Cover crops in organic-export banana systems: Farmer experiences and soil health in Ecuador

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THE USE OF LEGUMINOUS COVER CROPS IN BANANA
Smallholder growers globally produce most of the organic export bananas, a sector which continues to experience increasing demand (1). These growers have only limited financial resources and face increasing costs for nutrients which meet organic certification. The use of leguminous cover crops is among the alternatives for agroecological intensification for organic production with both potential benefits and costs (2). Among the benefits are:
- increased nitrogen fixation and organic matter production,
- soil protection and improved soil physical and biological properties
- weed suppression and potential habitat for beneficial organisms,
- leguminous cover crops for the “greening” conventional bananas.

Cover crops may generate additional costs:
- seed, planting and maintenance
- lowered efficiency of other routine practices such as harvest
- host to new pests.

OBJECTIVES: grower experiences and soil benefits
- Document banana grower experiences in the use of cover crops.
- Measure soil properties comparing plots with and without the tropical leguminous cover crop Pueraria phaseoloides.

METHODS USED: interviews and field measurements
- Identification of growers with current and past experience in the use of cover crops in organic and conventional banana
- Validation of interview guide to capture grower motivation and experience with the use of cover crops
- Interviews in 12 banana growers with farms in Guayas, El Oro and Los Ríos who have used or currently use cover crops
- Measurement of soil indicators in banana plot with and without cover crops on 6 farms. Indicators included banana productivity, banana root mass, pH, ratio of bases, infiltration, compaction, bulk density, % ground cover, labile carbon, % organic matter, plant parasitic nematodes, free living nematodes (3, 4).

RESULTS: grower experiences
Growers identified diverse reasons for experimenting with cover crops. The most important motivation was to control weeds (6 growers), while others introduced legumes based on the experience of their neighbors (3) or at the suggestion of certifiers (2). One grower introduced cover crops to improve plant performance with a shift to organic production.

In terms of benefits from cover crop use, 58% of growers using kudzu identified a 50-60% reduction in weed control costs, 16% estimated a reduction of 20-30% and the remaining 26% saw no difference in costs. Of the 12 growers, 9 suggested that plots with leguminous cover crops had more vigorous plants, while 3 growers from bigger bunchers.

RESULTS: soil health indicators
In a comparison carried out in 1 plots of plots with and without cover crops, increases in N, P, K and organic matter were found. A slight increase in labile carbon plots in plots with P. phaseoloides was found, while compaction was reduced. Bulk density and infiltration rate were slightly improved in controls.

Table 1. Soil data comparing plots with and without kudzu in organic banana.

<table>
<thead>
<tr>
<th>Management system</th>
<th>N</th>
<th>P</th>
<th>K</th>
<th>Labile carbon</th>
<th>MO</th>
<th>Apparent density (g/cm3)</th>
<th>Infiltration (cm/h)</th>
<th>Compaction (Newton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without Kudzu</td>
<td>8</td>
<td>31</td>
<td>203</td>
<td>1105</td>
<td>2.2</td>
<td>1.25</td>
<td>0.03</td>
<td>567</td>
</tr>
<tr>
<td>With Kudzu</td>
<td>10</td>
<td>76</td>
<td>311</td>
<td>1187</td>
<td>2.5</td>
<td>1.26</td>
<td>0.02</td>
<td>500</td>
</tr>
</tbody>
</table>

Table 1. Soil data comparing plots with and without kudzu in organic banana.

Further analysis is pending with data on nematode communities, but comparison of species (Figure 1) showed a reduction of root knot nematodes (Meloidogyne spp.) with cover crops. However, in the first sampling Helicotylenchus sp. population was high. The beneficial nematode Rhaditris sp. and saprophytic nematodes were slightly higher with cover crops indicating a trend to improved soil health.

REFERENCES

CONCLUSIONS
- Although only a small minority of growers have experimented with or currently use leguminous cover crops, they consider the practice effective economically and biologically.
- The soil health indicators indicate positive contributions which support grower views on cover crop use. However, data from more plots are needed as well as measurement of kudzu biomass contribution and costs.
- Nematode community indices will provide insight into biological effects.
- Further studies are needed on cover crop water use, nitrogen and biomass contribution and its role as habitat for pests and beneficials.