



APRA Brief

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Tractors, Markets and the State: (Dis)continuities in Africa's Agricultural Mechanisation

Key messages

- Today's emerging farmers and ready farm sites suitable for mechanisation are rooted in history, not least in processes of material accumulation (benefiting farmers, businesses and civil servants) supported by past interventions by the state, international aid agencies and corporations.
- Mechanisation plays into processes of accumulation from above and accumulation from below in African agriculture. Tractors serve as tools of patronage as well as instruments of agrarian transformation.
- Better-off farmers and well connected business have been better placed to benefit from the new wave of mechanisation. But some small-scale farmers are also tapping into the technology available, both reflecting and feeding into a process of accumulation from below.
- Discussions about technology are often too absorbed by considerations about technical and economic efficiency, overlooking social and ecological dimensions. And technology blueprints may foreclose options for the future, locking farmers into a particular farming pathway and undermining capacity to generate solutions adapted to different social and ecological environments.

Introduction

Agricultural mechanisation has once again become a topical issue in African policymaking, following the reinstatement of agriculture in the growth and development agenda for the continent since the turn of the century. This is illustrated by the pan-Africa strategy for agriculture (the Comprehensive Africa Agriculture Development Policy [CAADP]), the renewed interest in the sector within the established aid system, and the unfolding of new South-South relations involving agricultural investments, technology transfers and trade.

In this new context, mechanisation has been seen as part of a desired process to modernise African agriculture, and a necessary step to boost the sector's low productivity. A report by the African Centre for Economic Transformation notes that agriculture can power Africa's economic transformation, but for that to happen small-scale subsistence farmers need to be made commercially viable.¹ Such transformation, the report argues, requires embracing Green Revolution technologies – a combination of improved seeds, chemicals and mechanisation, including drones and tractors.

But the contribution of mechanisation to agricultural growth and food security and, more broadly, an inclusive and sustainable development trajectory is not linear, and the debate around desirable types of mechanisation and role of the state (versus markets) in the process is far from settled.

Drawing on research in Ghana, Mozambique and Zimbabwe, this brief offers an overview of recent trends in Africa's agricultural mechanisation and of how the topic has been handled in the policy debate. It highlights findings from the three country studies that illustrate how state-sponsored or farmer-led mechanisation are enmeshed in broader processes of agrarian change.

Broad trends

In 2018, FAO and the AU Commission (AUC) launched a joint strategy on Sustainable Agricultural Mechanisation in Africa (SAMA), laying out priority elements to be considered by national mechanisation strategies, including the prioritisation of

¹ Source: <http://acetforafrica.org/publications/african-transformation-report-2017/african-transformation-report-2017/> (accessed March 6, 2019).



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commodities that can more easily be mechanised (such as maize, rice and wheat) and farms that are profitable enough to bear the costs of mechanisation.

This renewed emphasis on mechanisation echoes the apparently growing dynamism in the trade of mechanical technology across the continent.² China, as well as India and Brazil more recently, have subsidised the export of their own domestically produced farming machinery, particularly tractors and tractor implements. These are sold to African governments, machinery dealers and farmers as part of concessional loans that integrate new South-South cooperation arrangements, blending Southern solidarity diplomacy with business interests. These new deals have increased access to relatively cheap brands, particularly those from China and India. The Brazilian industry has claimed to offer farming technology specifically devised for operating in the tropics.

In the meantime, the world-leading machinery corporations (from Europe and the United States) have shown renewed interest in the African market, in part in response to the stagnation of demand for machinery in the more mature European markets. Massey Ferguson, for example, has revamped the old MF35 model, marketing it as “the peoples’ tractor.”³

While competition between machinery providers from North to South has intensified, African governments have welcomed new business opportunities and development assistance, and South-South cooperation has become crucial to facilitating access to new technology.

Tractors have gained centre stage in these deals, reflecting the historical attraction to this symbol of power and modernity. Besides being instruments of political patronage, they have also long been seen as tools of social transformation, as in Nyerere’s villagisation (*Ujamaa*) vision in the 1960s, which regarded tractors as vehicles of emancipation for the peasantry. But twenty-first century state-led tractor deals are enveloped by a language of development as business. SAMA’s Agenda for Action recommends the development of public–private partnerships, which some African governments

have already put in place to ensure the financial sustainability of new (state-sponsored but privately-managed) mechanisation services (e.g. Mozambique). Also, despite SAMA’s emphasis on small-scale farmers, women and youth, profitability is regarded as the “conditioning factor [that] must be met prior to mechanization” (FAO and AUC 2018: xvi).

