Agroforestry cocoa in the Dominican Republic
Biodiversity and profitability

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BIODIVERSITY

It is the complete variety of living organisms that inhabit the planet, the relationships between them and the environment in which they grow and live. Biodiversity, in our case, is a national asset and heritage, its correct management benefits the whole society.

The cocoa agroforest is an excellent livelihood where a wide diversity of living organisms are developed, making it our most important agroforest, and it is no longer simply a productive activity aimed at economic benefit, but a matter of survival for our country and our neighbor Haiti. Therefore, a proper management ensures sustainable use (genes, species and ecosystems), conservation and protection of animal and plant species, habitats and microclimates, as well as water sources, thus contributing to our countries’ development.
Key concepts: Agroforestry and agroforestry systems

**AGROFORESTRY**: land use that meets 3 fundamental conditions (Somarriba, 2003):

1. **at least TWO plant species** interact biologically.
2. **at least ONE is a WOODY perennial species**.
3. **at least ONE plant GROWN** for agricultural purposes (including pastures).
Ecological and structural complexity gradient

Simple agroforestry cocoa

Cocoa agroforest

Credits: O. Deheuvels – CIRAD, UMR ABSys
**Key concepts:** Farmed biodiversity and ecosystem services

A service that PROVIDES multiple products

**Farmed biodiversity** is the result of choices made by farmers in a given context.

The richness and type of selected plant species will provide a diversity of ecosystem services.
The case of Dominican cocoa

Diagnosis carried out between 2015 and 2017 to characterize cocoa production in three provinces: Duarte (56 families), El Seibo (50 families) and San Cristóbal (42 families), with one cocoa plot recorded per family.
Cocoa plantations grow over 60 species in association with cocoa, including 9 most frequent ones that account for 94% of the associations. Additionally, there are 20 very rare species. The graph illustrates the percentage of self-consumption, sale and self-consumption, and service plant (shade, humidity, N2 soil fertilization). 94% of plants associated with cocoa is not harvested (low price). Source: Deheuvels, 2015.
Small plots!

Source: Deheuvels, 2015
Figure 13. Répartition des cacaoyères enquêtées par classes d'âges en République dominicaine

- Juvéniles (4-13 ans)
- Matures (13-25 ans)
- Vieillissantes (25 ans et plus)

Mostly old plots!

Source: Deheuvels, 2015
Figure 14. Age and density of cocoa plants in 148 Dominican plots.

Source: Deheuvels, 2015
Cartography of a 1.44-hectare plot in the province of Duarte

- 1,304 cocoa plants >1 m (density > 905 cocoa plants/ha),
- 84 associated plants of total size > to cocoa (32 poppies, 29 bananas & plantains, 12 avocados, 3 sweet orange and 8 fruit trees (1 sapote, 1 breadfruit, 1 plum), + 2 parasites (1 ficus, 1 copey), 1 sandbox tree, and 1 tulip tree.

Source: Guichard, Deheuvels & Saj. 2022.
Dominican cocoa plantations

Cocoa plants with:
- Different ages;
- **Heterogeneous and unknown** genetics (productivity, sensitivity, pollen compatibility...);
- **Random and heterogeneous** spatial distribution;
- Poor plot management.

> 60 plant species associated with:
- Different ages
- **Improvable** genetics
- **Random and heterogeneous** spatial distribution;
- No plot management
Dominican cocoa plantations

3 broad types (A, B and C) based on:

- Management intensity
- Characteristics (structure, functions) of the biodiversity of farmed plants

The case of Dominican cocoa

Mejores G.I. ≈ 7,000 USD/ha/year ≈ 583 USD/ha/mont

How to improve annual income?

GI: Global Income (= CI + POI + AVC)
CI: Annual income generated by cocoa.
POI: Annual income generated by associated products.
AVC: Annual value of self-consumed products.

Case study: Medina-Jamey

Conditions to improve economic sustainability:

- Diversity
- Quantity
- Favorable market
- Good monthly distribution

Average annual production volume (pounds/year) of cocoa producers in Jamey and Medina (San Cristóbal), in decreasing order
Case study: Medina-Jamey
Estimation of volumes produced by species associated with cocoa

Estimation of sale value of the total production of each species of AFS Cocoa (average market prices and sale hypothesis of 100% of the production).

- **Total value obtained from the set of associated products greater than from cocoa,**

- **In the Jamey area, where there is greater diversification,** the total sale value of cocoa-associated products doubles that of cocoa.
Case study: Medina-Jamey

Estimation of volumes produced by species associated with cocoa

- Greater dependence on cocoa income in Medina, where systems are less diversified
- Significant income in Jamey in times of non-cocoa production, thanks to the diversification of cocoa

AFS
Case study: Medina-Jamey

Estimation of volumes produced by species associated with cocoa

### Products that are Sold
1. Avocado
2. Bitter orange
3. Sweet orange
4. Tangerines
5. Lemons
6. Banana and Rulo (Jamey)
7. White yautía

### Products that are self-consumed
1. Avocado (Medina)
2. Grapefruit
3. Banana
4. Plantain
5. Rulo
6. Breadfruit (Medina)
7. Pineapple
8. Sapote (Medina)
9. Yellow Yam / Diablon
10. Purple yautía
11. Ginger

### Unharvested products (= that are lost)
1. Breadfruit (Jamey)
2. Sapote (Jamey)
3. Diablon Yam (Jamey)

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**How to improve annual income?**

1. **Choose** associated species for their market value.
2. **Ensure volumes** of critical products (= choose the appropriate number of species and plants per species).
3. **Establish a good planting pattern.**
4. **Train producers in AGROFORESTRY management of the group of species.**
“It takes a village to raise a child”
African proverb

"Il faut un village pour élever un enfant"
Proverbe africain

THANK YOU VERY MUCH
Merci beaucoup