



Agricultural Policy Research in Africa



# **TRACTORS AND AGRARIAN TRANSFORMATION IN ZIMBABWE: INSIGHTS FROM MVURWI**

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A stylized, light-colored plant graphic with three leaves and a stem, positioned in the top right corner of the page.

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# ACRONYMS

<b>2WT</b>	two-wheeled tractor
<b>4WT</b>	four-wheeled tractor
<b>ARDA</b>	Agricultural Rural Development Agency
<b>ATDC</b>	Agricultural Technology Demonstration Centre
<b>CA</b>	communal area
<b>DDF</b>	District Development Fund
<b>ESAP</b>	Economic Structural Adjustment Programme
<b>FDI</b>	foreign direct investment
<b>FTLRP</b>	Fast Track Land Reform Programme
<b>GMB</b>	Grain Marketing Board
<b>GNU</b>	Government of National Unity
<b>IMF</b>	International Monetary Fund
<b>JV</b>	joint venture
<b>LSCF</b>	large-scale commercial farming
<b>MAMID</b>	Ministry of Agriculture, Mechanisation and Irrigation Development
<b>MFI</b>	More Food International
<b>R&amp;D</b>	research and development
<b>RBZ</b>	Reserve Bank of Zimbabwe
<b>SSA</b>	sub-Saharan Africa
<b>UDI</b>	Unilateral Declaration of Independence

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# ABSTRACT



This paper examines postcolonial agricultural mechanisation in Zimbabwe in the context of recent land reforms. It pays particular attention to the central role played by state-capital relations – with notable links to international finance – in shaping a resurgence in tractor usage following Zimbabwe’s Fast Track Land Reform Programme (FTLRP). Moreover, the economy-wide crisis triggered by land reform shaped the emerging agricultural mechanisation. This study examines the decline in tractor supply by the government, and the growth and dominance of large-scale commercial farms as a source of second-hand tractors for smallholder and medium-scale farmers.

This paper relies on archival sources as well as empirical data collected in Mvurwi through surveys, focus group discussions, tracker studies and in-depth interviews. While the tractors imported by the government from Brazil on concessional terms have become a major source of tractor services for the resettled farmers in Mvurwi, resettled farmers are also reinvesting proceeds from the sale of agricultural commodities predominantly in agricultural mechanisation, creating a new source for tractor hiring services and agrarian transformation. Although patronage politics has shaped the distribution of tractors and the establishment of tractor service cooperatives, there is no evidence of concrete political gains resulting from these investments.

# SUMMARY

This paper examines postcolonial agricultural mechanisation in Zimbabwe in the context of recent land reforms and increased demand for mechanisation in Africa. The paper reveals the decline in tractor supply by the government, and the growth and dominance of large-scale commercial farms as a source of second-hand tractors for smallholder and medium-scale farmers. The paper takes a historical view of agricultural mechanisation, by comparing recent trends and experiences unfolding in the context of the FTLRP with earlier mechanisation experiences in the early independence period. In doing so, the paper relies on archival sources as well as empirical data collected in Mvurwi through surveys, focus group discussions, tracker studies and in-depth interviews. There are two broad questions to be answered by this paper: first, how do African state–capital relations, state-building initiatives, politics and modes of international assistance mould technological innovation in developing countries such as Zimbabwe? And second, how have developmental and political imperatives shaped mechanisation efforts over time in Zimbabwe? More specifically for Zimbabwe, how has the land reform (through changing structures of land use/ownership and shifts in political/patronage relations) influenced processes of agricultural mechanisation? And how has agricultural mechanisation shifted agricultural production and processes of accumulation among Zimbabwe’s medium-scale and smallholder farmers following the FTLRP?

Ownership of and access to tractors is changing and is increasingly skewed towards medium-scale farms. There has been a rise in land access for smallholders following the FTLRP, resulting in a greater proportion of land being cultivated. This, along with rising labour costs, has led to higher demand for tractors in recent years. Concurrently, capital flight in the aftermath of the FTLRP resulted in de-industrialisation and in urban-to-rural migration. However, most of the retrenched workers have been absorbed by the informal sector, leading to labour shortages in the countryside – despite an increase in total land under cultivation triggering a hike in the demand for labour-saving farming technologies, reflecting Zimbabwe’s

pre-independence experiences. The reconfiguration of agrarian relations after the FTLRP coincided with geo-political reconsiderations to generate new demand and supply lines for tractors. A major player in this sense has been Brazil, through its More Food Program implemented through the Brazilian Ministry of Agrarian Development from 2010. Other active countries included China, Turkey, Belarus, Iran and Romania. More recently, South Korea and India have joined the supply chain for tractors in Zimbabwe.

While the choice for bigger tractors in Africa is rarely motivated by state policy, in Zimbabwe tractor hiring amongst farmers is on the rise, signifying an increasing consideration amongst farmers to offer tractor hiring services. As such, in Zimbabwe, geopolitical-economic imperatives, state–capital relations and private sector needs drive mechanisation in agriculture. Zimbabwe’s mechanisation policies and resultant pathways from the early 1900s can be split into six phases, illustrating changing political, economic interests and ideological orientation: the white agricultural policy phase (1908–1948), the post-World War II policy phase (1949–1980), the national reconciliation policy phase (1980–1990), the ESAP and FLRP phase (1991–2005), the Look East policy phase (2006–2008), and the heterodox policy phase (2009–2019). Due to foreign currency shortages and credit collapse after 2000, former large-scale commercial farmers emerged as the new supply markets for second-hand tractors for the A2 medium-scale farmers. Similarly, following the collapse of state-led tractorisation introduced in the early 1980s, private hiring services and tractor ownership has been on the rise among the villagised small-scale (A1) and medium-scale (A2) farmers. However, the remaining large-scale commercial farmers have better access to modern farming equipment, including tractors, due to favourable access to bank credit. The equipment is well maintained compared to that observed at the indigenous large-scale commercial farm. The joint venture farms were observed to have invested heavily in a wider range of farming equipment, including modern technology in tobacco curing and irrigation in recent years. Our survey shows that the majority (72%) of the farmers across Zimbabwe’s farming sectors rely on tractors for tillage services.

