POLICY NOTE #4 • AUGUST 2014

GHANA
Strategy Support Program

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
IFPRI
A member of the CGIAR Consortium

CAN THE PRIVATE SECTOR LEAD AGRICULTURAL MECHANIZATION IN GHANA?

Nazaire Houssou, Xinshen Diao, and Shashi Kolavalli

AGRICULTURAL MECHANIZATION IN AFRICA SOUTH OF THE SAHARA

Increasing agricultural mechanization has long been of interest to many African countries. Constrained by the limited area that can be cultivated through the use of the hand hoe and its association with perceptions of primitiveness and drudgery, agricultural mechanization and large-scale farming have long been a part of the vision of modernizing agriculture in many African countries, including Ghana. Early state-led efforts that suffered from the usual state-associated implementation failures, combined with a number of other factors, such as lack of demand, discredited public efforts to mechanize agriculture in Africa. Such past efforts were rightly perceived as being supply-led (Pingali et al., 1987).

Recently, there has been growing demand to mechanize farm operations due to the urgency of intensifying agricultural production and expanding land under cultivation. Factors leading to this increased demand for mechanization include more frequent use of land, increasing non-farm opportunities that attract labor away from agriculture, and, consequently, increases in land to labor ratios (Diao et al., 2012). Unlike with the previous generation of mechanization programs, supply issues may now be the main constraint to successful mechanization in Ghana (Diao et al., 2014).

RECENT PUBLIC EFFORTS, BUT SAME OLD ISSUES PERSIST

Recently, many governments in Africa south of the Sahara have begun to invest in agricultural mechanization. The government of Ghana has done so through the provision of subsidized tractors to individual farmers and the promotion of state-subsidized but privately-operated Agricultural Mechanization Service Enterprise Centers (AMSECs) (Agricultural Engineering Services Directorate, 2003; Houssou et al., 2013a). So far, these efforts have not proven to be much more successful than the earlier agricultural mechanization efforts in the 1960s and 1970s. AMSECs have expanded the availability of mechanization services (Benin et al. 2012), but have not been privately viable at the scale at which they have operated. Old problems persist: maintenance and repair services remain underdeveloped, there is an inadequate supply of spare parts for the different brands of imported tractors, and mechanized plowing skills remain poor (Benin et al., 2012; Houssou et al., 2013a). Additionally, research indicates that demand for agricultural mechanization is still not adequately met, even though the Ministry of Food and Agriculture (MoFA) spent $52 million in loan funds on agricultural mechanization from 2003 to 2012 (Agricultural Engineering Services Directorate, 2012).

However, while the Ghanaian government has intervened to promote agricultural mechanization under the assumption that the private sector would not be able to meet the mechanization needs of Ghanaian smallholder farmers, a vibrant parallel market for agricultural machines has quietly developed. In this policy note, we present some insights into private-sector led efforts among tractor owners who combine own use of agricultural machines with hiring-out of mechanization services. These insights are based on analysis of data from a survey conducted by the International Food Policy Research Institute and the Savannah Agricultural Research Institute (IFPRI/SARI) between October and December 2013 in eight districts in Upper East, Upper West, Northern, Brong Ahafo, and Ashanti regions. The survey covered 1,843 farmers, including 408 tractor owners. The tractor owners surveyed constituted nearly 60 percent of all tractor owners in these districts, based on lists prepared by the district offices of Ministry of Food and Agriculture and a census of tractors conducted by USAID's ADVANCE project (2013).