Concomitant with these supply-led developments, there is also evidence of rising demand for mechanisation in parts of Africa. These have been attributed to the acceleration of urbanisation and land concentration, which have resulted in rising labour costs and land/labour ratios that have rendered labour-saving technology relatively cost-efficient (Diao et al. 2014). But other trends are observable. In Zimbabwe, for example, there has been a trend of increasing urban-to-rural migration driven by de-industrialisation. Yet, the growing informalisation of the economy and opportunities in the non-farm economy have triggered a rise in demand for tractors.

Second-hand markets for machinery, the development of mechanisation services and the emergence of new market coordination services – such as those provided by Hello Tractor that connect tractor owners with farmers needing tractor services – have also stimulated demand and market-based transactions.

With the developments outlined above comes the resurfacing of old debates on the rationale for mechanisation, appropriate technology types and roles for the state.

Recurrent debates

The economic case for mechanisation centres on the relative cost of production factors – land, labour and capital. According to the theory of induced technology change, the introduction of capital goods, such as machinery, into the farming economy will occur when their relative price falls vis-à-vis other production factors (Pingali et al. 1987). Hence, the rise of labour costs, increase in farm size, or shift to more intensive permanent cultivation will induce farmers to adopt mechanical technology to reduce labour costs. The market (through relative factor costs) will naturally generate an incentive for farmers to mechanise their activities, in response to labour scarcities and higher costs. This induced innovation framework is now being deployed to interpret the rise in demand for machinery in northern Ghana, where induced innovation dynamics are said to be in operation (Diao et al. 2014). While emphasising market dynamism, this perspective cautions against state interference that may distort market-based incentives, encourage rent-seeking and crowd out private machinery suppliers. This type of analysis does not explore, however, the negative externalities associated with certain mechanised solutions available in the market, which are not reflected in the cost of capital. Tractor tillage has been criticised for contributing to the erosion and degradation of soils. The case has therefore been made for steering farmers and markets towards solutions compatible with soil conservation objectives, such as zero-tillage implements. Brazil, for example, is a champion of zero-tillage and has devised a range of mechanical technology solutions across scales of production: from very large to hand-operated jab planters.

From a social equity perspective, however, the scale of mechanisation matters, especially if machinery is to be accessible to small-scale farmers who are the predominant social category in

2 Regrettably, data on imports and use of agricultural machinery in Africa is patchy. FAOSTAT stopped compiling data on mechanisation in 2007, creating a significant data gap that needs urgent attention.

3 Source: <http://int.masseyferguson.com/mf-35-the-peoples-tractor-launched-in-kenya.aspx> (accessed March 6, 2019).

African agriculture, the target group emphasised by SAMA. If this is a target group of development policy, the question is whether the market can naturally provide solutions that suit the group. The predominance of tractors (in aid programmes and market transactions) has been criticised for being inadequate given that the majority of African farmers operate in small and disperse plots that are unsuitable for tractors. Asia's 'small-scale engines revolution', including the use of versatile power tillers, threshers and irrigation technology (such as pump sets and shallow tube wells), has been suggested as an alternative to Africa's preference for tractors and almost exclusive focus on ploughing. The role of the state in the promotion of small engines in countries like Bangladesh and Nepal has been emphasised, and this includes removing import tariffs on small engines as well as appropriate energy policy that favours small producers (Biggs and Justice 2015).

However, if the aim of mechanisation policy is to provide an expanded infrastructure for mechanised service delivery and small farmers are more interested in paying for services than acquiring small-scale equipment, then the focus on larger machinery (such as tractors) is rational, although this may have a negative effect on soils. While animal traction was widely promoted as a viable alternative to tractors during the 1970s, as part of the induced technology framework, this has failed to take-off in Africa. Generally, farmers prefer to hire tractors rather than acquire bullocks. This may also apply to small engines if they frequently breakdown or require investments in capital that small farmers cannot afford. Furthermore, small engines may provide a less amenable base for hiring ploughing services. This raises important issues regarding the nature of accumulation, and the viability of accumulation from below.

