Monsoon crop biomass estimation using terrestrial hyperspectral imaging

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Introduction

- Lablab, maize and finger millet are the major monsoon crops grown in the region of Bengaluru, India.
- Besides maize, lablab and finger millet biomass estimation are still lacking.
- Hyperspectral remote sensing is an effective tool for crop monitoring and biomass estimation.

Objective

- To assess the potential of terrestrial hyperspectral imaging in estimation of crop biomass for lablab, maize and finger millet.

Methodology

- The study was conducted in rainfed and irrigated experimental fields of University of Agricultural Sciences, Bengaluru, India (Figure 1).
- The terrestrial hyperspectral measurements and biomass sampling were conducted in varying N levels and water supply for lablab, maize and finger millet (Figure 2 and 3).

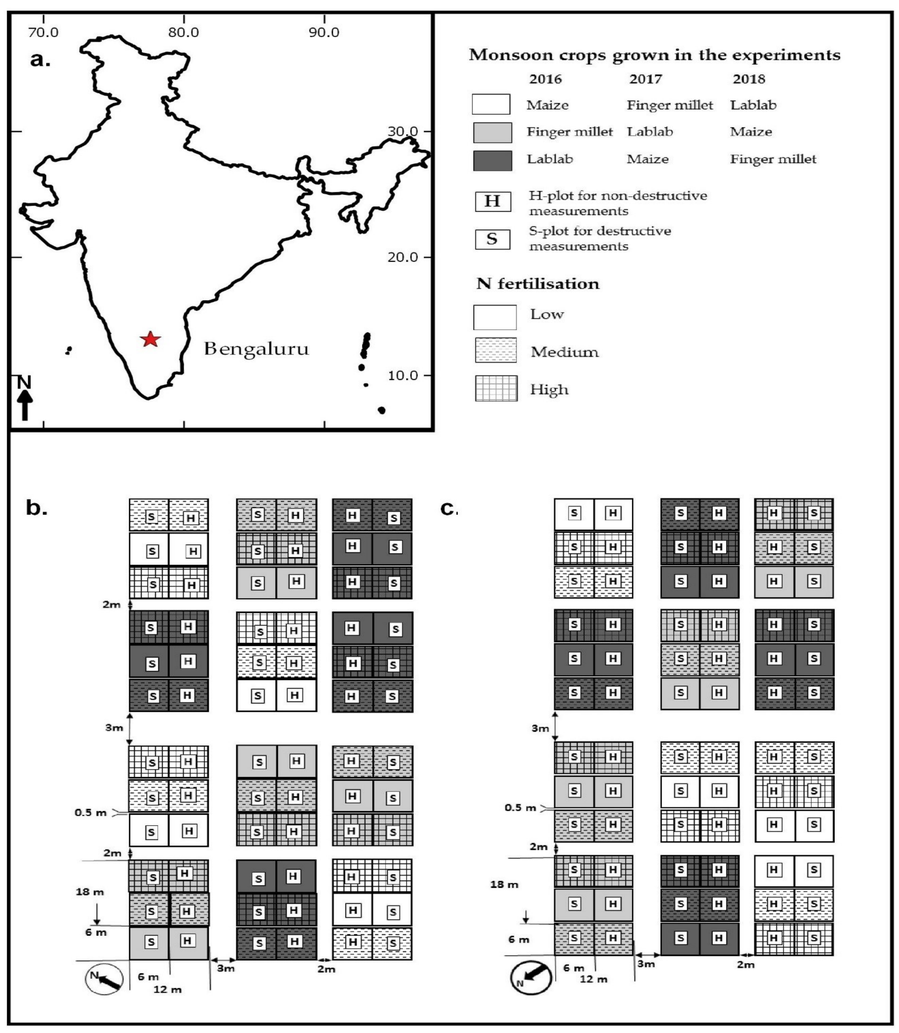

Figure 1. (a) Location of Bengaluru within India; (b) design of rainfed experimental layout; (c) design of irrigated experimental layout

