VISUAL ESTIMATION OF THE LEAF AREA INDEX (LAI) IN COFFEE FIELDS

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Introduction

- The Leaf Area Index (LAI) is a very useful parameter to understand the canopy of the coffee crop and to aid in field decision making. It is simply calculated as the total leaf surface divided by the corresponding soil surface.
- In coffee culture, it can be useful to adjust irrigation requirements (Gutiérrez & Meinzer, 1994), optimize foliar spray of formulations (Siegfried et al, 2007), or estimate ecological services provided (Taugourdeau et al, 2017). However, precisely determing the LAI can be challenging at field level, as instrument based approaches can be expensive and still have relatively low accuracy.
- Thus the objective of this work was to develop and evaluate a methodology for the visual assessment of LAI, as a quick and easy method to aid on-farm decision.

Matherials and methods

We conducted four rounds of LAI estimations at La Hilda State Coffee Farm (Poás, Costa Rica) using:

- Direct defoliations method ("Real LAI")
- Two instruments (LAI 2200-C and Accupar LP-80)
- Visual estimates from 5 workers. This was done twice per cycle (with 15 days between evaluations) and, after each round, workers received feedback on their performance.

Statistical Analysis:

- Repeatability and reproducibility of visual estimates
- Adjustment to the identity function between direct methods and visual estimateor instruments ($\beta 1 = 1$ and $\beta o = 0$).
- Determination coefficient (R^2).

Results and Disccusion

- Visual estimates were adjusted to the linear regression model in most cases (with $\alpha = 5\%$). and evaluators improved their capacity to visually assess LAI throughout rounds (Fig. 1).

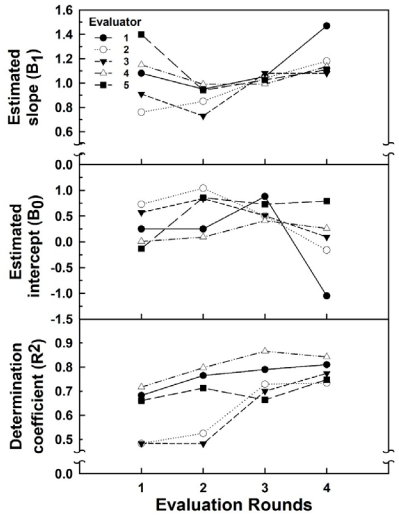

Fig 1. Estimated slope value ($\beta 1$) estimated intercept value (βo) and determination coefficient of the simple linear regression model of the visual estimation of LAI of five evaluators with respect to actual LAI.

- High repeatability and reproducibility in the visual method was observed, as variance attributable to the estimator and the estimation event was low (> 5%).
- Instrument evaluation of LAI produced values of R^2 between 0.5 and 0.6, with significant underestimation bias, and did not conform to the linear regression model.
- The performance of the different methods is discussed in the context of widely spaced coffee hedgerows.

Conclusions

- We here show an easy, affordable and reliable method for estimating LAI in coffee, so that it can be incorporated as a decision tool in farm management.

References

- Gutiérrez, M., and F. Meinzer. 1994. Estimating water use and irrigation requirements of coffee in Hawaii. J. of the Amer. Soc. for Hort. Sci. 119(3):52-657.
- Siegfried, W. *et al.* 2007. Dosage of plant protection products adapted to leaf area index in viticulture. Crop Protection 26(2):73-82.
- Taugourdeau, S., *et al.* 2014. Leaf area index as an indicator of ecosystem services and management practices: an application for coffee agroforestry. Agr., Ecosystems & Env. 192:19-37.

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