Through the Brazilian More Food for Africa Programme, the government has introduced tractor cooperative schemes in the communal and A1 sectors. The cooperatives are managed through the Ministry of Agriculture Mechanisation and Irrigation Development (MAMID), through which repayment of the concessional loans is carried out. The survey revealed that four tractor service typologies have emerged following the FTLRP. These include direct government services, specialised private services, farmer-to-farmer services and the large-scale commercial farmer and medium-scale farmer services. Through re-investment of agricultural sales proceeds, farmers are buying tractors for their own land tillage and to offer hiring services. However, more men than women tend to own tractors. Tractor hiring services by the More Food International (MFI) tractor scheme now also include the provision of services to some A2 farmers who have no tractors of their own. Whereas the provision of tractors under the MFI project may have had political intentions, beneficiaries tend to aspire for some level of independence in the management of their affairs, and as such, tend to 'perform anti-Zanu PF' to avoid patronage-based demands.

The reliance on rural agrarian capital in the form of proceeds from agricultural sales by medium-scale and smallholder farmers indicates that a process of accumulation from below may be unfolding. Yet, notwithstanding accumulation of tractors by medium-scale farmers, the full potential for agricultural development – including agricultural mechanisation – remains constrained by unfair treatment in global value chains and primitive capital accumulation, particularly among smallholder farmers for whom access to tractors remains limited. The paper shows that a political economy tradition that recognises the role of institutions and its linkages, including government

policies, reveals dynamics of technological innovation processes in variegated farming settings. This allows for an analysis that goes beyond neo-classical economics, where only supply and demand market forces are prioritised. In Mvurwi, changing land/labour ratios and induced innovation are only one part of the story. Investment in mechanisation is dependent on politics, patronage, changing agrarian structures and private farmer needs and capabilities.

Given the emerging agrarian structure after the FTLRP, the effects of climate change and increasing demand for food commodities raise questions about the appropriateness of technologies such as large four-wheeled tractors (4WTs) on larger farms, discounting possibilities of tractor hiring-out services; as such there is need for innovations in which two-wheeled tractors (2WTs) are introduced, accompanied by irrigation infrastructure. Importantly, livestock tillage remains vital across the farming sectors, notwithstanding increasing access to tractors.



# 1. INTRODUCTION

This paper takes a historical view of agricultural mechanisation by comparing recent trends and experiences unfolding in the context of fast track land reform programme (FTLRP) with earlier mechanisation experiences in the early independence period. For Zimbabwe, a new global push for agricultural mechanisation in Africa (Diao, et al., 2016) has coincided with agrarian transformation that is linked to a reconfigured agrarian structure, which emerged largely because of the FTLRP. Land reform has produced a trimodal agrarian structure – comprising predominant smallholder farmers ('A1' villagised model and communal farmers), 'A2' medium-scale and remaining large-scale commercial farmers. This structure has reshaped agricultural production patterns, capital accumulation dynamics and agricultural mechanisation processes in Zimbabwe (Moyo 2011; Scoones et al., 2010).

This paper seeks to answer two broad questions: first, how do African state-capital relations, state-building initiatives, politics and modes of international assistance mould technological innovation in developing countries such as Zimbabwe? And second, how have developmental and political imperatives shaped mechanisation efforts over time in Zimbabwe? More specifically for Zimbabwe, how has the land reform (through changing structures of land use/ownership and shifts in political/patronage relations) influenced processes of agricultural mechanisation? Has agricultural mechanisation shifted agricultural production and processes of accumulation among Zimbabwe's medium-scale and smallholder farmers following the FTLRP?

The paper traces how intensified agriculture and an increasing demand for agricultural mechanisation impact on the country's food security demands (see Baudron, et al. 2015). As such, the study reveals how an economic development imperative following the initial decline in agricultural production after the FTLRP resulted in altering policies. Moreover, the country's broader economic decline, closure of global commodity markets, capital flight and increased barriers to agricultural credit – accompanying economic restrictions imposed on the country after 2002 – all combined to

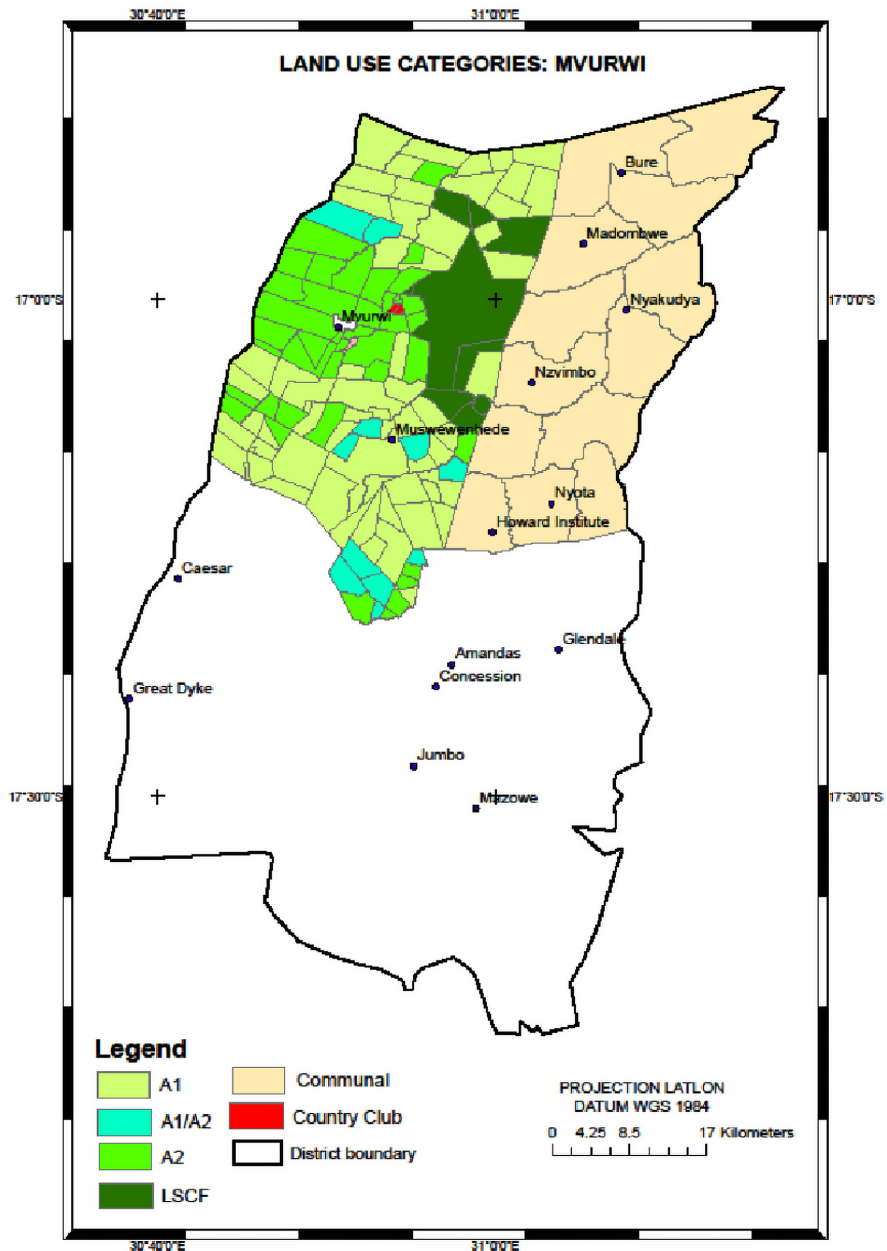
curtail private sector and government capacity to import farming machinery (RBZ, 2008; Mukwereza, 2013). Although this presented constraints for technological innovation, it also offered opportunities in terms of new suppliers of technology and farming machinery from new partners in the Global South (Cabral, et al., 2016). However, few studies have looked at agricultural mechanisation at the micro level. While Rusike (1988) studied the Chiweshe communal area (CA) of Mazowe district, the study falls short in shedding light on the dynamics of agricultural mechanisation in other farming sectors, such as the large-scale commercial farms, and resettled areas where agricultural production demands are markedly different. This paper fills a gap and adds a political economy perspective on the role of mechanisation in Zimbabwe's agrarian change.

