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Agricultural Mechanisation, Farm Productivity and Food Security in Sub-Saharan Africa

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Key Points

- Sub-Saharan Africa has the least mechanised agricultural system in the world and increasing access to labour-saving machinery would help to raise farm productivity.
- Agricultural mechanisation is a powerful developmental tool, but it cannot address all of the factors that contribute to Sub-Saharan Africa's food insecurity.
- If the political, social and economic factors that also contribute to food insecurity are to be ameliorated, a broader suite of policies would need to be adopted.
- China appears to want to maintain its position as the main supplier of agricultural machinery in Sub-Saharan Africa, with Beijing indicating that agricultural assistance will remain a key component of its Africa policy.

Summary

Agricultural productivity is low in Sub-Saharan Africa making it a major impediment to regional food security. International development agencies maintain that the wider adoption of agricultural machinery is necessary to raise crop yields and improve food security. Sub-Saharan African food security is also affected by social, economic and political challenges that cannot be addressed by technology alone, however. A single-minded focus on agricultural mechanisation, which does not take those other challenges into account, could create other, or add to those, problems. If mechanisation programmes are accompanied by training and extension services that improve employment prospects and reduce

environmental degradation, some of the main challenges associated with agricultural mechanisation can be avoided.

Analysis

The conventional economic development model maintains that agriculture is the starting point for wider economic development and poverty reduction, particularly in countries where the vast majority of the population works in the agricultural sector. A focus on improving the technology used by smallholder farmers, who operate on less than two hectares of land and account for 70 per cent of Sub-Saharan Africa's workforce, will build the foundation for further economic development.

The tractor is referred to as an "Unsung Hero" of twentieth century economic growth in the United States. By the 1950s, machinery had replaced 24 million animals on American farms, improved farm productivity and changed land-use patterns. Post-war Western Europe experienced a similar transformation. It was believed that the developing world would follow a similar trajectory. Agricultural technology played a part in lifting the living standards of the developed world, and it is assumed that the mechanisation of the developing world could deliver a similar outcome.

Sub-Saharan Africa has been slow to adopt mechanised agriculture and 60 to 80 per cent of the cultivated land is worked manually, without the use of animals or mechanical tools. That was not always the case, however, as Africa was once at the forefront of agricultural mechanisation in the developing world. In 1960, for instance, Kenya, Uganda and Tanzania each had more tractors in use than India. The fact that India now has 100 times more tractors in use than those three countries combined gives some indication of just how far Africa has fallen behind. It is also estimated that tractors are only used on ten per cent of the land currently cultivated in Sub-Saharan Africa, compared to 20 per cent in East Asia, 35 per cent in South Asia, 50 per cent in Latin America and the Caribbean, and 60 per cent in the Middle East and North Africa. The slow uptake of agricultural machinery in Sub-Saharan Africa is one of the reasons for its slow progress in improving food security.

Sub-Saharan Africa has the largest prevalence of undernourished people in the world and, after years of gradual improvement, that situation has worsened in recent years. Low agricultural productivity is often cited as the main cause of food insecurity across the region; crop yields are 44 per cent lower than the international average. Lifting farm productivity is therefore seen as the main way to improve food security in Sub-Saharan Africa.

The lack of modern tools is one of the main impediments to increased agricultural productivity in Africa and is one of the reasons that it has been a net importer of food since the 1970s. The scarcity of machinery across the food production system, from field preparation to sowing, harvest, post-harvest storage, processing, transport and retail, makes Sub-Saharan Africa's food security considerably more vulnerable than that of the rest of the world. While some African governments have attempted to raise agricultural productivity by increasing access to fertilisers and improved seeds, with variable success, agricultural mechanisation has received less attention.

International development organisations have only recently begun to rekindle their interest in mechanisation after a 30-year focus on other challenges. Farm mechanisation programmes that operated from the 1960s to the 1980s produced mixed results at best. While in some cases they improved farm productivity, in many others they failed due to a lack of access to spare parts and skilled labour.

Food insecurity in Sub-Saharan Africa is caused by more than just inadequate access to agricultural machinery, however. Population growth, weak institutions and rule of law (particularly in relation to land ownership), poor infrastructure, increasingly unpredictable and volatile weather patterns, weak international trade links, limited storage facilities, food loss and waste, pestilence, disease and economic instability have also taken a toll. While better access to agricultural technologies could ameliorate some of those factors, it will prove insufficient to overcome all of the social, political and economic challenges that also affect regional food security.

Mechanisation programmes also have the potential to widen wealth inequality. Large-scale farming operations can afford to purchase and maintain machinery, but smallholder farmers struggle to do likewise. Medium- and large-scale farmers, who have landholdings greater than five hectares, are in the best position to mechanise first. If those farmers offer to rent their machinery to those who are unable to afford their own, then those disparities could be reduced. Alternatively, smallholder farmers might be able to afford simpler, less expensive machines. Two-wheel tractors, which are cheaper to purchase and easier to maintain, are seen as a more appropriate tool for smallholders. These devices, while simple, are an improvement on the hand tools that are still used by a majority of smallholders.

