Motorization in a cotton-growing region in Mali: Impact on functioning and flexibility of family farms

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Abstract: *The motorization of large farms in Southern Mali did not achieve the expected results.Crop yields did not increase and labor productivity only increased when the cultivated area was significantly increased. The profitability of the tractor is mainly achieved by services carried out on other farms (treshing, ploughing and transport). The cropping systems were barely modified: tillage using disc plough and de-stumping of fields could cause a reduction in soil fertility. To accompany this innovation (or to advise against it, depending on the case) it would be necessary to design an innovating motorized farming production system that would take into account the various components of the farm.*

Keywords*: motorization, farming production system, innovation, flexibility*

Context and problem

The regularity of cotton income and relatively large farm size enabled a majority of cotton farmers (88%) to buy draught animals and to increase the cultivated area (Djaoura, 2006). In this context, motorization (tractors from 35 to 65 hp) seemed an alternative to animal traction on farms using more than four pairs of draught animals. Currently these farmers represent about 15% of cotton producers. Ploughing one hectare with draught animal requires at least two people and 3 or 4 work days. In the 1980s the little “Bouyer” tractors (35 hp) were promoted for farms with more than 20 ha. It was a failure because farmers had no experience in engine maintenance and the Bouyer Company stopped making spare parts. Later, some farmers bought second-hand tractors from Europe with more engine power (at least 65 hp)

In Mali, motorized production is considered as innovative and differs from usual practices for two reasons:

- Increasing the speed of land preparation and crop maintenance, thus allowing farmers to sow early and to keep the fields weed-free, thereby increasing yields;
- Enabling long distance transport and threshing of cereals.

These two changes in practice are aimed at raising labour productivity which should also increase cultivated area (in case of land availability) or release a part of family labour to develop new activities

Method

At the request of the Co-operative of Motorized Farms of Koutiala, a study about the impact of motorization on farms was carried out (Girard et al., 2007). From April 2006 to March 2007, 14 farms were studied to analyse their productive activities and performance.

Results

Tractors were bought in 2004 and 2005 with a credit scheme. The annual instalment to be refunded is 1.400.000 FCFA (2,130 euros). These farms have different crop rotations compared to other farms in the area: there are more productive and input-demanding crops (maize, cotton). In 2006 a tractor ploughed on average 53 ha. Of these, 24 ha (40%) were ploughed in form of hired services for neighbouring farms and paid in cash. On average in 2006 the area ploughed by tractor on motorized farms is low (29 ha). Maintenance works (weeding, hoeing) are rarely carried out with tractors due to the lack of suitable equipment. Thus draught animals are used for weeding and hoeing.

After the harvest, tractors are used to thresh sorghum, millet and soya. Hired services made with tractor (ploughing, threshing and transport) account for 24% of the agricultural incomes of the motorized farms, and 2/3 of these incomes are ensured by threshing. In 2006 the yields were not higher on motorized farms: 740 kg/ha for cotton, 1,810 kg/ha for maize. They are close to regional reference yields. Moreover the increase in cultivated area expected through motorization is getting difficult in the area of Koutiala due to the lack of cultivable land to buy or clear. The integration of the tractor and the basic equipment (a plough and sometimes a trailer) in the farm has slightly modified labour productivity.

In six out of the 14 cases, the income on motorized farms is too low to meet the refund of the annual instalment of the loan. This weak performance is mainly due to poor cotton yield obtained in 2006 (740 kg/ha), which is below the average of the ten last years regional yield (about 1,000 kg/ha).

Discussion

Currently the profitability of the tractor depends mostly on the income from hired services (threshing, ploughing and to a lesser extent, transport). We have not observed strong modifications in the management of cropping systems. Ox-ploughing is replaced by tractor-ploughing using disc plough and these two methods have similar characteristics: low depth, inability to bury a large quantity of organic matter. The use of disc plough often involves soil pulverization which can lower soil fertility. The de-stumping of fields worked by tractor may also have an impact on soil fertility in the medium term through the absence of nutrients supply and ground cover by the trees.

Farms using draught animals in Southern Mali showed certain flexibility thanks to their investment in cattle. In case of poor production (drought, flood) farmers can sell cattle to face the family and farm needs. Moreover these farms have a lower debt because animal traction power is not very expensive. Vice-versa motorized farms, which had to borrow money to buy the tractor, lost part of their flexibility needed to cope with uncertain situations (climatic hazards, rapid changes in commodity prices). The farm is involved in a five-year loan. This means a high pressure to achieve a good performance during these 5 years, which could be jeopardised by climatic hazards.

It is thus likely that these farmers will have to sell part of their herd to face bank repayment (the annual installment of 1.400.000 FCFA corresponds to 8 or 10 zebus). Second-hand tractors are not safe from a serious breakdown which can immobilize the equipment for several weeks. Repair costs can be as high as the annual installment. It was shown that the tractor profitability was strongly related to the capacity of its owner to carry out hired services. If there is a series of years with good rainfall, the number of tractors could increase in this area and consequently the potential market of motorized hired service will drop. Conversely, after a bad climatic year, the farms which are usually called upon to plough or thresh harvests, will not be creditworthy and will have to use old practices (manual threshing, draught animals ploughing or direct seeding).

To accompany the adoption of motorization in large Malian farms (or to advise against it) it would be necessary to carry out the same study for a year with normal rainfall. Moreover it would be necessary to design an innovating motorized farming production system that would take into account the various components of the farm: available cultivated area, management of soil fertility, financial needs, organization of service supply using tractors and form of payment. This step must be based on the technical references already available and on the monitoring of a sample of farms which already own motorized equipment. This farming design process could then be tested in other contexts or for other major organisational and technical transformation such as the move towards No Tillage and Direct Seeding in Mulch which are currently being tested in this part of Mali.

References

Djouara H., Bélières J-F, Kébé D. 2006. Les exploitations agricoles familiales de la zone cotonnière du Mali face à la baisse des prix du coton-graine. *Cahiers Agriculture*, 15, 1, 64-71.

Girard P., Dugué P., Bélieres J-F, Daouda D., 2007. Impacts de la motorisation sur le fonctionnement des exploitations agricoles familiales de la zone cotonnière au Mali (Koutiala). Rapport Cirad, CMKE, AFDI Aveyron, Montpellier, Koutiala, 85 p.