Transitioning From Sun-Grown System to Shade-Grown System of Coffee
. A Bioeconomic Model

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Problem:

Coffee is the main export commodity of many tropical nations. Many coffee farmers in this region now face the uncertainty associated with climate change. Warmer temperatures are expected to negatively affect the sustainability of coffee production. Evidence indicates increasing levels of infestation by insects leading to a decrease in coffee yields and farm revenues.

Fondo Nacional del Café

Recommended solution:

Agencies and scientists have proposed transitioning from sun-grown to shade-grown coffee system, by planting shading trees on the farm, as a response to increased infestations.

Such transition would provide many ecosystem services: shade trees provide pest control services, crop growth services through improved soil fertility, and timber.

However, depending on prices and other factors the recommended shading levels might not be affordable to coffee smallholders (Atallah, Gomez, and Jaramillo, *In review*).

How robust is this solution?

Here, we conduct computational sensitivity analyses and parameter variation experiments to identify the bio-economic conditions for which the recommendation of transitioning to a shade-grown system is cost-effective for coffee smallholders.

L. Shyamal, Hypothenemus hampei

Palmer Neil, FLICKR,

Hoffmann James, Coffee bean (infested)

Maeen Hura, Coffee Berry

Coffee Berries © Biodiversity International via Flickr (License CC-BY-NC-ND 2.0)

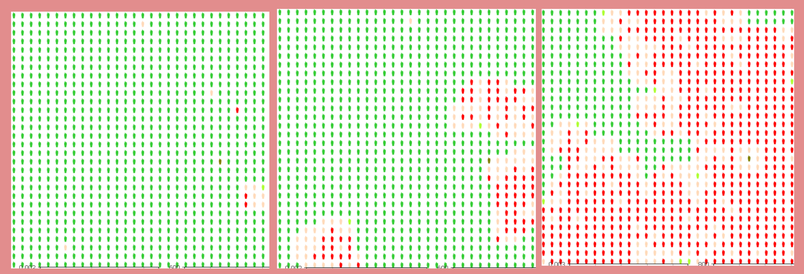
Lisa Monon, Coffee bean with parchment.

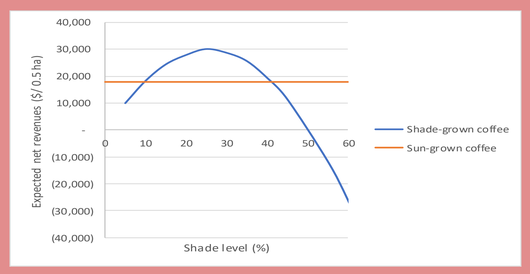
Wrigh Michael, 2004

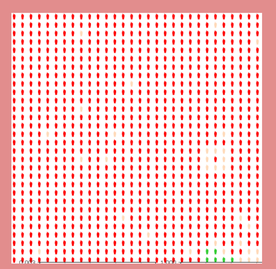
Methods:

1. Use software Anylogic to conduct 300 runs of the computational bioeconomic models of Atallah, Gomez, and Jaramillo (*In review*).
2. Adjust various input, and parameters like initial infestation rate, temperature, shading levels, prices, discount rate.
3. Obtain simulated data on the net discounted revenues reduction as a function of increase levels of shade, for each parameter value, holding other parameters values constant.

Data and Observations:







The Coffee Museum, Santos, Brazil.

Lin Brenda, Chiapas, Mexico.

Results and Discussion:

Although, in terms of fending off coffee berry borer, the shade-grown method is far superior than its sun-grown counterpart, its economic advantage is limited to a shade range of 10-40%.

This range of shading, according to this research, is highly dependent on the premium price. If the consumers are willing to pay a higher price premium, this will compensate for the fixed cost of planting and maintaining shade tree, and make for a smoother transition for the farmers.

This shading range of shading is also sensitive to the fixed costs and farm size.

Jessica Weiss, Coffee farmers from Columbia

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