Alternative weed management in organic banana agrosystems

S. Lakhia, M. Dorel, R. Achard
Contact: steewy.lakhia@cirad.fr
Introduction

• Banana monoculture
Experimental approach

Diagnosis of current weed management practices
- Feedback on projects and experimental devices

Proposal of objectives for the design of cropping system without herbicides
- Definition of a constraint framework

Prototyping with steering decision rule
- Participatory workshop
Experiment 1 Evaluation of alternatives to herbicides for weed control

- 3 treatments:
  - **Dem**: Manual selective weeding
  - **Gyr**: Mechanical weed control by a rotary mower hitched to a micro-tractor
  - **Deb**: Mechanical weed control by a brush cutter

→ The application of practices + the shade of banana trees modify the plant cover

Initial vegetal cover: 98% *Brachiaria mutica*
Experiment 1 modification of the vegetation cover

Dem: Manual selective weeding

Paspalum conjugatum

Commelina diffusa
Experiment 1 Evaluation of alternatives to herbicides for weed control

**Gyr:** Mechanical weed control by a rotary mower hitched to a micro-tractor
Experiment 1 modification of the vegetation cover

Deb: Mechanical weed control by a brush cutter

Paspalum conjugatum

Axonopus compressus

Commelina diffusa
Soil infiltration rates in treatment Dem and Deb were not significantly different but the two were higher than treatment Gyr.

In the Gyr mode, Repeated passages of machines (light, low pressure tires) cause a compaction of the surface of the ground:

- Reduces the speed of water infiltration into the soil.
- Eventually causes a loss of fertility of the plot.
Experiment 2

- Evaluate the agro-environmental performance of the banana cropping system + cover crops:
  - Banana + *Arachis pintoï*
  - *Banana* + *Paspalum notatum*
  - *Banana* + Bare soil
Experiment 2 : Plan growth

• Stronger growth of banana trees in the banana/bare soil and banana/Arachis pintoï modalities compared to the banana/Paspalum modality

• Banana trees grown on Arachis pintoï cover and bare soil show significantly higher levels of nitrogen nutrition than those grown on Paspalum notatum
Experiment 2 : Plan growth

• Root density of Paspalum notatum is much greater than that of banana.

• Root density of Arachis pintoï is equivalent to that of banana.

→ Paspalum notatum exerts significant competition on the banana tree : The root system explores the soil more intensely, which allows it to extract nutrients from the soil more easily.
Prototype 1
weed management by herbivory

• Sheep ability to provide a sufficient weed control without damaging banana plants or the suckers?
• Impact on the soil fertility, specifically on soil structure, return of nutrients by animal droppings?
• what about contamination at chlordécone?
Prototype 2
weed management by covering

- Result after 1 month coverage
Conclusion

• Mowing techniques select prostrated plants over time. Unfortunately, the frequent passage of vehicles for this management induced soil compaction.

• Cover plants (legumes) contribute to the nitrogen nutrition of the banana plantation. However, their implantation is costly.

• Prototypes (sheep and opaque films) seem to be interesting alternatives that should be validated experimentally.

• Bringing animal biodiversity back into banana agrosystems seems an interesting way to bring more autonomy to farmers who are heavily dependent on organic fertilizers.
Thank you for your attention !!!