Mvurwi, where land reform and intensive agricultural farming have been predominant, serves as a useful case study for a more detailed analysis of agricultural mechanisation in Zimbabwe. This study asked: how has the land reform reconfigured mechanisation circuits and agrarian transformation in Mvurwi? How is the mechanisation policy reaching out to farmers at a local level? Which farmers are targeted, and why? What patterns of elite capture, patronage and social differentiation emerge, and with what consequences?

Ownership of and access to tractors is changing and is increasingly skewed towards medium-scale farms. At present, there are 319 A2 and 4,529 A1 farmers in Mvurwi; the number of tractors owned by these two farming sectors increased from 94 in 2011 to 629 by 2017 (personal interview with MAMID official, 2017). However, most of these tractors (599) are held by the A2 farmers, while only 30 are held by the A1 farmers, and a further 5 are owned by ARDA (*ibid*).

This paper relies on a mixed methods research approach. The review of scholarly literature and policy documentation on agricultural mechanisation in Africa and in Zimbabwe was complemented by an analysis of primary qualitative and quantitative data generated by the study. Qualitative data was collected using in-depth interviews with smallholder tractor cooperative members (12) and large-scale commercial farms (LSCFs) in the selected farming

Figure 1: Map of land use, Mvurwi



Source: Author's own, 2018

area (2). This was complemented by two tracker studies in 55 CAs and 7 A1 farms (smallholder villagised resettled farms), two focus group discussions and two in-depth group interviews (involving two to three respondents) with tractor cooperative members. Quantitative data was generated by a survey of communal family farmers (453), medium-scale A2 farmers (50) and A1 farmers (353), 6 joint venture (JV) farmers and two large-scale estate farmers in Mvurwi.

The rest of paper is structured as follows: section 2 discusses tractors, land and politics to situate the study within a broader context; section 3 presents a periodised

history of tractorisation – defined here as shifts in supply and use of tractors by farmers – in Zimbabwe. In section 4, the paper discusses how land reform has reshaped the demand for tractors and restructured tractor supply chains in Mvurwi. It also presents a detailed analysis of the politics of tractorisation and tractor cooperatives, as well as the impact of mechanisation on agricultural commercialisation and rural transformation. Section 5 discusses theory and practice for agricultural mechanisation while section 6 offers concluding remarks.

## 2. OVERVIEW OF DEBATES ON AGRICULTURAL MECHANISATION

Since the early 1960s, agricultural mechanisation involving a wide range of technologies have been developed and adopted at different times and spaces and by different classes of farmers in dissimilar rural contexts in developing countries (Gass and Biggs, 1993). Technological innovation happened in response to increased demand for cultivated land and agricultural intensification by a wide range of farmers, to meet the growing market demand for agricultural commodities (Diao et al., 2016) due to population growth. For Adekunle (2015, i), “Mechanisation has the potential to expand production; improve timeliness of operations; widen the application of power to crop processing, irrigation and infrastructure improvement; compensate for labour shortages; and alleviate drudgery.” Yet, in sub-Saharan Africa (SSA), the uptake has been low due to lack of effective demand for agricultural mechanisation from farmers over the same period (Gass and Biggs 1993).

Agricultural mechanisation is often a result of “induced technical change in which development and application of new technologies is endogenous to the economic system” (Ruttan 2002, 163). The induced innovation theory was developed in the 1970s by Hayami and Ruttan (1970) and Binswanger and Ruttan (1978). It places emphasis on agricultural technology and adoption as a continuous sequence designed to save either labour or land – the limiting factors (Ruttan 2002; Diao et al., 2016). The model proposes that the development and adoption of new technologies is a function of the imperative to replace more expensive resources with less expensive ones (labour or land) (Binswanger 1986). We see this, for example, where automated machinery replaces human labour (when labour becomes expensive), increasing farmers’ ability to operate in competitive markets for agricultural commodities (Binswanger 1986).

In Zimbabwe, higher effective demand for tractors in recent years has been a result of a greater amount of land under cultivation and rising labour costs. Higher land access by smallholder farmers, following the FTLRP, resulted in increased land under cultivation. Furthermore, capital flight in the aftermath of the FTLRP resulted in de-industrialisation and in rural-to-urban

migration, yet most of the retrenched workers have been absorbed by the informal sector leading to labour shortages in the countryside (Shonhe, forthcoming), triggering an increase in the demand for labour-saving farming technologies. From the perspective of families and farmers on the ground, the impetus for mechanisation arose from the need to reduce drudgery associated with farm operations, releasing family labour for other income generating activities, as well as facilitating the adoption of sustainable farming practices (Houmy, Clarke, Ashburner and Kienzle, 2013).

