



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



Initial vegetal cover: 98% *Brachiaria mutica*



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

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



Cyperus esculentus





Nautilocalyx melittifolius



Paspalum conjugatum



Deb: Mechanical weed control by a brush cutter



Paspalum conjugatum





Axonopus compressus



Commelina diffusa



Experiment 1 Infiltration

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.





Experiment 2

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



Arachis pintoï



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.

figure 6a : Root density Banana / Paspalum









Prototype1 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 ?





Prototype2 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 !!!



Agroecology ★ Banana ★ Plantain ★ Pineapple

