Quantitative and qualitative assessment of pastures in Madagascar using a NDVI and NIRS combined approach

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context

- strong demographic growth (3.5%)
- increase crop lands/decrease pastures
- significant increase consumption animal proteins

forage resource management essential to improve availability and nutritional quality of pastures
objectives

 use satellite imagery for vegetation index (NDVI) to estimate amount of forage available in grasslands at territory level

 near infrared spectrometry (NIRS) to assess forage nutritional quality
material & methods

pasture of *Brachiaria brizantha*

- biomass measured every 15 d (vegetative period) 1.0 m² plots, in conjunction with SPOT 5 images

- prediction model (non linear regression) developed based on correlation between biomass measured in the field and NDVI
material & methods

- fresh forage samples collected and spectral acquisitions carried out directly in the field using portable spectrometer (ASD LabSpec 4)
material & methods

- samples dried, milled and analyzed laboratory to determine N (Kjeldahl) and fiber (Van Soest) content
- predictive models developed correlating spectral data and reference analyzes
- models constructed using a partial least square (PLS) regression and a cross-validation technique
results & discussion

- model results between forage yield and NDVI parameters gave a relatively low correlation coefficient ($r^2=0.64$; $n=39$)

- probably related to
  (i) leaf yellowing
  (ii) plots invaded by weeds
  (iii) variations in atmospheric conditions (clouds, dust, etc.)
  (iv) sampling conditions

![Graph showing yield vs. NDVI](image)

Yield (kg FM / m²) = 1,442.93e 0.82 NDVI – 1,639.07

$R^2 = 0.64$; $N=39$
results & discussion

- models to predict protein, NDF and ADF content of green forage samples were satisfactory

<table>
<thead>
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<th>Constituents</th>
<th>n</th>
<th>Mean</th>
<th>SE</th>
<th>Min</th>
<th>Max</th>
<th>$r^2$</th>
<th>SEC</th>
<th>SECV</th>
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<tr>
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</table>

- accuracy and precision of prediction models for protein content linked to strong absorption of -NH bonds in the IR, and relatively high concentration CP in forages
all models can be improved and we know how to do it!

precision and accuracy of results are essential in research

but in our particular context (Madagascar, etc.) the search of high accuracy is not the only concern (is not the first priority)

discussions allow an advance of our knowledge about the system and to propose (instantaneous) solutions to the many challenges farmers are faced
Thanks for your attention