Structural shifts in the economy beyond the agricultural sector also account for the increased demand for mechanical farming technology. In this sense, high land-labour ratios associated with agricultural labour shortages (Baudron et al., 2015; see Binswanger 1986) were a result of the absorption of surplus labour into non-farm employment, linked to an informalised sector that blossomed following the structural economic changes in the post-2000 period. Yet, as Sanders and Ruttan (1978) argue, induced technological innovation may undermine employment and, in some cases, mechanisation may benefit large-scale farms to the detriment of small-scale farms. Moreover, as Binswanger (1986) observes, mechanisation programmes based on state subsidies have a limited effect on agricultural intensification, and therefore a limited positive impact on employment. Binswanger and Pingali (1987), for instance, highlight the lack of success achieved through the introduction of new technologies in SSA, due to a variety of reasons, including the introduction of inappropriate technology, wrong pricing policies, infrastructural challenges and poor institutional support given the differences in agro-ecological settings and labour markets

Thus, technical innovation thrives if accompanied by technical support, including “organisation of farm production, technical and economic infrastructure and the physical environment” (Anthony, 1988, 10). In this perspective, farm production organisation entails organising specific factors of production: including capital, labour, technology and technical expertise. Technical and economic infrastructure encompasses the provision of technical services for agricultural

production; viz, training, technical maintenance and repair facilities, transport and communication, storage and processing, merchants, marketing, national credit policies and agricultural commodity pricing. The adoption and diffusion of technology is also affected by the physical environment. This includes physical factors such as soil structure and nutrients, vegetation, topography, predators and pests, average annual rainfall, sunlight and temperature. Taken from this angle, Zimbabwe's pre-independence success in tractorisation can be attributed to labour shortages and well-developed infrastructure – such as good roads in the countryside – as well as state subsidies for mechanisation (Binswanger and Pingali, 1988).

However, on its own, an emphasis on the factors of production as outlined by Anthony (1988) is inadequate. For instance, Gass and Biggs (1993) argue that applying purely economic criteria in assessing rural mechanisation is somewhat sociologically naïve, as it overlooks the critical issue of power in the distribution of resources, and the benefits thereof to rural communities. Gass and Biggs (1993, 161) argue that:

Part and parcel of not taking seriously or theorising the implications of (uneven) distribution of power at multiple levels (household, local, regional, national, transnational) is the implicit reluctance to bring the full range of institutions involved in the generation and diffusion of technologies into the picture, and hence the rejection of the view that we need to move beyond the market to institutional loci of the power that may act independently of prices on the determination of investment in research and development (R&D), and productivity, or alternatively may distort the market mechanisms themselves.

Gass and Biggs (1993) therefore conclude that “induced technical change” and the “choice of technique” approaches to rural mechanisation are inadequate in analysing the dynamics of tractorisation in developing countries. Importantly, emphasis on “specific social and contextual order,” “interplay of proxy of economic variables,” “natural order progression” and the notion of the “single best route” to rural mechanisation must acknowledge that internally generated inertia for technological innovation is difficult to re-animate and may result in tractorisation proceeding even if resistance has been activated (Gass and Biggs, 1993, 161–2).

To be sure, in Zimbabwe, global geopolitical considerations and domestic political interests coincided and intersected with the reconfiguration of land ownership patterns (Cabral et al., 2016) to shape agricultural mechanisation. The timing of agricultural mechanisation initiatives was considered

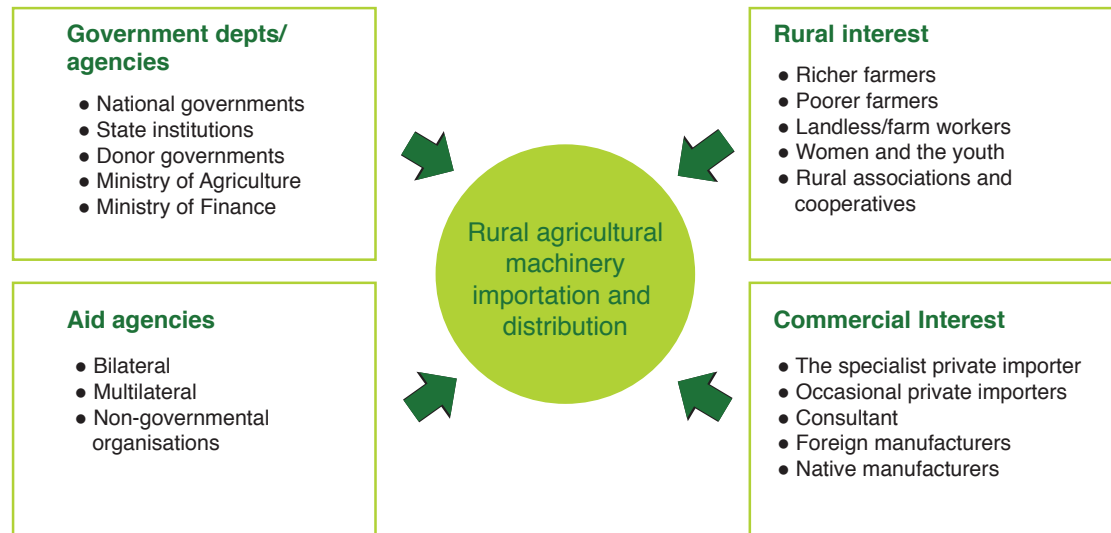
an endorsement of the FTLRP by the ruling Zanu PF government. Government plans to foster agricultural recovery after 2000 also influenced ongoing agricultural mechanisation, much as it advanced political interests for elites.

Some studies therefore combine induced innovation theory with a political economy approach and emphasise the role of public institutions and their linkages with technological change (Binswanger, 1978; De Janvry, 1978; Gass and Biggs, 1993; see also Napasintuwong and Emerson, 2003). Gass and Biggs (1993, 160) argue that the role of institutional actors in policy processes is critical in revealing the “implications that inhere in the spread of mechanical technology in rural areas.” Ultimately, the functions, the relative strength of influence by interest groups or institutions and their linkages within the value chains, and the relative strength of these linkages, determines technological change. Institutions can influence the method of mechanisation, which in turn influences the pace of implementation and the beneficiaries of the programme. This is informed by the fact that, historically, colonialism wrought an African state characterised by a fragile political and economic order, where the new government following the attainment of independence needed to create a stable political constituency with which to secure and protect political (Anthony, 1988) and economic power. Power modelled around multiple players and interests shapes agricultural mechanisation in developing countries (Figure 2).

The players include state institutions and private tractor traders who influence decisions on mechanisation (Gass and Biggs, 1993; Napasintuwong and Emerson, 2003), on imports, distribution and pricing of tractors, establishing service centres and labour regimes. State institutions' influence on mechanisation can be achieved through policy design or direct funding as state subsidies. In the case of India, state institutional support enabled the purchase of four-wheeled tractors (4WTs) and two-wheeled tractors (2WTs) and other machines using marketing regulations, including relaxation of import tariffs and the removal of the standards committee responsible for sanctioning tractor imports (Justice and Biggs, 2013) and state-led investment in infrastructure development (Hazell 2009; Baudron et al., 2015).

