

MECHANIZING AFRICAN AGRICULTURE

Drivers, Barriers and Benefits

Agricultural technologies that reduce the need for intensive manual labour make it possible for farmers to cultivate more land more effectively. This can increase both incomes and total food production, with significant benefits to farming households and communities in food-insecure regions. Despite these advantages, farmers in much of Africa rely on hand-held tools for farming. In many regions, tractors and engine-powered machinery is hard to access, and support such as trained operators, technicians and spare parts are rarely available. Recently, several initiatives have been implemented to empower farming households to access machinery in several African countries. This policy brief discusses the factors to consider for such initiatives to be successful.

What is mechanization?

Agricultural mechanization refers to the level of technological advancement of the tools used in farming and processing. This can range from simple hand-held tools to sophisticated motorized equipment. To mechanize means to use more technologically advanced tools for agriculture. Agricultural technology can fall into three general categories:

1. Hand-held tools, e.g. axes, hand-held hoes, cutlasses and baskets
2. Animal-powered equipment, e.g. ploughs drawn by bullocks or mules
3. Medium to heavy agricultural machinery, e.g. tractors, ploughs and threshers

Advantages of Adopting Labour-Saving Technologies

Replacing hand-held tools with labour-saving technologies can help farmers increase their yields and incomes, reduce drudgery and promote food security. Animal-powered equipment, for instance, increases production capacity by five to twenty times. Using a combination of animal-powered and tractor-

powered machinery can provide enough food to feed eight times more people compared to using animal-powered equipment alone. Technologies that reduce the amount of labour needed to prepare and cultivate land can enable farmers to cultivate larger plots, even in periods of labour shortages. Technological upgrades can also help farmers increase their yields by enabling farmers to complete tasks faster and at crucial times.

There are also large health benefits to the adoption of mechanization technologies. Using tools powered by animals or tractors can relieve members of farming families from some of the hard manual labour and drudgery required when using hand-held tools. These benefits are especially significant for smallholder farmers and their communities, which are among the lowest income and food insecure populations of the world.

Barriers to Mechanization in Africa

Despite the potentially significant benefits of using labour-saving technologies, light hand-held tools remain the main agricultural technology in Africa, used by almost half of farming households, compared to animal-powered equipment, used by 35 percent, and tractor-powered equipment, used by only 18 percent. Because of cost, tractor-powered machinery can be out of reach for many farmers.

Successfully implementing mechanization initiatives requires an understanding of the conditions faced by farmers and smallholders especially, which can include limited access to credit and insurance, lower levels of educational attainment, market and institutional failures, lack of local infrastructure and fragmented land holdings and challenging topographical features (e.g. slope of the land).

What drives mechanization?

To understand how to increase the availability of labour-saving technology across Africa and for smallholders in particular, it is useful to consider patterns of mechanization across the continent. This brief



is based on a recent study that analyzes the possible drivers of mechanization among 9,500 farming households in eleven African countries.

The study shows that while there are significant barriers to increase mechanization, access to labour-saving technologies is much higher in some countries than in others. Countries in which tractor-powered machinery is most accessible tend to have higher levels of economic development. In summary:

- Tractor-powered machinery is most common for farming households in Egypt and South Africa.
- Animal-powered equipment is the dominant type of agricultural technology for farming households in Senegal, Burkina Faso and Zimbabwe.
- Hand-held tools remain the dominant agricultural technology used by households in Cameroon, Ghana and Zambia.

At the household-level, the following factors were found to relate to higher levels of mechanization:

- **Household income:** Perhaps unsurprisingly, higher-income households are more likely to have access to both animal and tractor-powered machinery, since these have higher upfront costs than basic hand-held tools. Smallholder farmers with lower income are also less likely to have the collateral necessary for bank loans.
- **Farm size:** Farms with a larger land area tend to be more highly mechanized than smaller farms. Having more land to cultivate increases the potential benefit of labour-saving technologies and can make the investment more cost-effective. Land size may also be related to household income.
- **Education level of the head of household:** More educated household heads are more likely to have access to both animal- and tractor-powered tools. They are more likely to be aware of the benefits of various technologies and may find it easier to learn to use more advanced technologies.

- **Gender of the head of household:** Male-headed households are more likely to use animal- and tractor-powered technology. This may be because women generally have lower educational attainment in Africa, which makes adopting advanced technologies more challenging, and because women have less access to credit and collateral, which means they may not be able to access the funds to invest in these technologies. See PARI Policy Brief No. 19 for more information on the obstacles faced by women in African agriculture.

RECOMMENDATIONS

Below are potential ways for organizations seeking to promote development in this sector to address the main challenges that are holding back mechanization in Africa:

To increase the availability of medium and heavy agricultural machinery

- Create public-private partnerships to facilitate the importation, distribution and maintenance of high-potential technologies
- Incentivize the local production of smaller-scale technologies, such as two-wheeled tractors, that are designed to fit the local context and are gender appropriate

To address the high costs of medium and heavy machinery

- Develop targeted schemes for smallholders to increase access to credit to purchase or lease farm equipment, e.g. Micro-credit
- Enable collective ownership by existing farmer collectives, and put in place supporting institutions to train operators and technicians
- Incentivize alternative tenure models, such as private sector-led equipment leasing schemes

This Policy Brief is based on the study: Kirui, O.K. (2019) The Agricultural mechanization in Africa: micro-level analysis of state drivers and effects, ZEF Discussion Papers on Development Policy No.272.

Available at www.research4agrinnovation.org

PARI is funded by the German Federal Ministry for Economic Cooperation and Development (BMZ).

PARI implementing partners: ZEF/University of Bonn, University of Hohenheim, Technical University Munich, the Forum for Agricultural Research in Africa (FARA) and its

national partners, the African Growth and Development Policy Modeling Consortium (AGRODEP) facilitated by the International Food Policy Research Institute (IFPRI, Africa Office), and research collaborators in India.

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