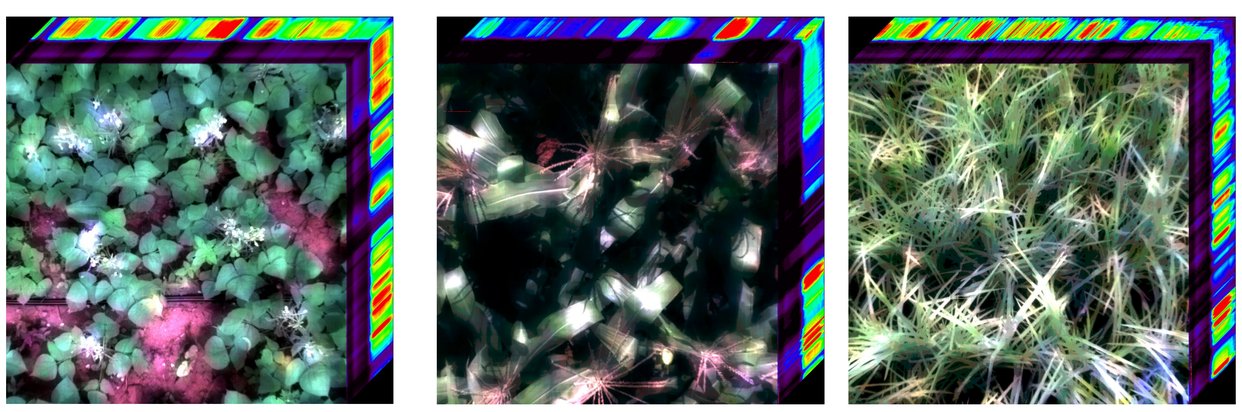

Figure 2. Hyperspectral images of lablab, maize and finger millet.

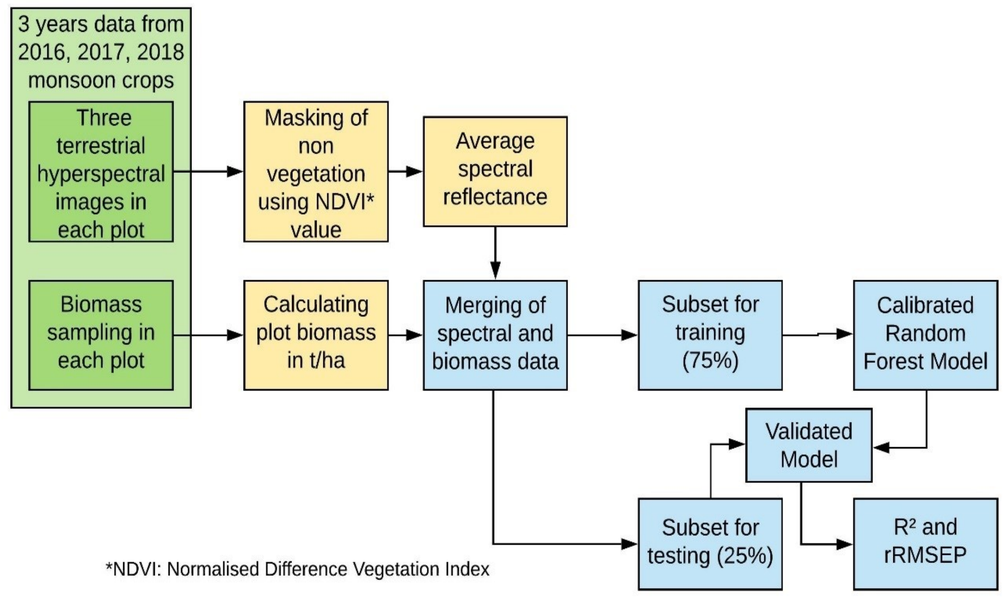

Figure 3. Workflow showing the data collection (green), data preparation (yellow) and data analysis (blue).