However, in SSA countries state capacity is often constrained (Baudron et al., 2015) which opens the space for other influential players with a stake in the development of agriculture. As Biggs (1990) observes, public support often results in inequities, benefiting medium- and large-scale farmers only. Non-government

**Figure 2: Agricultural machinery importation and distribution**



Source: Author's own, adapted from Gass and Biggs (1993) and FAO (2013)

Organisations (NGOs) are interested primarily in alleviating poverty in less economically developed countries (LECDs), and as such their influence within the network will be directed towards ensuring that the poor benefit from mechanisation (Gass and Biggs 1993). The private sector is generally driven by commercial interests; loan repayment capacity is therefore a key factor in the implementation of a private sector-backed mechanisation programme, as the Brazilian tractor scheme revealed (Cabral et al., 2016). Farm policies by farmers using different farming systems also influence mechanisation programs (Napasintuwong and Emerson 2003). For instance, in Bangladesh, the introduction of 2WTs was hampered by limited adoption of conservation agriculture wherein zero-mechanised tillage is mostly practised.

Equally, international agencies seek to impose institutional authority to satisfy geopolitical and global capital interests under the whims of primitive accumulation (Shivji 2009), shaping agricultural mechanisation (Cabral et al., 2016). In some cases, such agencies will capitalise on a recipient country's lack of resources, technical skills and institutional capacity for autonomous development (Anthony, 1988). The introduction of the economic structural adjustment programme (ESAP) in the early 1990s by the International Monetary Fund (IMF) led to a rolling back on public investment in agriculture, thereby reducing imports of agricultural machinery. Consequently, the agenda and processes of economic development in the developing countries is "broader and more complex than the technical mandates of the programs they support might suggest" (Anthony, 1988, 1). The

pursuit of building an African state and organisational expansion by international agencies figures interact over the policy debate on new technologies with differentiated intents (Anthony, 1988). The African state seeks to consolidate power while international institutions are eager to pursue dominance over capital accumulation processes. Therefore, while the demand for labour-saving techniques in SSA is driven in part by the types of farming systems in place – and as such the amount of labour required – dynamics of power and institutional arrangements require equal consideration.

The Brazilian More Food International (MFI) mechanisation programme, which has been implemented in Mozambique, Ghana, Senegal, Kenya and Zimbabwe, should be viewed from this perspective. Implemented by Brazil's Ministry of Agrarian Development in 2010, the programme draws on "Brazil's domestic More Food Program, which offers credit to family farmers, to support modernisation through the acquisition of agricultural machinery and implements aimed at boosting productivity" (Cabral et al., 2016, 49). Based on concessionary loans, the MFI programme seeks to increase agricultural productivity, introduce new technology to family farmers and to reduce drudgery. By targeting smallholder farmers, the Brazilian MFI tractorisation programme complements Zimbabwe's newly reconfigured agrarian structure, now dominated by CA and A1 farms holding an average of 6 ha of arable land.

Despite the influence of group partialities, technical considerations remain material. Land preparation demands more draught power (Lal, 2004), depending

on soil type and the farming systems used. The newly settled smallholder family farmers occupied two types of land in Zimbabwe: the previously tilled land and that which previously lay idle because of crop rotation or the provision of grazing land on commercial farms. The demand for tractorisation, and the types of tractors wanted, therefore varies depending on soil types. As Binswanger and Pingali (1988) observe, the soil in newly cleared land is “soft and can be prepared with hoes or digging sticks”, in which case, farmers show a preference for animal-drawn ploughs.

Moreover, the use of tractors in lands where tree stumps have not been effectively removed is not promoted, due to potential damage to the tractors and tractor-drawn implements. In contrast, farmers settled on land previously tilled by the dispossessed large-scale farmers express a high demand for tractorisation, even though the farm sizes have been reduced. However, smallholder farmers on previously tilled land continue rely on animal-drawn implements, reflecting Shultz’s (1964, cited in Rutton, 2002, 162) view that “peasants in traditional agrarian societies are rational allocators of available resources and they remain poor because most poor countries provided them with only limited technical and economic opportunities to which they could respond – that is, they were ‘poor but efficient’”. Tractor size and model types are additional factors that are pertinent to smallholders’ ability to mechanize their operations. In Bangladesh, 2WTs were found to be most common and cheaper than animal-drawn implements and made accessible to all farmers (Roy and Singh 2008),

mainly through hiring service providers (Justice and Biggs 2013). The 2WTs were also found to be more versatile, and are therefore used for transport, post-harvest operations and water pumping (Diao et al., 2012). In Bangladesh, public policy promoted the provision and use of 2WTs through the removal of duties, sales taxes and standardisation restrictions on smaller machinery (Biggs et al., 2011). Private sector intervention – capitalising on the enormous demand for 2WT tractors – imported cheaper machines manufactured in China, rather than the Japanese and Korean-made machines that were of a higher quality and price (ibid).

In Africa, small tractors are observed to be concentrated in North African countries and South Africa, while in Asia tractors are more common in Bangladesh, Sri Lanka and Vietnam, where wet paddy rice production is common (Diao, et al., 2016). For most of Africa, 4WTs are common even though land size does not seem to justify their adoption (Chancellor 1986). Moreover, Chipato et al., (2014) also discount tractor hiring service provision as a motivation for the use of bigger tractor sizes in Africa. It is possible that farmers in Africa, across different farm sizes, prefer bigger tractors simply to imitate large-scale commercial farming and possibly to gain prestige (Diao et al., 2016). What then is the history of tractorisation in Zimbabwe? How has access to appropriate mechanisation, public support and hiring services provision affected technological innovation in Zimbabwe, over time? These questions will be addressed in the following section.



# 3 THE HISTORY OF TRACTORISATION IN ZIMBABWE

Tractors have been a vital component of agricultural mechanisation throughout Zimbabwe's colonial and post-colonial periods. However, farmers' access to tractors has depended on the political-economic imperatives, state-capital relations and therefore politics and power. In Zimbabwe, as in Punjab – where Indian tractor owners have four times more land than those who hired from them (Diao et al., 2016) – large-scale commercial farmers tended to have better access to tractors during the colonial era and up until after the FTLRP. Large-scale commercial farmers were linked to global commodity markets and used greater amounts of green revolution inputs (high-yielding variety seeds, agro-chemicals and machinery) all of which tend to result in a greater demand for labour and, where labour was expensive, greater demand for mechanisation (ibid).

