FOUR-YEARS OF EXPERIMENTATION ON COTTON UNDER MULCH BY NORTH CAMEROONIAN FARMERS

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DMC under ESA project

Since 1994 Sodecoton1, through the DPGT2 and ESA3 projects, has popularized several techniques for soil fertility maintenance on over 150,000 ha in the north of Cameroon (Sadou et al., 2005): This include anti-erosion management (weeded bands, stone lines and reach,...), leguminous trees planting and preservation in cultivated fields (preservation of Acacia albida tree), promotion of organic manure. In addition to these large scale extension actions, conservation agriculture was experimented through cropping systems improvement approach developed by CIRAD, commonly named DMC (Direct seeding - Mulch-based - Cropping systems). 2001 to 2005 was mainly a period for designing (DMC) techniques. During these four years, more than 70 farmers have tried DMC on their fields.

The cotton- cereal rotation

The cotton – cereal rotation is common in northern Cameroon. It was the basis for the first DMC systems. In the first year, cereal (sorghum, maize, millet) is intercropped with a cover crop (Brachiaria ruziziensis, Mucuna pruriens, Dolichos lablab, Crotalaria retusa, Vigna unguiculata). These combinations make it possible to double the quantity of produced biomass (Naudin and Balarabe, 2005). This biomass is entirely kept on the field, (or partially consumed by livestock) and used as soil cover for cotton the next season (figure 2, picture 1 and 2).

How are the tests carried out?

Farmers fields are 2,500 m² square. They are divided in 2, 3 or 4 plots. DMC is experimented on one plot (about 200 to 1250 m²) the rest being carried out with conventional methods (either ploughing or direct seeding). The entire work is done by the farmer. The project only contributes by advising and, if the need arises, by providing specific herbicides treatment devices (pictures 3, 4 and 5).

Impact on the yield

Between 2001 and 2004 yield was recorded on 123 fields:

+ On 1/3 of fields, yield is equal between the control and the DMC plot. In the case of similar yields, DMC presents, sometimes, the advantages of being obtained with less work.
+ On 1/6 of fields, yield is inferior on DMC parts. It is generally due to bad management, mostly to late weeding.
+ On half of the fields, yield is superior on the DMC plot compared to control. The differences are much higher if the parcel is under DMC over a long time or if the rainfall is deficient (Far-North fields or dry year: 2002). In the Far-North, the gain in yield results mostly from a better water balance (Soutou et al., 2005), that derives from a better structure of soil (Naudin et al. 2005) caused undoubtedly by more biological activities (Brévault et al. 2005). Beyond the yield gain, better fibre qualities can be expected (Guibert et al., 2005).

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2 Développement paysannal et gestion de terroir
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Economic impact

More than long term effects (improvement of the soil organic matter content, decrease in erosion, improvement of soil fertility, decrease in weed pressure), farmers are looking for short and medium terms economic gains. In DMC main differences with conventional techniques are as follow:

Reduced expenses:
+ Tilling
+ Ridging
+ Weeding (if mulching is sufficient)

Added expenses:
+ Herbicide for localised spraying (if mulching is not sufficient)
+ Urea (50 kg/ha) the first 3 years if mulched with graminaceous and not previous leguminous

The balance remains generally in favour of DMC whether in terms of cash income per hectare, number of working days per hectare or labour productivity (table 2).

Conclusion

On farm trials in CA are very useful. They provide farmer’s opinions on experimented techniques and enable to take them into account when designing DMC features. But the monitoring is expensive and sometimes fastidious. After these 4 years of trials in farmers’ fields, the effort will be focused on the training of Sodecoton extension team that will be in charge of CA extension to a large scale. At a research point of view, the remaining topics to be focused on are:

+ selection of adapted fertilisation according to cover plants used in the rotation
+ selection of herbicide treatment to decrease labour on the field with more weeds (North province) when mulching is not sufficient
+ production of biomass the same year of the cotton, taking advantage of the first rain of the season.

Bibliography


Figure 1: map of North and Far-North provinces of Cameroon with rainfall

Figure 2: cereal-cotton rotation on CA, (Séguy modified Naudin). The first year the cereals are combined to cover plants that produce biomass to cover the soil in year 2 and eventually to feed livestock

Figure 3: Distribution of fields according to differences in yield between DMC and control plot (in %). Years 2001/2002/2003/2004, 123 fields (pair of DMC and control plot).
Figure 4: evolution of weeding from 10 to 20 days after sowing. Score 1 : < 7 % soil cover by weeds, Note 2 : 7 %, Note 3 : 15 %. 50 fields of North and the Far-north, 2004 year.

Table 1: comparison of cotton yield components between DMC and conventional plots in the North and the Far-north provinces, year 2004.

<table>
<thead>
<tr>
<th>Province</th>
<th>Cropping system</th>
<th>Nb of hill ha⁻¹</th>
<th>Plants hill⁻¹</th>
<th>Bolls/plant</th>
<th>Boll weight (gr.)</th>
<th>Yield (Kg ha⁻¹)</th>
<th>Number of plot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Far-north</td>
<td>Conventional</td>
<td>26 402</td>
<td>1,89</td>
<td>6,32</td>
<td>4,66</td>
<td>1 468</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>DMC</td>
<td>27 455</td>
<td>1,83</td>
<td>6,58</td>
<td>5,37</td>
<td>1 776</td>
<td>34</td>
</tr>
<tr>
<td>North</td>
<td>Conventional</td>
<td>19 655</td>
<td>1,43</td>
<td>12,37</td>
<td>5,28</td>
<td>1 837</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>DMC</td>
<td>21 176</td>
<td>1,48</td>
<td>12,22</td>
<td>5,20</td>
<td>1 988</td>
<td>15</td>
</tr>
</tbody>
</table>

Table 2: comparison of major economic indicators between CA and control. 2004 campaign, in the North and Far-north.

<table>
<thead>
<tr>
<th></th>
<th>DMC</th>
<th>Conventional</th>
<th>Number of fields</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net income ha⁻¹ (euros)</td>
<td>301</td>
<td>225</td>
<td>41</td>
</tr>
<tr>
<td>Working days ha⁻¹ (person-days)</td>
<td>101</td>
<td>109</td>
<td>28</td>
</tr>
<tr>
<td>Valorisation of a working day by the farmer or his family (euro working day⁻¹)</td>
<td>3,53</td>
<td>2,28</td>
<td>22</td>
</tr>
</tbody>
</table>

Picture 3 and 4 : different types of spray shield used in the spraying of total herbicides in between rows of cotton.