

WHAT ARE THE EFFECTS OF AGRICULTURAL MECHANIZATION?

A case study from Zambia

During the last decade, governments, private actors as well as civil society and development partners have joined efforts to promote a productivity revolution in Africa’s agriculture. For this, smallholder farmers are key, since 70% of the farms in Africa operate on less than two hectares. Typically, they do not realize more than 25% of their potential yields. To unlock this underutilized potential, policymakers have turned to agricultural mechanization more recently. However, agricultural mechanization always has been controversially discussed. One concern is that mechanization causes rural unemployment. Another concern is that multi-national agribusiness companies take advantage of smallholder farmers. To shed light on these concerns, this policy brief summarizes economic, social and environmental impacts from a private business model that aims to enable “emerging” medium-size farms to provide mechanization services to smallholder farmers in Zambia.

Business model under study

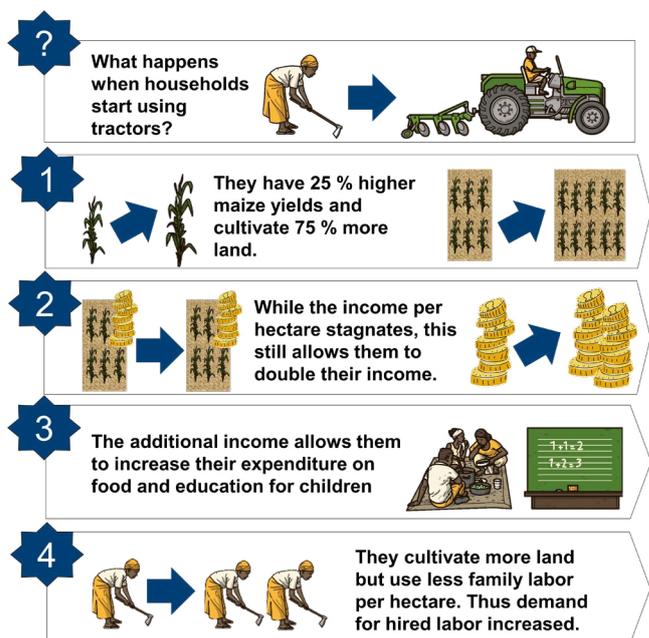
The model, promoted by John Deere and its Zambian dealer AFGRI, was targeted at small and medium sized enterprises and emerging farmers (with a median farm size of 66 ha). It offered financing of tractors with an interest rate below the market rate and encouraged them to provide mechanization services to smallholder farmers. Eventually, 12 out of 21 tractor owners interviewed for this study provided tractor services to smallholder farmers – on average to 60 smallholder farmers.

Those who provided services benefitted from the support of a non-governmental organization that helped to organize the smallholder farmers and to link them to the tractor owners. Tractor owners who did not provide services mentioned a variety of reasons: high transaction costs of reaching smallholders; potential damage to the equipment in fields that were not cleared of stones and stumps; and dissatisfaction with the level of fees that they could charge.

A combination of methods was used for the study, in particular a survey among a random sample of farm households that received and did not receive tractor services and focus group interviews using participatory impact diagram in communities, where smallholders had used tractor services provided under the initiative. To assess the impact of the mechanization scheme on smallholder farmers, statistical methods were used to identify comparable farm households, and then to assess whether the differences between the households can be interpreted as a causal effect of using tractor services.

Effects on smallholder farmers using tractor services

Agronomics effects: Farmers who used mechanization services cultivated almost the entire arable land that they own, whereas the farmers in the control group cultivate only 60%. Yield increased by approximately 25% - however, higher income per hectare could not be achieved since more inputs were used as well.





Income effects: Smallholder farmers using tractor services were able to double their overall income, as they could cultivate a larger share of their land and increase their labour productivity. This is a remarkable success because in agricultural development projects in Sub-Saharan Africa, even income increases in the range of 20-30% are considered a success.

Social effects: The increased income was used for education of children and food. Skipping of meals became less likely, which is an important finding considering high levels of undernutrition in Zambia. Consumption of alcohol or tobacco did not increase in the participating households. Some smallholders were able to invest their income into off-farm businesses, such as trading livestock or running grocery stores.

Labour use effects: Looking at mechanization, there is a concern that mechanization could lead to unemployment. This study suggests, that in situations where an expansion of the cultivated area is feasible, mechanization even increases the demand for hired labour. This effect was amplified because the increased income achieved by mechanization allowed farmers to replace family labour (including child labour) with hired labour.

POLICY RECOMMENDATIONS

Increase land productivity: As the possibilities of land expansion are limited in the long run and associated with environmental disadvantages, a stronger focus on using mechanization to increase land productivity rather than promoting land expansion is required. A more effective use of farm inputs, especially fertilizer, appears required to reach this goal. This can ensure that income gains

from higher yields are not eaten up by higher input costs. For this other actors such as government extension services need to play a role.

Link smallholders and tractor owners: High transaction costs of providing services to smallholders were a major reason for limited service provision. Tractor owners providing services to smallholders benefitted from the support of an NGO, which linked smallholder groups to tractor owners. ICT tools such as “Hello Tractor” may help to reduce transaction costs of providing and accessing tractor services.

Avoid negative environmental effects: In this study, problems of increased soil erosion have been limited because the ripper rather than the disc plough was promoted. However, in other cases smallholders could prefer the plow to the ripper. Extension services could play an important role in ensuring appropriate soil fertility management on mechanized smallholder farms. This could also be supported via lower tax and tariffs for soil-protecting implements.

Strengthen public sector: The findings indicate that smallholder farmers can benefit from private sector driven mechanization initiatives. This does not imply that governments have no role to play. The public sector is essential to promote mechanization by providing complementary services, including training and agricultural extension to build the capacity of small and medium size entrepreneurs to own and manage tractors and ensuring the environmental sustainability of mechanization through applied research on soil conserving mechanization.

This Policy Brief is based on the study:

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