

Synopsis: Agricultural Mechanization and South-South Cooperation: What can Ghanaian policymakers and private sector learn from Asia's experience

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The Asian experience with agricultural mechanization has been marked with major successes over the past four decades. Farm mechanization has recently emerged in Africa south of the Sahara (SSA) despite limited experiences in the past. Exchanging different regional experiences on how mechanization has evolved, especially in Asian countries, can help identify alternative approaches and design effective mechanization policies in Ghana and elsewhere in SSA. Similarly to Africa, Asia has taken many different paths towards agricultural transformation and presents opportunities to learn from a number of countries who solved a variety of challenges with different solutions.

As part of the efforts to catalyze research and knowledge-sharing on agricultural mechanization in Africa and Asia, the National School of Development at Peking University and the International Food Policy Research Institute (IFPRI) organized a stakeholder's workshop in June 2014 at Peking University, China. This workshop brought together researchers, policymakers, private sector stakeholders and agricultural engineers from Nigeria, Ghana, Ethiopia, Nepal, Thailand, India, Pakistan, China and Bangladesh. The knowledge-sharing forum illuminated the diversity of policy approaches and experience on mechanization in Asia and in Africa. This policy note shares some reflections from the participants on issues discussed during the workshop and their implications for the formulation of mechanization policies in Ghana.

Mechanization in the context of economic transformation

Most of the workshop's speakers and participants agreed that the dialogue regarding mechanization of agriculture and economic transformation was more open in the 1970-80s. Since then, the debate has garnered little attention from development researchers and policymakers. Therefore, the research debate on mechanization policies needs to be reopened, restructured and reframed in order to guide rural development and pro-poor initiatives. Professor Justin Y. Lin, honorary dean of the National School of Development, described the context well in his opening remarks for the workshop. In his view, despite the rapid transformation of China over the past 35 years, about 45% of the population still lives in rural China and depends on agriculture for their livelihood. Non-agricultural growth, higher education levels, and rural-urban migration present challenges to farming in China and beyond. In China, this has required the transformation of production from rudimentary subsistence to more scientific, precise and technically enhanced productive agriculture, where mechanization plays a key role. In this sense, China has a rich experience to share over the past 30 years of mechanization development.

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Countries share many of the reasons for increased use of agricultural mechanization. Population growth leads to increased demand for food production and intensification of agricultural production. Presentations from India and Bangladesh show that the proportion of the population engaged in agriculture in these countries is far greater than the contribution of agriculture to Gross Domestic Product. This implies that agricultural labor productivity is low, providing a potential opportunity for productivity augmenting technologies, such as agricultural machinery/equipment, to boost productivity and incomes. Furthermore, urbanization and non-agricultural sector growth causes a shortage of rural labor. This has been observed in China and can also be seen in Ghana where rural youth are increasingly migrating to urban areas. Considering the different patterns of machinery use across Asia and Africa broadened our views of the driving factors behind sustained mechanization. Land-labor ratio, environmental factors, culture and tradition all influence the scale and type of mechanization. For example, much of Nepal's terrain is mountainous, where small-scale machinery is more appropriate, while the limited area of open flat agricultural land in the south of Nepal may be more suited to large-scale machinery. This example stresses the importance of making appropriate machinery available to farmers.

Pitfalls in government policy

Given the overall recommendations that there should be a diversity of innovation in the technology used by all categories of farmers, we consider policy adjustments to explore for the sustainable development of mechanization in Ghana. A clear policy direction on agricultural engineering and mechanization development should be developed and implemented by government in consultation with private sector, national researchers, and other stakeholders in mechanization. The various roles of the private sector and of government should be clarified at the national, regional, and district levels. For example, government should carry out farm, trade, and market analyses on mechanization and its role in agricultural transformation in Ghana, in order to support policy directions. Policies should be comprehensive to include research, extension, education, and institutional development. The private sector should be supported to actively engage in mechanization, while the government could help provide public goods such as research, extension, and regulation.

