Organoleptic quality of Ethiopian Arabica coffee deteriorates with increasing intensity of coffee forest management

Lore Geeraert[1], **Gezahegn Berecha**[2], **Olivier Honnay**[1] & **Raf Aerts**[1]

[1] Plant Conservation and Population Biology, University of Leuven, Leuven, Belgium

[2] Department of Horticulture and Plant Science, Jimma University, Jimma, Ethiopia

Natural coffee forest (NCF)

Small coffee agroforest (SCA)

Figure 1. Transformation of natural forest to coffee agroforestry systems. Competing understorey vegetation is removed and trees are selectively cut, with selection for preferred shade providing species.

Introduction

Arabica coffee (*Coffea arabica* L.) is native to the moist montane forests of Southwest Ethiopia. Most of these forests have been transformed to coffee agroforestry systems to increase coffee productivity. In these systems, only a few selected canopy trees remain to provide shade to the cultivated coffee shrubs (Fig.1). Increased light conditions and associated changes can affect Arabica coffee bean quality.

For the first time in Southwest Ethiopia, place of origin of *C. arabica*, we assessed the effects of overall forest management on organoleptic quality.

Methods

20 study plots, 3 levels of forest management intensity

- NCF: Natural Coffee Forest (7 plots)
- LCA: Large Coffee Agroforest (> 200 ha) (6 plots)
- SCA: Small Coffee Agroforest (< 26 ha) (7 plots)

Main variable of interest

- Organoleptic quality → mature coffee berries

Potential confounding factors

- Coffee genetic variability → coffee leaves
- Soil nutrient availability → soil samples
- Altitude → GPS coordinates

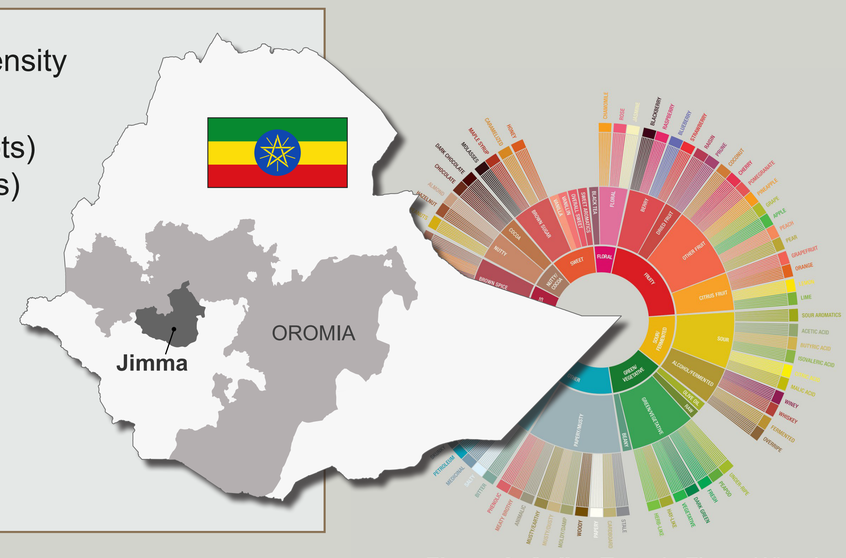

Figure 2. Coffee Taster's Flavor Wheel by SCA and WCR.

