EFFECT OF PLANT DIVERSITY ON THE GLOBAL PRODUCTIVITY OF AGROFORESTRY SYSTEMS IN TALAMANCA COSTA RICA

Ricardo Salazar
Philippe Tixier

EURAF MONTPELLIER 23 MAI 2016
Complex AFS in Talamanca
How plant diversity alter the performances of the system?

Resource partitioning (mainly light and nutrients) explains ‘agronomic’ performances of AFS.

At testing by standardized measurements, the effect of the plant diversity, spatial structure and dynamic production of AFS performances.
Experimental site

Over a network of 20 plots (30m X 30m = 900 m²) that cover a wide range of diversity and spatial organization, we measure:

- The spatial structure of the cultivated plants
- The dynamic of production of each plant during 3 times every six month
- Leading to a dataset including 2367 plants
Plant diversity classified by use groups:

**Banana:**
5 different varieties of *mussa* spp.

**Cacao:**
2 genetic groups:
- hybrid
- creole

**Timber:**
11 different species:
- *Cordilia alliadora* (83%)

**Firewood:**
18 different species:
- *Inga* sp
- the most important

**Fruits:**
27 different species of tropical fruits
Spatial structure in a large gradient of diversity
Productivity

Kg/ha
Kg/ha
m³/ha
m³/ha
Kg/ha or units/tree

Local $ market

Potential Incomes

- Measured productivity methods change according to the group
Potential incomes

• Banana and cacao represents the commercial crops while fruits, timber and firewood were considered complementary crops.

• Fruit production represent a large part of potential incomes, BUT most of the cases are used for local consumption.
We used a linear model to test the significance of the Functional Diversity on the incomes from all plants.

Incomes from all plants

\[ p = 0.00023 \]
Incomes from banana

Incomes from cocoa

p = 0.00324
Hypothesis of the effect

• Complementation of resources as nutrients and light in a complex AFS (+)

• Competition for specializes crops as banana and cacao (-)
Conclusions

• This study supports a strong basis to build more process-based models to go further to better understand the effect of diversity on agronomical and economical performances of AFS.

• To discuss their relevance according to farming constraints.
Merci pour votre attention