Among the various issues on the table regarding Africa's mechanisation, one of the most contentious is, as always, that concerning the role of the state versus the market, and the weighting of failure on either side. Though a long running political and intellectual dispute, the reality is that governments are influenced by market operators and markets are shaped by government action, and therefore the state-market divide is to a large extent an abstraction. Hence, arguments suggesting that emerging farmer entrepreneurs in Ghana reflect the virtues of market liberalisation are challenged by the observation that these entrepreneurs' trajectories are shaped by past state interventions. As highlighted by our study of mechanisation in northern Ghana, these past interventions include state-subsidised land clearance in the 1960s and 1970s that made tractor-based mechanisation physically feasible and financially viable today.

The Ghana study urges us to consider the long trajectories and complex dynamics of accumulation in agrarian societies that cut across different moments of one country's economic policy history. The divide between state and market is not so clear cut. Continuities exist in mechanisation policies although they have been reframed in the narrative of liberal markets, and in the role that various actors play. Thus, state input suppliers have reinvented themselves as private sector companies, and the aspiring capitalist farmers recruited from within the state bureaucracy with state patronage have become medium-scale farmers, with roots in civil service and trading classes. Much of the infrastructure of past state initiatives continues to exist, but now fashioned into the framework of liberalised markets. Similarly, in Mozambique and Zimbabwe, the division between the state and the market is rendered meaningless by elite-party capture of both realms. This implies that mechanisation has been, to a large extent, instrumental to further accumulation from above. Yet, a pattern of accumulation from below is also taking shape in the process of mechanisation, the contours of which require further investigation.

Country highlights

Ghana

A historical analysis of the development of commercial agriculture in northern Ghana reveals many continuities into the present, which raise questions about the influences of market liberalisation in kick-starting a new phase of successful commercial agriculture. This suggests that the present phase of mechanisation builds upon past mechanisation efforts. What has been considered to be the failure of mechanisation, the high toll on tractors and other equipment of converting fallow land into ploughed lands, has actually created the conditions that enable tractor ploughing to be viable in present days.

Beyond the continued uptake of mechanised ploughing, there are continuities in the composition of the class of medium- and large-scale farmers, in their origins in fractions of accumulating civil servants and traders. They are not a new phenomenon made possible by market liberalisation, but were a central feature of the original emergence of an aspiring agrarian commercial class. The attempt to create a clear dichotomy between statist interventions within agrarian markets and liberalised markets is open to question, since NGO interventions in seeking to promote technology uptake among smallholders has led to what essentially constitutes a disguised subsidisation of inputs. Although the main focus has been on new proprietary seeds and inputs, demands among farmers have frequently led to tractor ploughing services becoming a significant component of support for smallholders, both in the state and NGO sectors.

The revised theory of induced technology change applied to the Ghanaian context places emphasis on the dynamics of population, the relationship between land and labour scarcity ratios, and the impact of markets in the uptake of mechanisation. However, it fails to root these changes in more complex patterns of the history and political economy of agrarian accumulation, the politics of agricultural support services, and the livelihood strategies of farmers. This results in a somewhat simplistic model of agrarian change, thus affirming dominant theories of market liberalisation.



© Marcos Villalta with Save the Children_ irrigation project_Mozambique

Mozambique

In Mozambique, the mechanisation of agriculture is still dependent on state and aid support. Machinery stocks are low and there are few private machinery owners renting out equipment to other farmers. In 2015, the Mozambican Ministry of Agriculture launched a national mechanisation programme, as part of a strategy to increase production and productivity and transform peasant farming into commercial agriculture. This was prompted by a concessional loan from Brazil that funded the import of tractors and implements at below market price. By 2018, the programme had established 96 service centres across the country for mechanisation service delivery. The majority of these centres were established public-private partnerships – run by private companies, who purchased farming machinery from the government at a subsidised price and under a leasing contract, and were to provide mechanisation services to the population on a fee-for-service basis. Mozambique's predominantly small-scale peasant farmers rely on short-handed hoes and cannot afford to buy seed or fertiliser, let alone machinery. The programme pledged to target mainly these farmers and address national food security objectives by offering services through privately-managed centres.

Yet the privileged private-public service delivery model and the available machinery package do not seem geared to reach the majority of Mozambican farmers, who are dispersed and farm in small and rugged plots, where tractor ploughing is not cost efficient. Only the better-off farmers are able to pay for tractor services and have the services offered to them within a suitable timeframe. Service centre managers have an incentive to prioritise clients with clear and larger plots that ensure efficient tractor utilisation and reduce the risk of broken parts. Finally, from a sustainability angle, the tractor-based strategy reinforces a tillage-centred approach and the push for intensified production of selected crops, which fits the government's modernisation ambition but risks locking farmers into a particular production model.

