

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

*NAUDIN, K.*¹, *BALARABE, O.*²

1 SODECOTON/CIRAD-CA, BP 302, Garoua, Cameroon, krishna.naudin@cirad.fr

2 SODECOTON/IRAD, Garoua, Cameroon

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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 fiber qualities can be expected (Guibert *et al*, 2005).

¹ Société de développement du coton du Cameroun

² Développement paysannal et gestion de terroir

³ Eau sol arbre.

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.

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Picture 1 and 2 : farmers parcels , rotation over 2 years in the Manbang village. 2003 : sorghum, 2004 : cotton.on the left DMC plot : sorghum + *Brachiaria ruziziensis* in 2003 and cotton on mulch in 2004, on the right : control plot: sorghum by direct sowing on bare land in 2003, cotton on tillage in 2004. Note the effect of *Brachiaria ruziziensis* on *Striga hermontica* and the advance of the DMC cotton the cotton after ploughing.

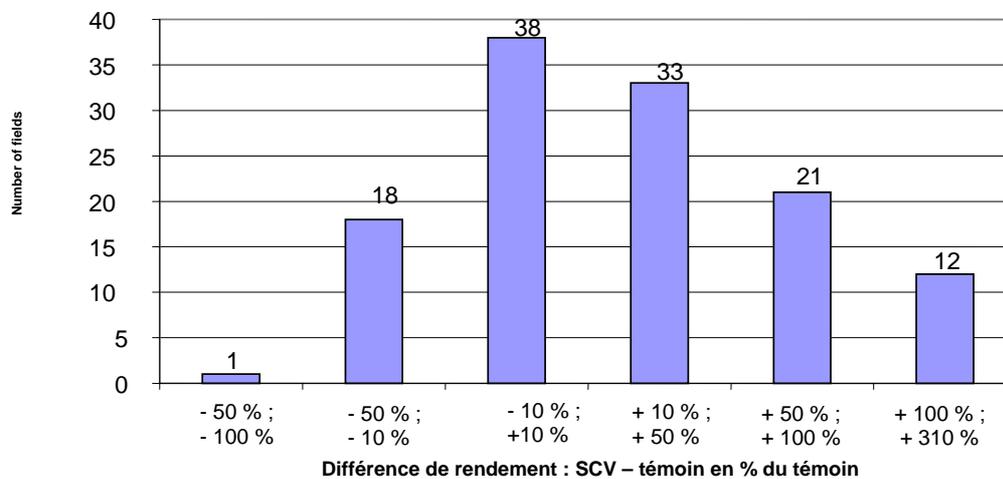


Figure 3: Distribution of fields according to differences in yield between DMC and control plot (in %). Years 2001/2002/2003/2004, 123 fields (pair of DMC and control plot).

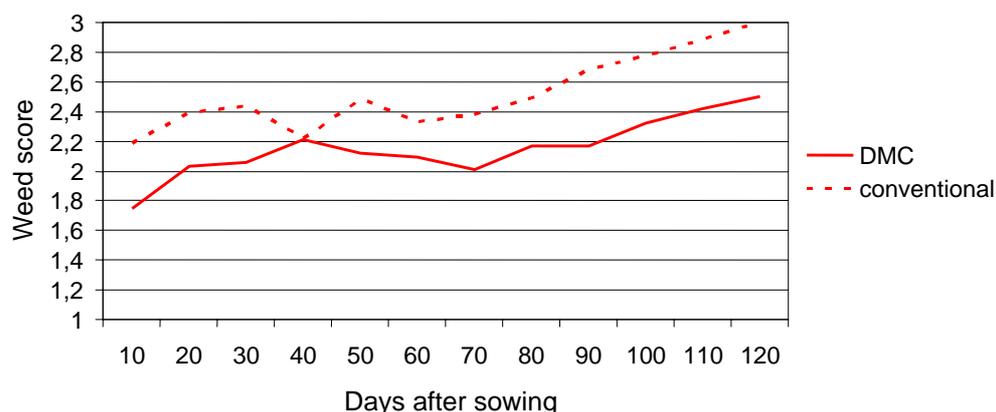


Figure 4: evolution of weeding from 10 to 20 days after sowing. Score 1 : < 7 % soil cover by weeds, Note 2 : 7 %, Note 3 : 15 %. 50 fields of North and the Far- north, 2004 year.

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

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

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

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



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