As mechanisation reduces the labour requirements of farm operations, it could also reduce the number of employment opportunities available to unskilled labourers. Most of the 30 mechanisation programmes established in Sub-Saharan Africa prior to 1980 failed because of a lack of access to spare parts, operators and service technicians. Agricultural mechanisation could create new service and maintenance employment opportunities, if training centres are provided as part of the mechanisation process. Those centres could also provide the transferable skills necessary for the economic diversification into industry that could provide jobs for the large youth population that will soon reach employment age.

There are a number of environmental concerns related to the adoption of agricultural machines. Mechanised agriculture was a factor in the creation of the dust bowls that affected the US in the 1930s. In Africa, soils are susceptible to erosion due to shallow topsoils and heavy rainfall. Excessive tillage or the improper use of conventional tillage implements (such as disc or mouldboard ploughs), can over-expose soils to rain and wind erosion. Conventional tillage implements are widely used in Sub-Saharan Africa, but large-scale farms are increasingly adopting conservation agriculture practices and technologies, which aim to minimise soil disturbance. Smallholders are also being encouraged to practice conservation agriculture. If mechanisation is to be successful in the long term, efforts will need to be made to ensure that the most appropriate tools and methods are made available to all African farmers.

Land expansion is another environmental concern that needs to be addressed. Mechanisation in the US and Brazil increased farm production by expanding the amount of natural land converted to crop. On the other hand, mechanisation could reduce the need to clear new land for agriculture as already existing cropland could be made more productive.

Chinese companies are the main suppliers of agricultural machinery in Sub-Saharan Africa and they are more likely to receive state support in exporting their equipment than companies based elsewhere. Indian tractor manufacturers, however, also see the region as a desirable export market and aim to significantly increase their presence there.

The involvement of China in African agricultural development has led to the idea that Beijing aims to exploit the continent for its own self-interest. That notion has some validity, but not in the way that is often articulated. Claims that China has taken control of large amounts of agricultural land (up to six million hectares, or one per cent of all the farmland in Africa), have contributed to the notion of Africa as China's "second continent". Those claims have been vastly overstated, however, and it is more likely that China has only acquired about four per cent of that amount. It is questionable how much influence it gains from that trade. China sees African agricultural mechanisation as a way to generate business opportunities for Chinese companies and sell Chinese-made products into new markets, rather than as an opportunity to improve Chinese food security through the exploitation of African land. Officials from the Food and Agriculture Organization also see Chinese technology transfers as beneficial, stating that the introduction of small machines from China has been one of the main drivers of African agricultural development.

Chinese officials also see agriculture as a component of its internationalisation. Chinese policymakers and political commentators have spoken about the Belt and Road Initiative driving the "going-out" of Chinese manufacturers and retailers involved in the agriculture industry. The Forum on China-Africa Co-operation (FOCAC), which is held every three years, aims to strengthen the Sino-African relationship and has also highlighted agriculture's centrality to the Sino-Africa relationship. At the most recent FOCAC meeting, President Xi Jinping stated that China would offer US$60 billion to Africa. Those funds would be used to fund a variety of projects but, in terms of agriculture, he promised that:

> We will support Africa in achieving general food security by 2030, work with Africa to formulate and implement a program of action to promote China-Africa cooperation on agricultural modernization. We will implement 50 agricultural assistance programs, provide RMB 1 billion of emergency humanitarian food assistance to African countries affected by natural disasters, send 500 senior agriculture experts to Africa, and train young researchers in agri-science and entrepreneurs in agri-business.

There was some hostility to that announcement aired on Chinese social media. One critic, quoted in the *Financial Times*, stated that 'China is a poor country as well' before asking, 'Is there any country that can provide China with $60 billion in aid?' Criticism was so widespread that an article was printed in the *Global Times*, a media outlet that is ideologically aligned with the Chinese Communist Party (CCP), which argued that detractors of the CCP's Africa policy are being influenced by 'Western forces':

> The West has been putting the cart before the horse when it comes to its Africa policy. It emphasizes political governance yet overlooks industrialization. Western NGOs are very active in Africa, but what the continent needs most is transportation lines, power plants and manufacturing industries. China-Africa cooperation has created a new way of cooperating with equality, mutual benefits and fruitful results. It made the West, which always wants to exercise leadership in Africa but always fails in doing so, feel uncomfortable. It is thus natural for some Western forces to use their advantage in shaping public opinion to make up for their disadvantaged position in economic collaboration with Africa.

It goes on to directly rebuke those Chinese citizens that question the CCP's foreign policy, reinforcing the notion that international engagement is vital to China's long-term grand strategy:

> Chinese people should also be aware that major powers must fulfil their obligations. Otherwise they can hardly stay where they are for long, not to mention going forward. It's a petty mind-set to think that it is immoral to aid foreign countries because there are still poor people in China. It can hardly guide the nation's grand practice.

China is likely to continue to be the main supplier of agricultural equipment in Sub-Saharan Africa. While it also provides technical assistance to regional farmers, it is unclear whether that will help to ameliorate the social, economic, environmental and political challenges that affect food security in the region. Developed countries, which have experience in overcoming those challenges, should also be engaged in the region's agricultural development.

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