Despite its faults, the adopted policy is not without its logic. It is part of an ongoing process of accumulation that the state and its international development partners have nurtured, intentionally or not, over the years. In line with a modernisation thrust, tractors are instrumental to accumulation from above, where well connected private investors (large farmers, businesses or former civil servants) are entrusted by the government to embody the modern agribusiness.

Alongside the large-scale modernisation vision, the government's mechanisation programme is also, perhaps inadvertently, supporting a process of accumulation from below. Increasingly, small to medium-scale farmers, holding enough capital to buy tractors and equipment, are able to buy their own machinery, which they then rent out to other farmers. Our study suggests that, relative to privately managed service centres, these individual (peer-to-peer) farmers' services may be more accessible to the average small-scale farmer because of cost structures, social networks and geography. Yet, the extent to which this represents a more inclusive model needs empirical verification. What mechanisation solutions can be devised to help those farmers at the bottom to 'step up' remains an open question.

Zimbabwe

For Zimbabwe, agricultural mechanisation is part of the endorsement of the government's land reform programme and efforts towards agricultural recovery. In this sense, discerning dynamics of tractorisation requires a political economy angle which



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sheds light on the role of the state, local actors and global players shaping policymaking and agrarian change.

Zimbabwe's agricultural mechanisation trajectory is intimately connected to the country's land reform process and the associated aid politics and domestic power politics. The new global push for agricultural mechanisation in Africa has coincided with agrarian transformation linked to a reconfigured agrarian structure, now dominated by small-scale (A1) farmers and an increased number of medium-scale (A2) farmers. In a process that combined both colonial emancipation aims with party-based patronage politics, medium-scale farmers replaced large-scale commercial farmers, and as such have benefited from both government- and private sector-led agricultural mechanisation. This emerging agrarian structure has reshaped agricultural production patterns, capital accumulation dynamics and mechanisation processes. Land reform has resulted in increased land under cultivation by small-scale farmers. High demand for tractors in recent years has emanated both from the increase in land under cultivation and rising labour costs.

Significantly, the country's macro-economic performance deteriorated in the wake of economic sanctions by traditional donors, following the implementation of the land reform programme. This created new challenges to the import of farming machinery, for both the state and private operators. Despite difficulties on the supply side, agricultural mechanisation has been induced by shortages in farm labour resulting from the informalisation of the economy and increased participation of the rural population in petty commodity production and cross-border trade. However, the economic crisis and foreign currency shortages have also shaped mechanisation in Zimbabwe. State-mediated private tractor acquisition for commercial agriculture wrought by colonial agriculture policy has been discontinued. Notwithstanding, Zimbabwe's pre-independence pattern of tractorisation had been undergirded by labour shortages and well-developed infrastructure. Land-dispossessed white commercial farmers have been the main suppliers to the new medium-scale farmers through an increasingly dynamic second-hand tractor market. Medium-scale farmers have also benefited from the few tractors imported by the government and the Reserve Bank of Zimbabwe, through patronage networks.

Since 2015, the government of Zimbabwe has also benefitted from the Brazilian More Food International (MFI) programme, as part of the framework of South-South cooperation. The programme

narrative emphasises food self-sufficiency for small-scale households. Besides this MFI programme, the government has also been involved in the direct import of tractors through concessional loans from countries such as China, Turkey, Belarus, Iran and Romania. These are mainly targeting medium-scale farmers, who are allocated machinery on a patronage basis.

Tractors are instruments of political patronage, as evidenced by the dynamics in state-party patronage and aid programmes and concessional loans from Southern international partners. Notwithstanding, there is a growing private sharing and hiring market with A1/communal farmers that is becoming more important than government- or aid-sponsored initiatives. Indeed, the majority of farmers access tractors using proceeds from their own agricultural sales. Accumulation from below is, therefore, happening alongside accumulation from above.

Given increased demand and use of tractors by small-scale farmers, there is a need to review the size of tractors offered to farmers. Large tractors are more useful for larger farms while the uneven nature and size of plots owned by small-scale farmers make ownership of bigger tractors less viable. Generational and gender dynamics in mechanisation also need further attention – whereas there is some evidence of new opportunities for young people in the business of hiring out tractors, the participation of women in mechanisation remains low. And to the extent that both women and youth own fewer productive assets, their prospects for accumulation are limited.