TRACTOR DIFFERENCES: PUBLIC VERSUS PRIVATE CHANNELS

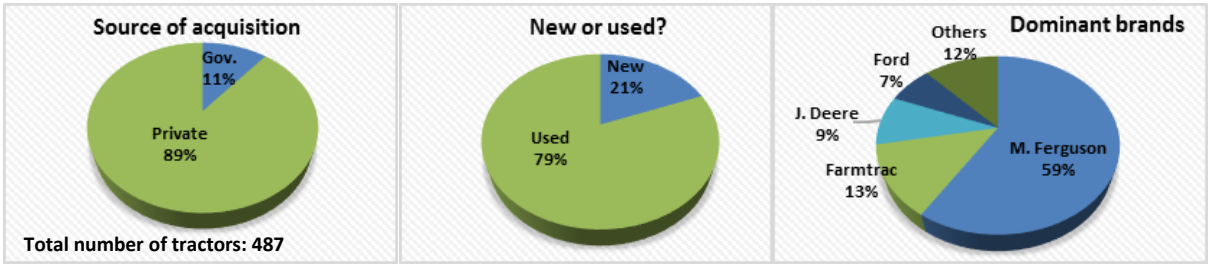
According to the listing done by district offices and the tractor census, the number of tractor owners in the survey districts ranges from 6 to 180. The cultivated area per tractor in these districts ranges from 198 to 2,976 hectares per tractor in 2012. The survey reveals that animal traction is mostly used in Upper East and Upper West regions, where few tractors are found. Likewise, the survey shows that nearly 90 percent of tractor owners purchased their tractors from private dealers based in Accra, Kumasi, Tamale, and district capitals (Figure 1), with only a small fraction of owners having purchased their tractors from government sources.

About 80 percent of imported tractors are second-hand. Few private dealers sell new tractors. Used machines at affordable prices, which seem to perform as well as new ones, offer a significantly

cheaper alternative to new tractors for Ghanaian farmers and agricultural machinery operators.

Massey Ferguson (MF) is the dominant brand on the private market for used tractors. With readily available spare parts that are somewhat cheaper than those of other brands, it is the most common tractor among private buyers. A used 2-wheel drive MF tractor of 50-70 horsepower sold for between USD 5,000 and 10,000 in 2012 compared to USD 29,000 for a new one and USD 19,000[1] if its price was subsidized by MoFA. Similarly, a used John Deere tractor sold for USD 9,000 compared to USD 19,000 for a new one.

Figure 1—Tractors in use in Ghana - source, new or used at purchase, and brand

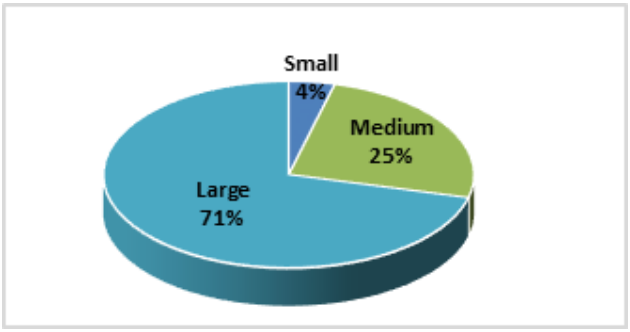


Source: IFPRI/SARI Survey (2013). Gov. stands for Government, including NGOs and projects. M. Ferguson indicates Massey Ferguson brand. J. Deere indicates John Deere brand.

WHAT KIND OF FARMERS OWN A TRACTOR?

Some farmers buy tractors even if they do not have adequate land to make full use of them. A quarter of the tractor owners are medium-scale farmers who cultivate 20 hectares or less, and a few are small farmers who cultivate less than 5 hectares (Figure 2). On average, tractor owners in the sample hold 39 hectares of farmland with a cultivated area of 23 hectares, i.e., about 60 percent of their holdings are under cultivation.

Figure 2—Farm size among tractor owners



Source: IFPRI/SARI Survey (2013). Small (< 5 ha), Medium (5- 20 ha), Large (>20 ha).

Private imports of tractors have been on the rise recently (Diao et al., 2012). About 80 percent of owners surveyed reported having acquired their tractors less than five years ago (Table 1).

Owners who bought their tractors from private traders did so by paying cash. Nearly 87 percent of them indicated that they used their personal savings to buy the tractors and 4 percent used remittances sent by their relatives. Only about 2 percent of tractor owners financed their tractor purchases with loans.

