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Mechanization in Ghana: Searching for Sustainable Service Supply Models

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INTRODUCTION

Mechanization has received less attention in academic literature, international policy dialogue and program formulation than other modern inputs to agricultural transformation (Pingali 2007). Demand for mechanized services by smallholder farmers, on the other hand, has grown recently and governments in countries such as Ghana and Nigeria are devoting significant resources to promoting agricultural mechanization. The government of Ghana has increased its support to mechanization through stepping up the establishment of subsidized Agricultural Mechanization Service Enterprise Centers (AMSECs) since 2007. While the intention of establishing AMSECs is to promote private sector-led mechanization, doubts are raised regarding sustainability due to the heavy subsidy on tractors and other equipment, and the government's direct involvement in the importation and distribution of agricultural machinery.

Two questions are fundamental for the sustainability issue:

- Has the AMSEC model left enough room for the private sector to develop the supply chain for mechanization, including machinery imports and trade?
- Does this model link smallholder demand for mechanized services to supply such that supply can further induce demand and mechanization can broaden its role in agricultural transformation?

Based on a recent paper by Diao et al. (2012), this brief assesses the current supply model and government policy in Ghana and introduces a few stylized supply models relevant to Ghana. Policy recommendations for Ghana are also made.

AMSEC IN GHANA: WHAT HAS GONE WRONG?

The supply chain of mechanization can be broken down into three key components: (i) mechanization service provision; (ii) supply of machinery; and (iii) repair services, including supply of spare parts. Both service provision and repair services are currently run by the private sector through the markets. The introduction of the AMSEC model has a notable impact on these markets. Our analysis focuses on the supply of machinery and how the government's interventions affect the private sector's role along the supply chain.

Evidence indicates that mechanization service provision in Ghana is a competitive market. Most farmers in Ghana access tractor services for land preparation through the tractor service provision market, where tractor owners provide hiring services to small-scale farmers, who generally are unable to own their own machinery. The government, which previously supplied services through state farms, withdrew from this market in the early 1990s after the structural adjustment reform. The suppliers of mechanized service include individual tractor owners who often are larger farmers and own one or two tractors, as well as AMSECs. According to the information drawn from a survey conducted by Benin et al. (2012), as well as from the authors' own observations, farmers reported similar service prices between these two types of suppliers and that the only significant difference in service prices is between the South and the North—the South is more developed than the North.

AMSECs are established as private entities but are selected by the government to provide subsidized tractors and other agricultural machinery. AMSEC was initiated in 2003, founded on the position that government has a mandate to promote timely and affordable services to farmers who cannot afford agricultural machinery on their own. The first AMSECs were established in 2007/2008 with 12 pilot centers, followed by 77 more centers in 2009 and 2010. AMSECs were selected by the government, with the Agricultural Engineering Services Division (AESD) of the Ministry of Food and Agriculture (MoFA) as the implementing agency. Each center received a package of 5–7 tractors with plow, harrow, and trailer attachments.

The price of the tractors to AMSECs is two thirds of the CIF price, with only a 20 percent down payment paid at delivery and the interest-free balance supposed to be paid over 2-3 years. There is little information available to document how allocations of machinery were decided. Government officials have decided the number of tractors allocated to each center, which seems to lack any market mechanism. According to an AMSEC survey con

ducted in 2011, the repayment schedule has failed to meet the government's expectations for most AMSECs (Johnston et al. 2012). While the objective of establishing AMSEC was to promote private sector's engagement in mechanized service provision to smallholder farmers at lowered cost, the subsidies seem not to have been passed onto farmers, as farmers paid the same charge provided by both subsidized AMSECS and non-AMSEC providers, and the charge has been increasing annually (Benin et al. 2012).

The AMSEC scheme can be understood as a specialized service provision model, a model which represents an important shift in the recent government policy to promote mechanization service provision. Instead of medium and larger farmers owning individual machines for their own use and for hiring services to smaller farmers, an AMSEC is designed as a non-farm private enterprise that operates in hiring service business area. The assumption behind this model is that the specialized service provision can be profitable.

However, Houssou et al. (2012) show that even with heavily subsidized tractor prices, capacity utilization of AMSEC tractors is far below the threshold level for tractors to be an attractive and profitable investment for the private sector. Measured by returns to tractor investment at the subsidized price, the majority of AMSECs surveyed were not profitable due to low operational scale and high operation costs.

Service provision is still dominated by plowing services in Ghana. In 2010, only 38 firms among the 136 surveyed (including both AMSECs and non-AMSECs) provided services beyond plowing and 80–90 percent of service revenue for a provider is from plowing (Benin et al. 2012).Southern Ghana has two cropping seasons while the north has only one, with potential for 60 days of plowing in the south, and 45 days in the north. If tractors were to move between south and north, the maximum operational days is in theory 90 days. But providers are not currently migrating across regions due to additional fixed costs of transporting equipment, increased direct and opportunity cost per acre for remote supervision of operators, and lack of local market knowledge.