Key themes and gaps in research

Three running themes in this study are worth highlighting:

- **Historical continuities in state-market interplay:** the latest upsurge of mechanisation in agricultural policy in Africa has recalled old debates on induced innovation and the role of markets versus the state in driving mechanisation. Yet, where growing private demand for mechanisation and market dynamism are observed, these are not unrelated to past supply side interventions. Today's emerging farmers and ready farm sites suitable for mechanisation are rooted in history, not least in processes of material accumulation (benefiting farmers, businesses and civil servants) supported by past interventions by the state, international aid agencies and corporations.
- **Agrarian structures and concurrent processes of accumulation:** mechanisation plays into processes of accumulation from above and accumulation from below in African agriculture. Tractors serve as tools of patronage as well as instruments of agrarian transformation. Nyerere's vision of peasantry emancipation contrasts with the Mozambican government's present ambition to see emerging the modern agribusiness entrepreneur. Better-off farmers and well connected business have been better placed to benefit from the new wave of mechanisation. But some small-scale farmers are also tapping into the technology available, both reflecting and feeding into a process of accumulation from below. This is particularly noticeable in Zimbabwe, where the pattern of accumulation is tightly linked with the land reform process.
- **Competing development doctrines and technological 'lock-in':** mechanisation also plays into competing development doctrines that are underpinned by distinct emphases on productivity, environmental sustainability, and social equity and justice. Discussions about technology are often too absorbed by considerations about technical



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and economic efficiency, overlooking social and ecological dimensions. And technology blueprints may foreclose options for the future, locking farmers into a particular farming pathway and undermining capacity to generate solutions adapted to different social and ecological environments.

Further research should:

- Investigate the role of mechanisation in processes of accumulation from below and from above through an in-depth analysis of the life trajectories of individual farmers;
- Unveil patterns of social differentiation in access to mechanisation and use of machinery. Specifically, their scope for exploring how gender, age, class, political affiliation and social networks determine access to machinery and mechanisation services, with the aim of identifying inclusive models of service delivery;
- Explore the extent of bottom-up appropriation and innovation in access and use of machinery. For example, Lewis (1996) found that the introduction of tractors into Bangladeshi agriculture in the 1980s created new opportunities, including for brokers who became involved in dividing up the 'lumpy' technology into small units suited to predominantly small-scale farmers.

Exploring how African farmers (women and men, young and senior, poor and rich) interact with machinery, accumulate it, access it or appropriate it requires carrying out field-level ethnography. Such research is needed to explore the scope for transformative innovation from the bottom that can offer a counterpoint to the persisting top-down bias of mechanisation programmes and studies.

References

- Biggs, S. and Justice, S. (2015) *Rural and Agricultural Mechanization: A History of the Spread of Small Engines in Selected Asian Countries*, Washington DC: International Food Policy Research Institute, <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/129214> (accessed April 3, 2016)
- Diao, X.; Cossar, F.; Houssou, N. and Kolavalli, S. (2014) "Mechanization in Ghana: Emerging demand, and the search for alternative supply models," *Food Policy* 48. October: 168–181, <http://doi.org/10.1016/j.foodpol.2014.05.013>
- FAO and AUC (2018) *Sustainable Agricultural Mechanization: A Framework for Africa*, Addis Ababa: Food and Agricultural Organization and Africa Union Commission
- Lewis, D.J. (1996) "Appropriating' technology? Tractor owners, brokers, artisans and farmers in rural Bangladesh," *Journal of International Development* 8.1: 21–38, <https://ideas.repec.org/a/wly/jintdv/v8y1996i1p21-38.html>
- Pingali, P.Y.; Bigot, Y. and Binswanger, H. (1987) *Agricultural Mechanization and the Evolution of Farming Systems in Sub-Saharan Africa*, Baltimore MD: The Johns Hopkins University Press

Image captions:

- Cover - Used a cost-sharing arrangement under Feed the Future to purchase this tractor, this Ghanian family is able to process their soya
- Page 2 - Tractor owned by União Distrital dos Camponeses, Chókwè, Mozambique
- Page 3 - A Save the Children irrigation project in Mozambique has enabled women to grow onions and tomatoes
- Page 4 - A1 small-scale tobacco farmer in Mvurwi, Mazowe district, Zimbabwe
- Page 5 - Privately-managed Agrarian Service Centre, Meconta, Mozambique

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