The history of Zimbabwe's mechanisation can be organised into six distinct phases. Colonial agricultural policy and state-capital relations favoured white, large-scale commercial farmers (LSCFs), who benefited from state-subsidised agricultural mechanisation programmes and produced for global markets (Simalenga, 2013; Selby, 2006; Hodder-Williams, 1983; Rukuni et al., 2006). This contrasted with smallholder farmers who produced for auto-consumption and sold surplus food crops, such as maize and other small grains, in the domestic market.

## 3.1 The white agricultural policy (1908–1948)

In the first phase (1908–1948), as shown Table 1, the agricultural policy established in 1908 (Ranger, 1977) and consolidated after the formation of the unified colonial state in 1923, buttressed the superiority of white, large-scale commercial farmers (Selby 2006; Hodder-Williams 1983). In 1929, the commercial farmers of the Rhodesia Tobacco Association controlled the settler-state, as Hodder-Williams (1983) concludes, ensuring support for white settler producers and undermining the black, predominantly small-scale producers – particularly

from the 1930s onwards. Therefore, agricultural intensification in Zimbabwe was historically configured to serve the white minority's agrarian economy (Selby 2006; Tshuma, 1997).

## 3.2 The post-World War II policy (1949–1980)

The second phase (1949–1980) was associated with the end of World War II, in which veterans of the war received government-mediated assistance for farming (Stoneman 1981). The support included the provision of credit facilities and the importation of machinery for the white commercial farming sector. A faulty narrative portraying smallholders as less productive swayed agricultural policy towards the LSCFs.

The colonial government perceived large-scale commercial farming as economically more viable than small-scale farming, and therefore tilted investments and subsidies towards that sector. This had implications for the mechanisation of the agricultural sector, resulting in the purchase of machinery suitable (economically and functionally) only for large-scale commercial farming. Yet, as Baudron et al., (2015) observed:

The approach used by the past initiatives may have also been inappropriate, with a focus on large machines not suitable for small and fragmented fields, and/or too costly for many African smallholders and private sector hire-service providers, and a reliance on the public sector that led to inefficient and uneconomic government-run tractor hire schemes.

In response to sanctions imposed on Zimbabwe by Western countries following the Unilateral Declaration of Independence (1965), the Smith government offered increased support to some key sectors, including agriculture, as part of its imports substitution policy. The colonial government increased tractor imports from 1967 onwards, as shown in Figure 2, resulting in a steady increase in tractors that only declined in the early independence

**Table 1: Change in mechanisation support, 1908–2018**

Period	Context	Policy intervention	Main drivers	Main beneficiaries
The white agricultural policy phase (1908–1948)	The shift of settler minority white interests from mining to agriculture development and the formation of unitary government in 1923	Agricultural policy established in 1908	Colonial powers and settlers farmers	Settler white farmers
The post-World War II policy phase (1949–1980)	End of the World War II and the Unilateral Declaration of Independence of 1965–thereafter	Credit facilities and government support towards commercial agriculture and the import substitution policy	Government White farmers	War veterans of the WWII and commercial farmers
The national reconciliation policy phase (1980–1990)	Need to retain white capital and incorporate previously excluded black population in the new independent economy after independence	National reconciliation and social welfarist policies	Government Donor community	Commercial farmers and smallholder farmers
The ESAP and FLRP phase (1991–2005)	Shift towards market policies and withdrawal of government from agricultural and other sectors	ESAP – introduced under IMF direction	IMF Government	Commercial farmers
The Look East policy phase (2006–2008)	Capital flight instigated by the FTLRP resulted an economy-wide crisis where markets collapsed	Look East and heterodox policies including Quasi-fiscal activities and agricultural input support for the farmers	RBZ Government	Medium-scale and smallholder farmers
The heterodox policy phase (2009–2019)	GNU and post GNU policy contradictions and factional fights – associated with succession politics within Zanu PF and the government	Heterodox economic framework, mainly neo-liberal	Governments of Brazil and China, among others	Medium-scale and smallholder farmers

Source: Author's own, 2019

years. From the late colonial period to 1980, large-scale commercial agriculture benefited from subsidisation of the increasingly successful white commercial farmers who began to consolidate larger farms into companies and directly imported machinery.

### **3.3 The national reconciliation policy phase (1980–1990)**

Following independence, from 1981 to 1990, Zimbabwe's agricultural policy took a welfarist stance, targeting a reversal of the racial imbalances that were the legacy of colonialism entrenched since the early 1890s. The newly-elected Zanu PF party pushed for a policy of 'gradual transformation', aiming for a slow

movement towards socialism, perhaps in fear of a confrontation with imperialist powers. Despite this dominant movement, and the absence of a hegemonic force pushing for structural reform in the early 1980s (Stoneman 1989; Moyo 1991), efforts to incorporate small-scale farmers began to gain momentum.

Even though less than 0.4% of the communal households owned tractors in 1983/4 (Zimbabwe Central Statistical Office 1984), tractor hiring services provided by ARDA from 1980, the District Development Fund (DDF) and the Ministry of Local Government from 1984 benefited this sector immensely (Rusike 1988). The government also sought to help farmers recover from draught-power shortages following the second Chimurenga war and the 1982–4 drought years, yet



tillage services remained inadequate (Rusike 1988). Smallholder farmers' access to draught power was also affected in the early 1980s and early 1990s by some debilitating drought periods in Zimbabwe. The long-held assumption that mechanisation was not appropriate for smallholder farmers resulted in 90% of the smallholder farmers in CAs relying on animal power (oxen, donkeys and cows) for draught power as well as animal-drawn farming implements (Simalenga, 2013). Yet, the supply of cattle, the main source of animal power, has not been consistent and experienced a notable dip in the early 1990s, despite the spike in the 1970s – as illustrated in Figure 3.