Results

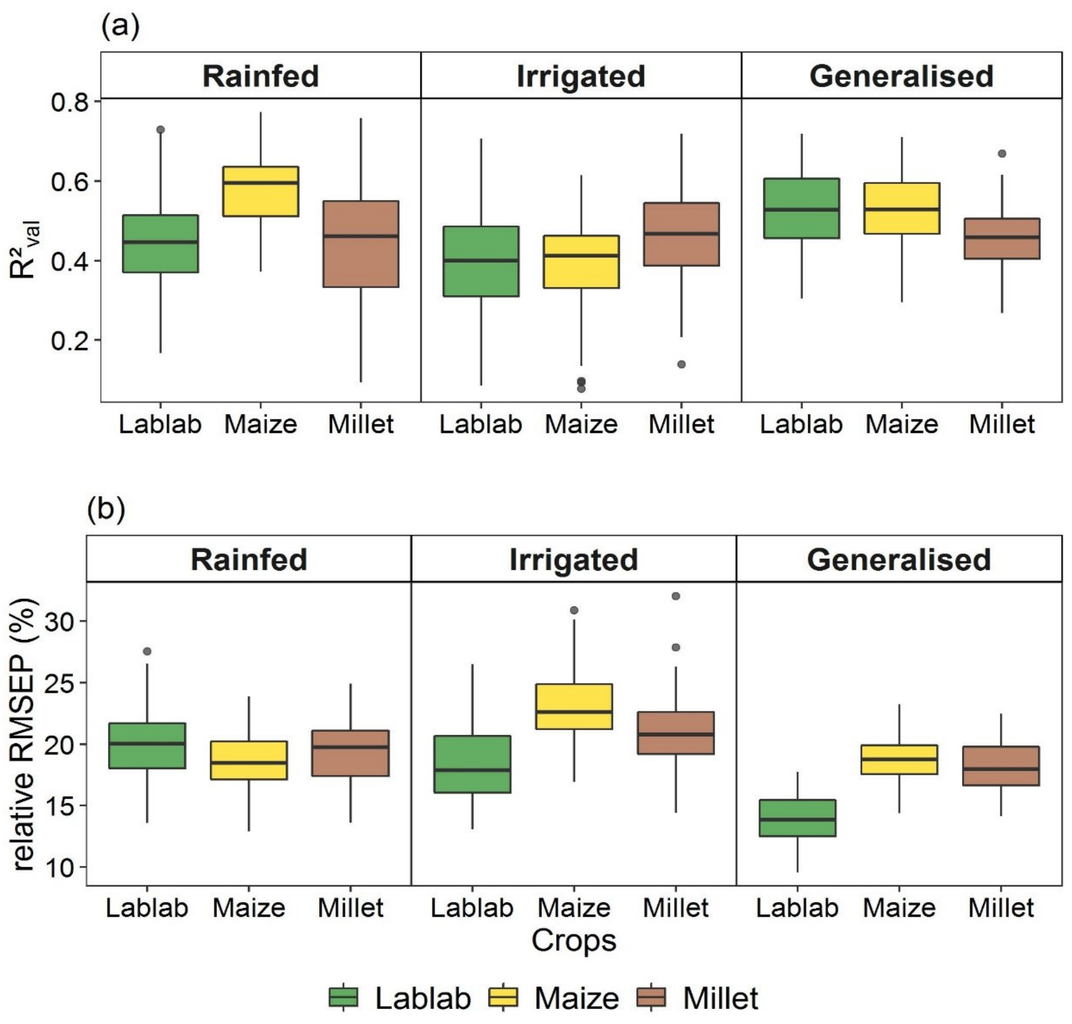

Figure 4. Prediction accuracies R^2 (a) and rRMSEP (b) values of the 100 models for fresh matter biomass of lablab, maize and finger millet.

- The prediction accuracies based on the relative error (rRMSEP) was lower in generalised condition (lablab 14 %, maize 19 % and finger millet 18 %) (Figure 4).

Summary

- Generalised models built on crop data from both rainfed and irrigated conditions, are more robust than water management specific models.
- Sensor data fusion from a combination of sensors may improve the prediction performance.

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