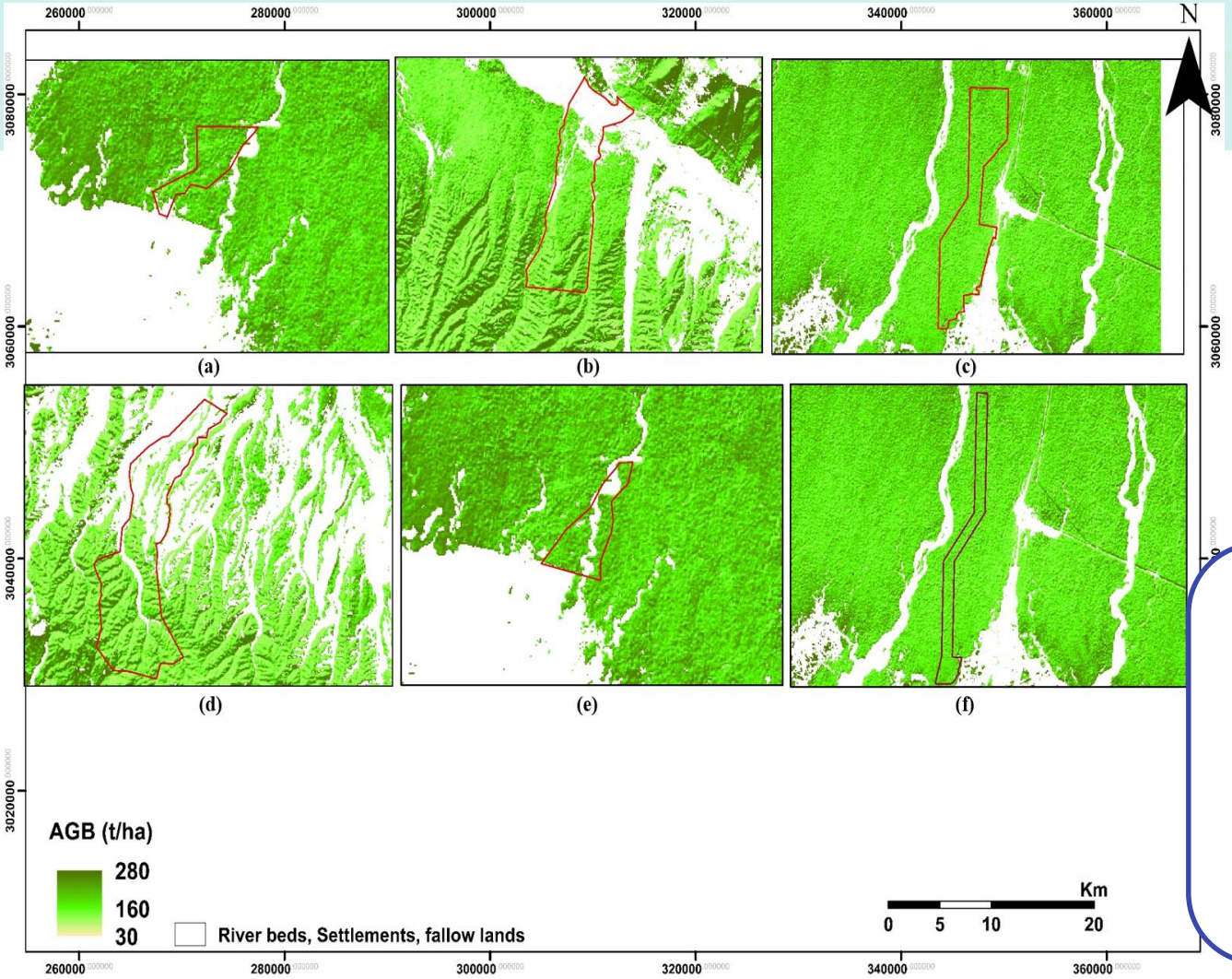


Fig. Relative RMSEs obtained by backward elimination of variables from the Random Forest model

The model using all the spectral bands values and the Vegetation indices was used for mapping the predicted AGB as the backward removal of least important variable did not improve the model performance.

Field based Above-ground biomass



Sentinel-2 data can suitably predict above-ground biomass of sub-tropical forest (small area)

CONCLUSION

Sentinel-2 data can suitably predict above-ground biomass of sub-tropical forest (small area)

Potential of Texture parameters in predicting AGB is our future work.

This method is adaptable to compare the AGB of Buffer zone area Community forest and core area forest where forest data does not exit.

Question or Suggestion are welcome!!!