Discussions at the workshop revealed that most governments subsidize agricultural production in one form or the other. In the case of Ghana, financing for agricultural machinery has always been a challenge to most farmers. Credit markets for agriculture are generally weak, with loans often not available due to lack of collateral. Government subsidies are one way to overcome the financing issue. For example, the Tian Li Cooperative Farm on the out skirts of Beijing benefit from up to a 75% subsidy on the financing of agricultural equipment from government (50% subsidy from the central government and 25% subsidy from the local government). In addition, they benefit from subsidies of up to 50% on other agricultural inputs such as fertilizers, seed, and agro-chemicals. In Bangladesh, the government subsidized shallow tube wells for mechanized irrigation in the 1970s but eventually phased out, allowing the private sector to take over supply. Subsidies have been used more widely in the past in India, but currently only 1% of tractors are subsidized, by up to 25% of the sale price. Notably, the Nepalese government has avoided the use of such interventionist mechanization policies for fear of displacing labor out of agriculture.

A variation of this subsidy policy is the promotion of privately-managed agricultural mechanization service centers, which has emerged in Ghana and Nigeria. While Ghana's concept of promoting the establishment of Agricultural Mechanization Services Enterprise Centers (AMSEC) is similar to that of Nigeria, there are some differences in the implementation processes. In Ghana, the Government

supplies the agricultural machinery directly to the AMSEC at about a 30% subsidy and the AMSEC is given a payment plan such as down payment of 10-30% and the balance spread over five years interest free. Meanwhile in Nigeria, the Government allocates about US\$ 250,000 for the purchase of machinery to a bank. A contract is entered between the AMSEC and the bank, in which the AMSEC is expected to raise and deposit about 20% of the amount to the bank to enable the AMSEC access the Government funds. During the repayment period, the AMSEC has a 2 years grace period to recover the 20% deposit, after which the AMSEC pays back the government allocation for a number of years without interest.

Some of the problems with this policy approach were highlighted in our discussions. In particular, market forces are distorted by the price and credit subsidy leading to selection of less appropriate type and technology of machine, and failure to target recipients of the subsidy efficiently. Typical examples drawn from both Ghana and Nigeria include the direct involvement in the importation, supply, and allocation of agricultural tractors by governments to farmers, in both Ghana and Nigeria.

In Ghana, we have seen challenges with this approach leading to poor recovery of sales, underutilization, and mismanagement of machinery. One problem is that the selection of agricultural machinery has not been effective or appropriate for all categories of farmers. Subsidized imports have mainly been for relatively medium and bigger tractors which are both expensive and larger than most small and medium scale farmers need in Ghana, although Ghana has a mix of small (less than or equal to 2 ha), medium, and large-scale farmers. However, in recent times, there have been some marginal imports of lower power tractors and machines such as power tiller, vari mini systems, and compact 50 horse power tractors. In Nepal, small-scale farmers are supported to acquire smaller and simpler machines, such as two-wheeled tractors, which do not require sophisticated knowledge, but are instrumental in helping them overcome labor constraints and labor wage costs during critical stages of farming operations. Increased use of small and simple machines could trigger other small scale enterprises to provide servicing, repair and manufacturing services and create the foundation for the emergence of other rural industries. Lower-medium scale farmers (2-20ha) could hire equipment from tractor owners or government-sponsored mechanization centers for their farming activities, since their farm size does not make it expedient to own expensive large tractors. Farmers with over 20 ha could own a tractor with accompanying equipment to ensure timeliness of their farming activities which is essential in rain-fed agriculture. These farmers may also provide services to other farmers by hiring out their tractors. The appropriate selection of agricultural machinery for categories of farmers is essential. Small-scale farmers should be encouraged to use smaller low-powered agricultural machinery, such as 2 wheeled machines. This could be achieved by increasing the subsidy rates on these specific machines to enable smallholder farmers to have easy access. Medium and large scale farmers should also be encouraged to use medium to high-powered machinery such as 4-wheeled machinery for commercial farming.