There is scope for providers to increase revenue by using tractors for other operations in addition to plowing, while to realize such potential requires the active engagement of the private sector in producing or importing low cost attachments. The current tractor subsidy policy does not encourage such engagement, when AMSECs can get expensive new tractors from the government at extremely low cost. Specialized service provision can further increase operating costs when tractors are operated by hired operators instead of their owners. Frequent breakdown of tractors is reported in Ghana, which shortens operating time and increases maintenance cost. This situation indicates poor management and misaligned incentives for operators in newly established AMSECS, where a certain scale has been imposed by the five-tractor-package received from government.

In the case of China (described in the next section), harvesting machines are operated by their individual owners who only need to hire an assistant. In Ghana, operators are paid by the number of acres plowed, bearing none of the variable costs which they control.

In Ghana, agricultural machinery is imported through two totally different and independent channels. The government dominates the new machinery imports—almost all recent new tractors have been imported through the government. One the other hand, the private sector dominates the used tractor market. Total stock of tractors in Ghana was estimated at 2,200 in 2002, and since then the government has imported almost 3,000 tractors and 300 power tillers (AESD 2012). While in the early period of the last 10 years individual farmers were the main recipients of the new tractors, new tractors were mainly given to AMSECs (totally about 480 tractors) since 2008.

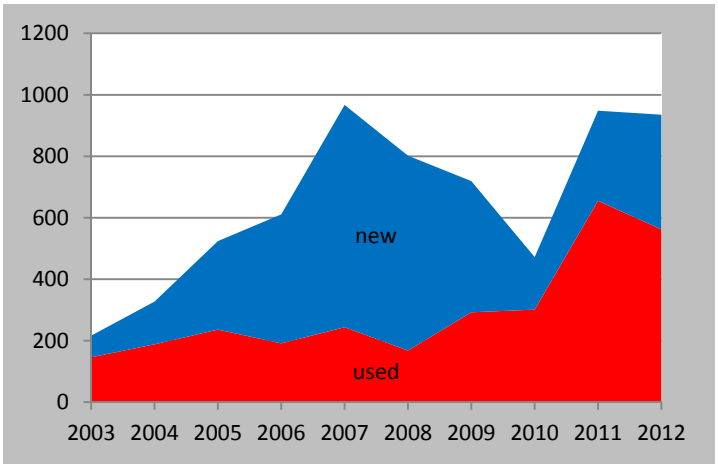
Agricultural machinery imported by the government is financed by either a grant received from a developed country or concessional loans from the governments of a few emerging economies, with restrictions on from where tractors are to be imported, as well as which brands. Therefore, different brands of tractors have been brought in from different lender countries by the government under different loan agreements. Under each arrangement, a different local company was selected as the agent for the government. Without the continuity of government contracts, these companies struggle to survive in such business environments. It is unlikely that tractor importation and spare part supply could become steady and profitable businesses while the government is the biggest importer and frequently changes from one brand of tractors to another.

The lessons from Asia demonstrate that appropriate and affordable machinery will be supplied when there is a private sector-led, competitive market for machinery imports. Currently, local machinery suppliers in Ghana are not concerned with which machinery will meet the demand of farmers and tractor users, but instead are concerned with lobbying for government contracts. In Bangladesh and Thailand, soon after private imports took off, domestic manufacturers began adapting imported machinery to suit the local market. It is unlikely to expect this pattern in Ghana, when international manufacturers and the local market are disconnected through the government imports.

However, the Ghanaian private sector has experience and knowledge to do business in tractor importation, and has fully operated the used tractor market over the past three decades. In

fact, a significant share of imported agricultural machinery is used, and the shares have remained steady over the last decade, despite government's increasing role in imports (Figure 1).

FIGURE 1: AGRICULTURAL MACHINERY IMPORTS



Source: Customs, Excise and Preventive Service, Government of Ghana.
Note: Data for 2012 is up to July 2012.

Imports of new tractors have been sporadic as they are driven by the different phases of government imports, while used imports have increased considerably since 2010. Most private importers are small businesses that have built a stable import channel from exporting countries through long term business networks. Massey Fergusson and Ford dominate used imports, ranging between 50-70hp and can be up to 30 years old. Tractor purchase is a costly investment both for its users (farmers) and traders (private entrepreneurs). The India model shows that available financing support can help private sector to expand business by stimulating demand from tractors buyers. In Ghana, the private tractor importers in the second hand markets are doing business without any governmental support, and commercial financing is also unavailable to them.

ALTERNATIVE SUPPLY MODELS

To be able to draw lessons from other countries, three stylized models are developed based on experiences of Asian countries. While the models are named according to the countries—Bangladesh, China, and India—they represent experiences beyond these three countries .In fact, the three models are used to demonstrate that there are various pathways for developing a supply chain for mechanization and the government policies have a role in influencing the process. In this brief, the three models are summarized in Table 1, while a full discussion can be found in Diao et al. (2012).