Table 1—How long ago owner acquired tractor, percent of owners

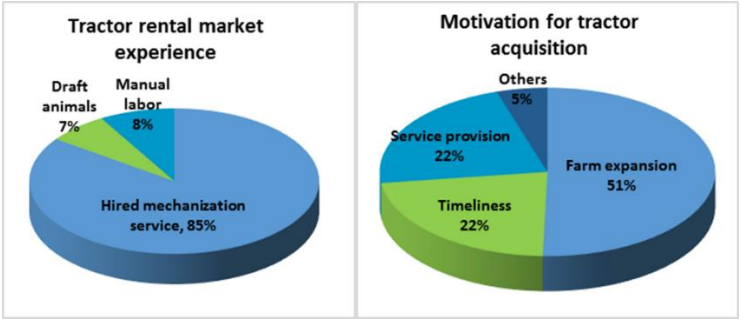
	Overall	New tractor owners	Used tractor owners
Less than five years	78	73	79
Five to ten years	15	18	15
More than ten years	7	9	6

Source: IFPRI/SARI Survey (2013).

WHEN AND WHY DO FARMERS OWN A TRACTOR?

Before they acquired their own tractors, nearly 85 percent of the tractor owners reported having hired-in mechanization services on their cropland for more than ten years (Figure 3). When asked what motivated them to buy a tractor, about 50 percent of owners responded that they wanted to expand the area that they cultivated. In addition, owners indicated that they need to plow on time and want to provide plowing services to other farmers. Having observed how the rental market works when they were hiring-in such services, they may have been attracted by the prospects of profitably offering such services themselves.

Figure 3—Tractor rental market experience and motivation for tractor acquisition



Source: IFPRI/SARI Survey (2013).

[1] Subsidized price estimated based on the Government official subsidy rate of 33 percent.

The survey of tractor owners shows that on average they plowed 20 hectares of their own farmlands (Table 2). As the tractor owners do not cultivate adequate land to make full-time use of their tractors, they have strong incentives to provide hire-out services after they acquired their tractors. About 83 percent of the tractor owners offered services to other farmers, with these owners offering services to 60 other farmers. The services provided to other farmers involve plowing on average roughly 160 hectares each year. With the area plowed on the owner's farm, this brings the total use of tractor for plowing close to its seasonal limit, i.e. about 182 hectares in the North and 242 hectares in the South (Houssou et al., 2013a). Such hiring-out of plowing services is common – even draft animal owners offer services to other small farmers (Houssou et al., 2013b). In addition, about 25 percent of owners own locally manufactured maize shellers that can be powered by their tractor, allowing them to provide maize shelling services in addition to hire-out plowing services.

Table 2—Hiring-out of tractor services by tractor owners

	Overall	New tractor owners	Used tractor owners
Percent of tractor owners	83	78	84
Ratio of owner to farmers served (median)	1:60	1:80	1:60
Number of hectares plowed:			
Own farm	20	25	19
Hired-out service provision	163	152	169
Total	182	176	187

Source: IFPRI/SARI Survey (2013).

According to tractor owners, used tractors do not cost any more to maintain than do new tractors (Table 3). New tractor owners are likely to service their tractors more frequently and, thus, to spend more money on tractor maintenance, compared with used tractor owners. Previous survey findings (Benin et al., 2012), as well as the IFPRI/SARI (2013) survey results, indicate that repair skills and spare parts for used tractors, particularly for MF tractors, are readily available. Additionally, the spare parts are much cheaper than spare parts for the new tractors imported by the Government.

Table 3—Tractor maintenance and mechanical breakdowns

	Overall	New tractor owners	Used tractor owners
Number of maintenance sessions per year	2.9	3.3	2.8
Annual cost of maintenance per tractor (Ghana cedis)	252	261	242
Type of breakdowns (percent)			
No breakdown	11	9	11
Engine problems	31	24	32
Hydraulic	22	25	21
Tires and wheels	21	20	21
Other breakdowns	16	21	15

Source: IFPRI/SARI Survey (2013). Maintenance entails change of engine oil and filters.

The patterns of mechanical breakdowns appear to be similar for both groups of tractors with exceptions: used tractor owners are more likely than new tractor owners to encounter engine problems.