### 3.4 The ESAP and FLRP phase (1991–2005)

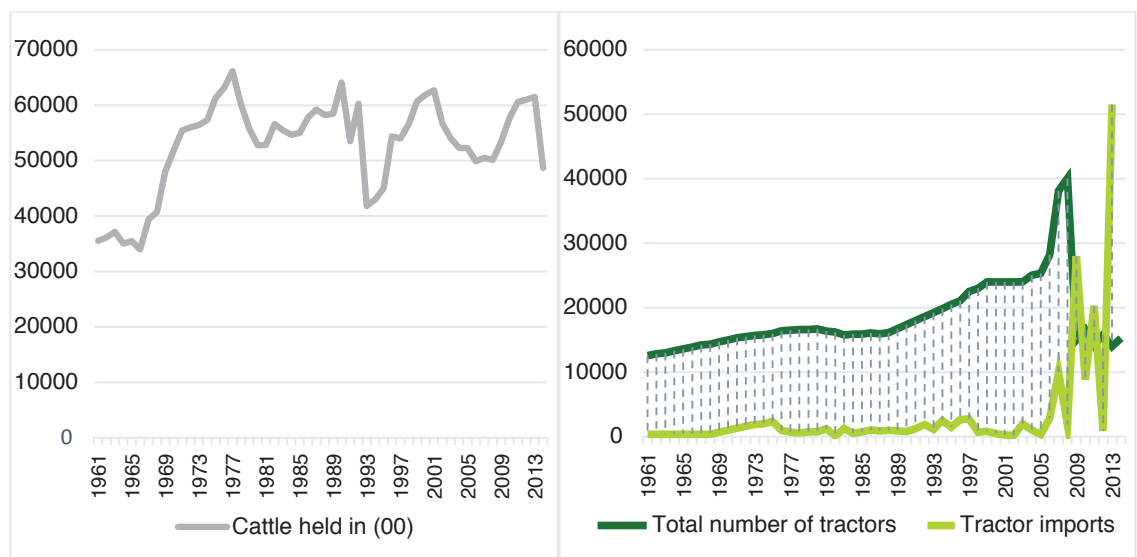
In the third phase (1991–2005), the International Monetary Fund (IMF)-led ESAP prescribed a reduction in public support for the productive sectors, leading to the private sector's emergence as the main driver of tractor imports throughout this period (see Stoneman, 1988). As a result, most government-run tractor schemes popularised in the 1990s across SSA collapsed, reinforcing agriculture's reliance on the private sector (where this existed), and therefore on the “development of market systems, replication, dissemination and uptake of new technologies” (Baudron et al., 2015, 10, citing Magistro et al., 2007).

Tractor imports rose between 1991 and 1997, under neoliberal economic policies imposed by ESAP. A complete reliance on technology markets was inadequate due to its failure to take the role of

institutions and power in agricultural mechanisation into account. As Baudron et al., (2015) observed, the private sector was often reluctant to invest in agricultural technological innovation because of weak agricultural markets, inadequate awareness of the role of technological innovation in agriculture, which discouraged the adoption of new technology. As a result, NGOs and governments filled the gap by supporting projects that promoted mechanisation for smallholder farmers (London and Hart, 2010).

In 2000, new farming sectors were created under the emerging land/labour relations in which A1 and A2 exhibited differentiated demands for and access to tractors following the FTLRP. In A2 farms, large areas suitable for 4WTs above 40 horsepower (HP) had already been cleared for cropping, even though utilisation was constrained by limited access to agricultural financing. In A1 farms, small fields unsuitable for large tractor use were invariably cleared before the FTLRP. With 2WTs being historically uncommon in Zimbabwe, labour shortages resulted in growing demand for relatively large tractors. While the LSCF retained and developed ‘mechanised, high-input, high-output farming’ supported by private finance and credit, the medium and smallholders had limited access to productive resources and infrastructure, such as feeder roads and tractor service centres (Simalenga, 2013, 18). Overall, macroeconomic conditions of high inflation, high interest rates and limited foreign investment militated against the acquisition of new machinery by the new farmers (Simalenga, 2005) and equally curtailed government support. Economy-wide capital constraints hampered private- and public-sector

**Figure 3: (a) Cattle production and (b) Tractorisation in Zimbabwe**



Source: Author's own, compiled from FAOSTAT 2018; Zimstats 2017; CIMMYT 2014

capabilities to harness the business potential created by increasing demand for power-saving technology in the face of labour shortages.

Inevitably, from 2004, contract farming (previously common in cotton and soya beans for smallholder farmers and LSCFs, respectively) was introduced for tobacco farming and was accessible to all farming sectors. This increased the demand for labour and the scope for reconfigured agricultural mechanisation, fomenting an agrarian transformation in Zimbabwe. Against a national demand for 40,000 tractors, and despite documented stocks of 24,000 in 2003 (FAOSTAT, 2018), only 13,000 were recorded to be operational by the DDF, suggesting that at least 11,000 were not in good working order, were warehoused or had been exported (Simalenga, 2013). As such, an upsurge in tractor use from 2004 (shown in Figure 3b) was also accompanied by the emergence of a new market for tractors, a development that was, crucially, tightly connected with the reconfigured land ownership and production patterns following the FTLRP.

Newly settled A2 farmers purchased second-hand farm machinery from former LSCFs, but faced financial constraints to pay for repair and maintenance services. The government therefore directed ARDA to provide tractor hiring services to A2 farmers (Simalenga, 2013). As such, the Zimbabwean government's tractorisation programme was driven through state institutions such as ARDA during this period (2003–2006), although historically, state involvement in mechanisation was often ineffective. To equip ARDA and to complement an existing fleet of 126 tractors, the government imported 700 tractors from Iran, South Korea and Malaysia and bought a further 133 second-hand tractors from the LSCF sector over this period. The private sector also contributed to Zimbabwe's burgeoning tractor supply, with Farnec, Bain New Holland and Hasst Zimbabwe all involved in the manufacture and supply of tractor-drawn equipment (Simalenga, 2013).

### **3.5 The Look East policy phase (2006–2008)**

In the fourth phase (2006–2008), the economic crisis worked against attempts to prop up the agrarian economy through heterodox economic policies. Capital flight in 2000 negatively affected agricultural and industrial productivity among other sectors of the economy (RBZ, 2008), even though the government was able to import another 500 tractors from Iran (Simalenga, 2013). The withdrawal of balance of payment support and donor funding also triggered the closure of ongoing projects funded by external finance, a decline in access to

foreign lines of credit for external trade and severe foreign exchange shortages. This prompted the Reserve Bank of Zimbabwe (RBZ) to “take extra ordinary and innovative measures to stimulate economic activity, and to ensure food self-sufficiency” (RBZ, 2008, 9). A major objective and component of these measures was the desire to cement the benefits of the FTLRP by reversing the downward trend in agricultural productivity. In 2007, the RBZ therefore introduced a five-phase Farm Mechanisation Programme, targeting communal and commercial farmers.