The key lessons of the three models can be summarized as follows. Small farm size and high land fragmentation is not necessarily a barrier to private investment in mechanization, since these challenges are common across Bangladesh, China, and India where widespread mechanization has developed. Ownership of machinery by farmers is an important condition for successful and sustainable adoption of mechanization. In all three countries, farmers have been the most important investors in agricultural machinery in the first stages of mechanization. When tractors are tailored to the farmer's economic conditions and when multi-functional operations are feasible, investment by small-and medium-scale farmers in tractors is profitable by combining the provision of hiring services and servicing their own land.

Adoption has been sustainable when the private sector actively engages in machinery supply market, including imports. While liberalized trade policy is a must for private sector engagement (as in Bangladesh), the subsidy policy is sometimes necessary to stimulate demand (as in India). However, subsidy policy should be broad and avoid narrowly targeting selected machinery items by the government. Only through the market interaction of machinery supply and demand will suitable and affordable machinery be brought into the country. When the supply chain is led by the private sector, local adaption becomes possible even for a country without capacity to manufacture tractors. In India, this capacity has grown into the largest tractor export industry in the world, while Bangladesh's industry has adapted simple machinery for the domestic market. Local fabricators will play a critical role in developing simple implements and attachments tailored to the need of farmers. This is important for multi-functional operations to become possible, which can both increase returns to the owners of machinery and demand for such services by farmers. Specialized suppliers of mechanization services become profitable and hence sustainable only for more control-intensive operations using specialized equipment and in the countries with large agricultural area and diverse seasons. This case is evidenced in China where specialized providers of combine harvester services have evolved. Even in such countries, coordination in collective action under this model is still a challenge, for which either the local government's help or other coordination arrangements are necessary.

CONCLUSIONS

What can Ghana learn from the Bangladesh, China, and India models?

Government policy in Ghana has moved forward to increase the number of AMSECs, which reflect a typical specialized service provision model. For this reason, we would like to draw policy implications from the three stylized models in order to help the country search for a sustainable mechanization supply model.

Successful mechanization process begins with ownership of machinery by farmers

Farmers can better manage tractors as production assets and use them more efficiently. All three models demonstrate that only when farmers begin to own and operate their own machinery will the mechanization process take off. Multi-use of machinery can increase the incentive for farmers to invest in tractors when farm size is small and when labor cost for land preparation is high.

Imports of machinery should be open to and led by the private sector

In Bangladesh, it was only when trade restrictions were lifted that private sector imports of power tillers grew considerably. In India, the successful phase of mechanization occurred when government allowed the private sector to fully operate the agricultural machinery markets, both imported and domestic. When importation is directly handled by the government, it is unlikely to bring in the right tractors at the right prices for farmers. Local demand will guide the importation of appropriate and affordable machinery.

Government subsidies should encourage private investment

In the India and China models, government subsidies successfully encouraged private sector's investment. The crucial difference between these subsidies and the subsidy policy of the Ghana model is that subsidies were applied across an extensive menu of machinery including animal-drawn implements, hand tools, power tillers, and tractors. Subsidies should go directly to farmers as buyers of the machinery. The subsidized prices for a large range of machinery could be explicitly listed in a publically available government document, as the case of India's subsidy policy (Government of India 2012). Imports and trade in subsidized machinery would be undertaken by the private sector, with only the price subsidy being administered by the government.

Promote the financial sector's involvement in mechanization

In Ghana, a used tractor market operated by the private sector exists without government support. The development of this market is constrained by limited financial capacity of private enterprises in importation and farmers as buyers. India's experience shows that through governmental support to the financial institutions, domestic banks (particularly development banks) can provide longer-term lending to the private sector to invest in agriculture sector. Interest rate subsidies and any other policy that can lower the risk of banks in doing such business can be options.

There are several areas of promise that mechanization supply can become sustainable in Ghana.

1. The private sector has been involved in the imports of used machinery over three decades. This is already a profitable business in Ghana, which, with the correct support from government, could expand.
2. Evidence indicates that urbanization and rising wages will continue to increase pressure to intensify farming and therefore increase demand for mechanization.

However, the government's promotion of the AMSEC model should be reconsidered. From the experience of other countries which have successfully mechanized, it is clear that a specialization model of mechanization service provision is only profitable at later stages of mechanization and with bigger scale. While current AMSECs are not profitable as an investment,(Houssou et al. 2012), individual farmers who purchase used tractor owners can make money by offering hiring services in addition to servicing their own farms, as shown in the Bangladesh and India models discussed above, although the appropriate type of machinery has varied by country. This model of supply already exists in Ghana and better policy can further promote its development.

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