KEY MESSAGES FOR POLICY ON MECHANIZATION

Public efforts in Ghana need to support the development and introduction of appropriate and affordable agricultural machinery to increase the range of farm operations that are mechanized and to facilitate the adoption of improved agricultural practices. Such efforts can take the form of investments in research and development of such machinery conducted with private equipment manufacturers. A vibrant market is likely to develop given the demonstrated willingness of Ghanaian farmers to invest as much as USD 10,000 to mechanize their operations and to offer mechanized plowing services to other farmers. Without substantial expansion of individual farmer investments in tractors, it would not be possible to scale up mechanization services to adequately meet the needs in the country, even if the operations of AMSECs could be made viable. The emergence of private equipment supply, maintenance, and service provision in the Kpong irrigation scheme to support the mechanization of profitable rice farming, for example, is an indication of the potential for private sector development (Takeshima et al., 2012).

Public investments are also needed to help tractor owners improve maintenance and the utilization of their tractors. A recent survey by the University of Hohenheim (Germany) suggests that tractor operators are not sufficiently skilled and that they have a poor understanding of required maintenance to maintain the tractors in good running order. Training in maintenance and tractor operations, and the licensing of tractor operators are some of the areas to consider.

REFERENCES

Benin, S., M. Johnson, K. Jimah, J. Taabazuing, A. Tenga, E. Abokyi, G. Nasser, G. Ahorbo, and V. Owusu. 2012. "Evaluation of Four Special Initiatives of the Ministry of Food and Agriculture, Government of Ghana." Final report, Ministry of Food and Agriculture, Accra, Ghana.

Diao, X., F. Cossar, N. Houssou, and S. Kolavalli. 2014. Mechanization in Ghana: Emerging Demand and the Search for Alternative Supply Models. *Food Policy.* 48: 168–181.

Diao, X., F. Cossar, N. Houssou, S. Kolavalli, K. Jimah, and P. Aboagye. 2012. Mechanization in Ghana: Searching for Sustainable Service Supply Models. IFPRI Discussion Paper 01237. Washington, DC: IFPRI.

Agriculture Engineering Services Directorate. 2012. Tractor Import Data. Accra: Ministry of Food and Agriculture.

Agriculture Engineering Services Directorate. 2003. AMSEC Proposal. Accra: Ministry of Food and Agriculture.

Houssou, N., X. Diao, F. Cossar, S. Kolavalli, K. Jimah, and P. Aboagye. 2013a. "Agricultural Mechanization in Ghana: Is Specialization in Agricultural Mechanization a Viable Business Model?" *American Journal of Agricultural Economics* 95 (5): 1237-1244.

Houssou, N, S. Kolavalli, E. Bobobee, and V. Owusu. 2013b. "Animal Traction in Ghana." International Food Policy Research Institute, Ghana Strategy Support Program Working Paper No. 34).

IFPRI/SARI (International Food Policy Research Institute & Savannah Agricultural Research Institute). 2013. Survey Data on Medium and Large-Scale Farmers and Agricultural Mechanization, Accra, Ghana.

Pingali, P., Y. Bigot, and H. Binswanger. 1987. *Agricultural Mechanization and the Evolution of Farming Systems in Sub-Saharan Africa*. Washington, DC: World Bank.

Takeshima, H., K. Jimah, S. Kolavalli, and X. Diao. 2012. *Dynamics of Transformation: Insights from Rice Farming in Kpong Irrigation System (KIS)*. International Food Policy Research Institute, Ghana Strategy Support Program Discussion Note No. 008. Accra: IFPRI.

USAID/ACDI-VOCA. 2013. ADVANCE Tractor Census of Northern Ghana. Accra. Project report. USAID/Ghana and ACDI/VOCA.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
2033 K Street, NW • Washington, DC 20006-1002 USA
T: +1.202.862.5600 • F: +1.202.467.4439
Skype: ifprihomeoffice • Email: ifpri@cgiar.org

GSSP – IFPRI
c/o IWMI, PMB CT 112 • Cantonments, Accra, Ghana
CSIR Campus (Opposite Chinese Embassy) • Airport Residential Area
T: +233 (0) 302 780 716 • F: +233 (0)-302 784 752
gssp.ifpri.info
Contact: Shashi Kolavalli - Senior Research Fellow and Program Coordinator

This publication has been prepared as an output of the Ghana Strategy Support Program, which is funded by USAID and facilitated by the International Water Management Institute (IWMI) headquarters. Any opinions stated herein are those of the author(s) and do not necessarily reflect the policies of the International Food Policy Research Institute (www.ifpri.org), its partners, or its collaborators.