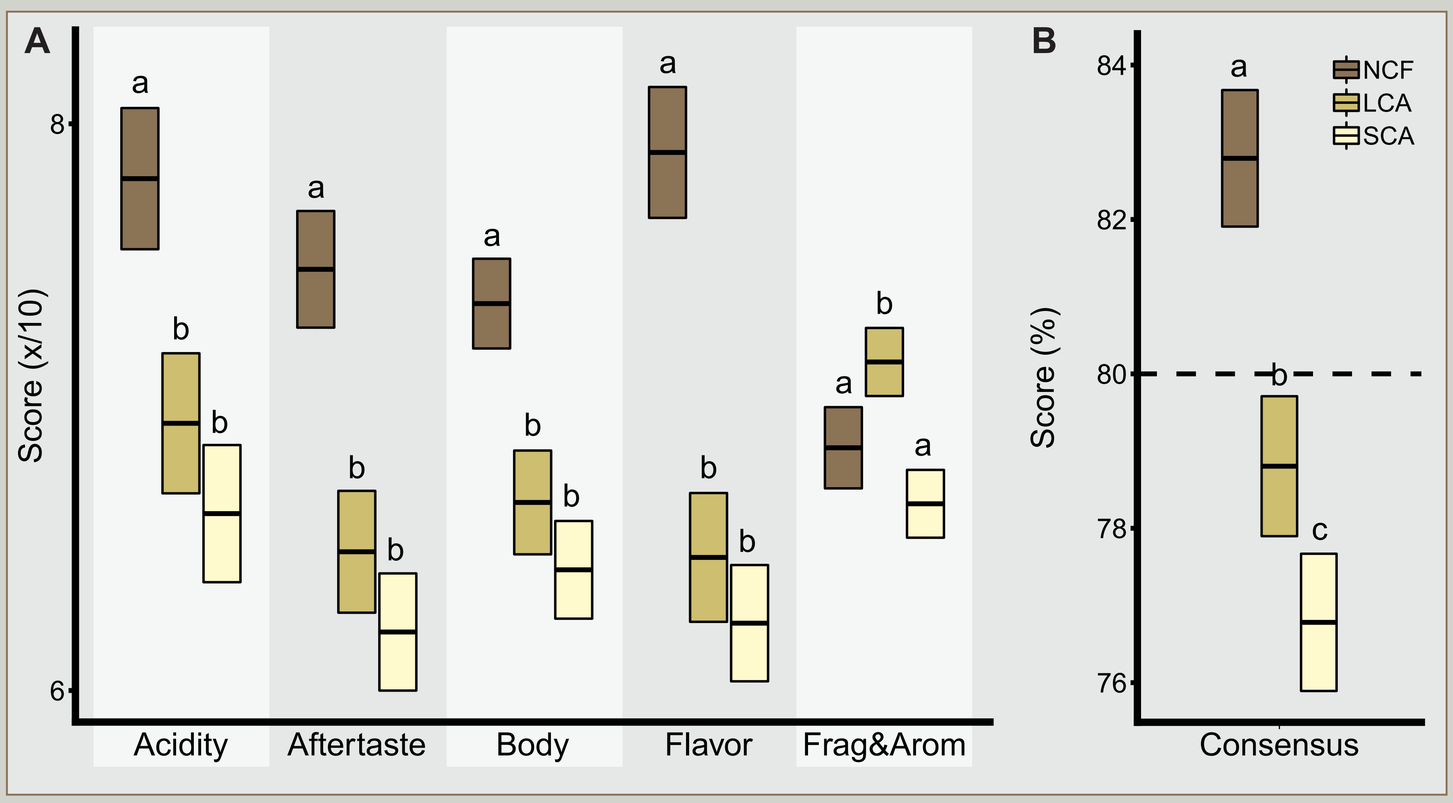

Figure 3. Influence of forest management intensity on Arabica coffee organoleptic quality in SW Ethiopia. **(A)** Individual quality attributes, valued on a 10-point scale. **(B)** Quality consensus score, valued on a 100-point scale. Only coffee with a consensus score ≥ 80 points (dashed line) can be considered Specialty Coffee. Boxes represent 95% confidence interval, horizontal lines within the boxes represent estimated marginal mean values. For each quality attribute, different letters indicate significant differences between the three forest management intensity levels. NCF: natural coffee forest, LCA: large coffee agroforest, SCA: small coffee agroforest.

Results

- Natural forest → coffee agroforest : organoleptic coffee quality ↘
- Forest management ↗ in agroforest : organoleptic coffee quality ↘
- Natural forests (low yield) = Specialty Coffee
- Agroforestry (high yield) = regular coffee

Specialty Coffee Association

Conclusions

- Arabica coffee production: quantity ↔ quality trade-off
- Shade levels ↘ + changes in micro-climate & biotic interactions: organoleptic coffee quality ↘
- Conservation challenge for Ethiopian natural forests
- Conservation challenge for *C. arabica* genetic resources

About the author:

Doctoral researcher (2015-2019) University of Leuven, Belgium
Ecology, Evolution and Biodiversity Conservation

PhD research: *Effects of agricultural intensification on Arabica coffee yield in SW Ethiopia*

lore.geeraert@kuleuven.be

About the research:

Geeraert, L., Berecha, G., Honnay, O., Aerts, R., 2019. Organoleptic quality of Ethiopian Arabica coffee deteriorates with increasing intensity of coffee forest management. *Journal of Environmental Management*. 231, 282–288.

doi: 10.1016/j.jenvman.2018.10.037

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Acknowledgements:

Coffee leaf samples were collected in the framework of the Institutional University Cooperation Program of Jimma University (permit IUC-JU/725/08 of 12/08/2008) and analyzed in Belgium as requested by Jimma University's Office for Academic and Research Affairs (Ref. No. JU 51/900 of 21/01/2009). The samples are not within the scope of EU ABS regulation.