Second, recipients of the subsidized machinery have shown poor loan recovery rates as there has been some level of influence in tractor allocation by government appointees. Subsidies should be well targeted to benefit the small-scale farmers who are more credit constrained. It is widely acknowledged that in the past, many subsidy programs benefited the wrong group of people. Targeting the recipients of subsidies is a challenge, and the government should seek efficient ways of reaching intended beneficiaries. Third, the brand of subsidized machinery which is imported directly by the government has changed under each concessionary loan. This has largely been attributed to the type of facility received by government, which tags the concessionary loan to a specific machinery brand. Unless there is a basic level of stock of a particular machinery brand, the supply of spare parts and after sales support services will not develop. In turn, new machinery cannot be maintained properly due to lack of knowledge or

limited access to spare parts. The uncertainty which is created by government selection of the machinery brand has weakened the incentives for entrepreneurs to invest in these auxiliary businesses to sustain newly imported machines.

Facilitating the private sector

The role of government in the development of mechanization is to play a facilitative and regulatory role, enabling the private sector to take the lead role in the provision of agricultural mechanization services. The enabling environment may take the form of provision of subsidies and incentives such as a temporary tax subsidy on importation of agricultural machinery and other agricultural inputs. Current policies could be adjusted in order to engage and encourage the private sector to take lead roles in the machinery supply chain. For example, if government is to provide subsidies on machinery, it could do so over a limited time frame. Special subsidies could be extended to a range of machinery brands, sizes, and types. India had a policy requiring that 14 percent of bank lending was allocated for agricultural purposes. A similar policy could be explored in Ghana in order to encourage the availability of credit for agricultural machinery.

Our discussions identified the role of the private sector in the development of mechanization as supplying machinery and implements, providing efficient after sales support services, and training end users on how to operate the machines. Other trainings covered the local fabrication and manufacture of simple tools, parts, and implements by artisans. The private sector can also facilitate farmer access to agricultural machinery loans. With a more competitive market environment set by policymakers, the private sector can find innovative solutions to increasing the utilization of tractors through use for planting, harvesting, shelling, and other operations. In the experience of several Asian countries, these innovations have often come from the private sector, rather than government. The mode of service provision is also an area for the private sector to innovate. As already demonstrated in many countries, service providers can operate using a taxi model whereby agricultural machinery is provided to farmers for a specific time or task in exchange for a fee.

Research, training and regulation

Local farmers, operators, extension agents and mechanics often lack the technical skills to operate and maintain agricultural machinery. From our Asian colleagues, we learned that local entrepreneurs adapt imported machinery to the local context, which requires skills and trainings. Management of equipment is important along with farmers' knowledge of how to harness technology for the greatest benefit. A key role for government is to invest in research for the adaption of mechanization technologies, provide extension services on effective use of machinery within the local farming systems, and conduct trial tests of machinery. It is also expected that government should play an active role in building up the requisite institutional and human capacity for an effective management of mechanization strategy, including the training of agricultural machinery operators and mechanics.

The successful use of agricultural machines by small-scale farmers in Asia was discussed at length during the workshop. For Ghana, the government research and extension network should be tasked to test and trial some of these small-powered machines on local field conditions. This type of technology may perform poorly in Ghanaian fields due to poor land preparation. It is important this is investigated before small machines are mass imported and promoted. There is also the need to educate small-scale farmers on emerging farming techniques such as zero-tillage, crop rotation and proper use of agro chemicals to enhance their most basic production asset, farmland. Improper use of mechanization technology can lead to environmental degradation. To prevent this, policymakers should take a lead role

in pursuing a green and blue revolution agenda that conserves the environment through the application of appropriate technologies.

In conclusion, experiences from Asia show that the benefits of agricultural mechanization can be considerable in Ghana if the right policies are enabled. Labor-saving machinery has the potential to increase agricultural productivity and release rural labor for other non-agricultural sectors. As a result, rural household incomes will increase and generate positive spillovers for the industrial sector. Ghanaian participants in the workshop were encouraged by the experiences of colleagues from Asia and Africa, and have expressed strong interest in continuing to learn from similar countries where mechanization has been successful in fostering agricultural transformation.

For workshop agenda and presentations, see:

http://www.ifpri.org/sites/default/files/2014_nds_ifpri_program.pdf

Pictures from the Seminar and Field Visit in China

(more photos here: <https://www.flickr.com/photos/ifpri/sets/72157645310520046/>)

