The BarCo project: for the promotion of barrier crops to curb the expansion of the Cocoa swollen shoot virus in Côte d’Ivoire (June 2018 – December 2020)

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Survey 2008-2016 (Aka et al., 2020)

300,000 Ha infected in 2018

Government program for cutting and replanting: 100,000 Ha by 2022

Insect vectors: mealybugs, omnipresent in cocoa plantations

BarCo CSSV, an expanding disease in Côte d’Ivoire
How to curb the spread of CSSV in CI?

Implement a set of cocoa plantations surrounded by barrier crops for **experimentation and demonstration**

Optimize innovation adoption by beneficiaries through a "**Living Labs**" approach including trainings

Improve and promote the use of barrier crops when replanting in CSSV infested areas

Characterize **barrier effect** on virus propagation and mealybug dispersion

Inventory of mealybug **natural enemies**

**BarCo**
Mechanisms of barrier effect

CSSV

Mealybugs

Parasitoids

Ladybirds

Dispersion

Ex: Coffee

BarCo
14 plots (4 ha) implemented in June 2019

Cocoa infected by CSSV

2 demonstration plots, 4 plots with coffee barriers, 4 plots with *Acacia mangium* barriers, 4 control plots with barrier crops replaced by cocoa
A “Living Labs” approach

✓ A functional collaboration platform with the farmer cooperatives SCAPB and SOCANC (≈ 700 cocoa farmers)

✓ Cooperatives, as partners of the project, in charge of most of field activities

✓ Involvement of farmers in plot implementation and maintenance
✓ CSSV symptoms appeared in 1 plot in June 2022 (2 years after planting)

✓ A control plot (barrier crop replaced by cocoa)

✓ Symptoms appeared mainly on cocoa in contact with old infected plantations
Results from the most infested plot

✓ Mealybugs *Pseudococcus longispinus* and *Ferrisia virgata*, early present on cocoa, but in small populations

✓ *Formicococcus njalensis*, first recorded in November 2020 and dominant from then

✓ *F. njalensis* populations first aggregated in a restricted area on the border of the plot

✓ Progressive invasion of the plot from an area in contact with the coffee barrier
Results from BarCo & Cocoa4Future projects, in different cocoa production areas of Côte d’Ivoire

- More than 30 morphospecies collected in Côte d’Ivoire (identification in progress)
- Parasitism rate > 10% in some sites
- Genera *Aenasius* sp. and *Anagyrus* sp. dominant among parasitoids and of interest for biological control
Coffee                       Cocoa
300 farmers trained

A wide acceptance of the innovation by farmers
A survey of farmers to improve innovation

What barrier crops would you use?

- Oil palm
- Cashew tree
- Garcinia kola
- Rubber tree
- Coffee
- Irvingia gabonensis
- Teak
- Avocado tree
- Terminalia superba
- Gmenila arborea
- Acacia
- Xylopia aethiopica
- Bixa orellana
- Terminalia ivorensis
- Mango
- Tieghemella africana
- Jatropha
- Ricinodendron heudelotii
- Bixa orellana
- Terminalia ivorensis
- Mango

https://forestcenter.iita.org/

Sanial Elsa, 2017
What next?

✓ For a better characterization of barrier effects:
   Since January 2021, the Cocoa4Future EU project (2020-2025) ensures plot maintenance and observation continuity, for 4 years more

✓ For a better inclusion of cocoa farmer expectations:
   Cocoa4Future project includes activities on co-conception of innovations with farmers

Production system sustainability and new dynamics of cocoa industry

- February 2020 - January 2025
- Funded by EU (DeSIRA) and AFD
- Total budget = 7 000 000 €
- ≈ 700 000 € for activities on CSSV
Many thanks!

https://barco.cirad.fr/