The programme facilitated the procurement of “combine harvesters, tractors, harrows, ploughs, vicons, planters and other animal-drawn farm implements” (RBZ 2008, 4), under a quasi-fiscal framework. This state-subsidised programme resulted in an additional supply of 925 tractors and 35 combine harvesters by the end of the first phase. The programme also distributed 100,000 ox-drawn ploughs, 100,000 ox-drawn planters, 100,000 ox-drawn harrows, 100,000 cultivators and 100,000 scorch-carts (RBZ, 2008), highlighting the lingering government bias in favour of animal power for smallholder farmers in Zimbabwe (Mlambo 2004; Simalenga 2005). The main source of tillage hiring services for communal family farmers and A1 farmers, the DDF, had a fleet of 768 tractors, of which only 45% were in good working condition (Simalenga 2013).

### **3.6 The heterodox policy phase (2009–2019)**

In the fifth phase (2009–2018) a heterodox economic policy framework during and after the Government of National Unity (GNU) had mixed outcomes for agricultural mechanisation. The re-introduction of a neo-liberal economic policy framework during the GNU (2009–2013) was characterised by the introduction of multi-currency regimes and some considerable stabilisation of the economy. Whereas the GNU abolished quasi-fiscal imports of agricultural machinery by the RBZ and withdrew from direct state imports of agricultural machinery, the liberalisation of agricultural commodity trade and the removal of restrictions on foreign currency retention resulted in increased agricultural financing through reinvestment of sales proceeds associated with contract farming (Shonhe, 2018). Additionally, the recovery in production of some export crops, such as tobacco and sugar cane, from 2006 also enabled farmers to apply proceeds from agricultural commodity sales to purchase farming equipment from a variety of sources. Furthermore, the Look East policy, which saw the development of aid programmes between Zimbabwe's Ministry of Agriculture and China's Agricultural Technology Demonstration Centre

(ATDC), also created opportunities for mechanisation by opening up new sources for relatively cheaper machinery (Mukwereza, 2013).

In 2009, government records indicate a national stock of 13,793 tractors (FAOSTAT, 2018), against a total demand of 40,000 (Nhau, 2006). A comparative analysis across farming sectors shows that A2 farmers had more 40–80 HP tractors than other sectors (Figure 3). Even though the communal area farmers held more tractors than the remaining sectors (A1, LSCF, small-scale commercial farming and the old resettlement area [ORA]) from 2009 to 2012. Beginning in 2013, the A1 sector took the lead, with contract farming and re-investment of agricultural proceeds being the source of finance (Shonhe, forthcoming), a phenomenon not yet noticeable in Figure 4. Overall, across all farming sectors, total tractor holdings have declined in the period 2010–2014, as shown in Figure 4, even though the trend has begun to reverse in more recent years, as our survey shows.

While the 40–80 HP tractors predominated across all the farming sectors, as shown in Figure 5, A2 farmers also emerged as the most tractorised sector for all tractor sizes. This observation is in tandem with the observations on tractor ownership made by Simalenga (2005). According to the writer, A2 small-scale commercial farmers tended to buy from large-scale commercial farmers. The relatively high degree of tractor ownership by A2 farmers is disproportionate to number of farmers in this sector. For instance, in 2010, there were 300,000 A1 resettled households who owned 2,556 tractors, compared to 22,400 A2 medium

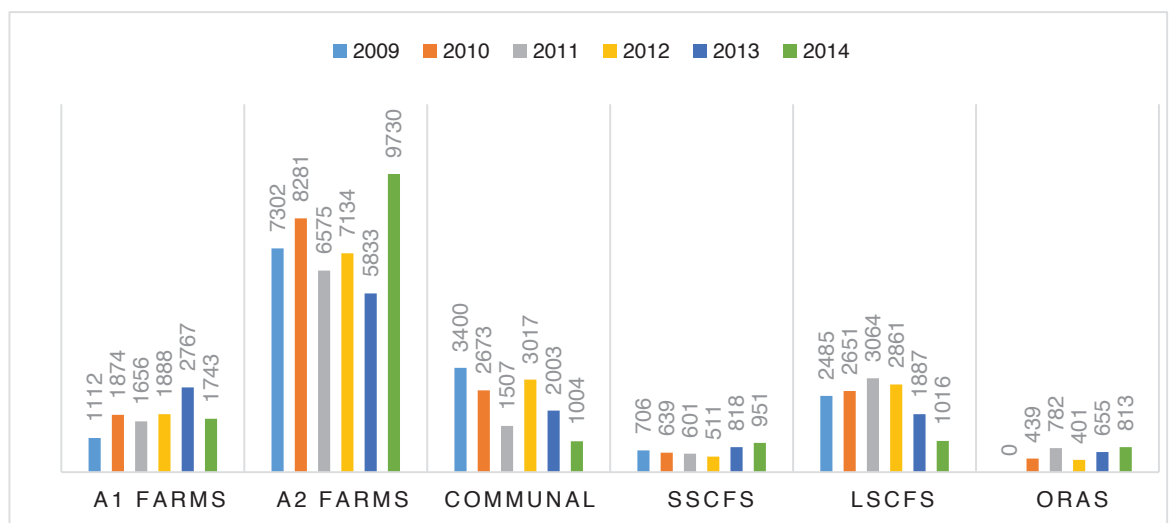
scale farms who owned 9,730, and 956 black LSCF who owned 1,016 in 2014 (Moyo and Nyoni, 2013).

The government also signed a cooperative agreement with Brazil for the supply of tractors during this period. Brazil's MFI aimed at achieving food self-sufficiency for small-scale farming households. The MFI programme brought in two tranches of mechanisation equipment worth US\$30 million and US\$98 million respectively. In the case of Zimbabwe, the Brazilian programme resulted in the distribution of the tractors through cooperatives on farms with irrigation land. The government was also involved in direct imports of tractors through concessional loans from countries such as China, Turkey, Belarus, Iran and Romania over this period.

The reliance on government-led schemes for mechanisation has been criticised as being inappropriate (Adekunle, 2015); instead, some scholars prefer the reliability of machinery markets. According to Adekunle (ibid), the repair and maintenance of machines purchased through government-led schemes face challenges due to shortage of spare parts which tend to shorten their operating life. The land reform reconfigured agricultural mechanisation in Mvurwi, revealing how state-capital relations and politics shape commercialisation paths and agrarian transformation in Zimbabwe, as the next section discusses.

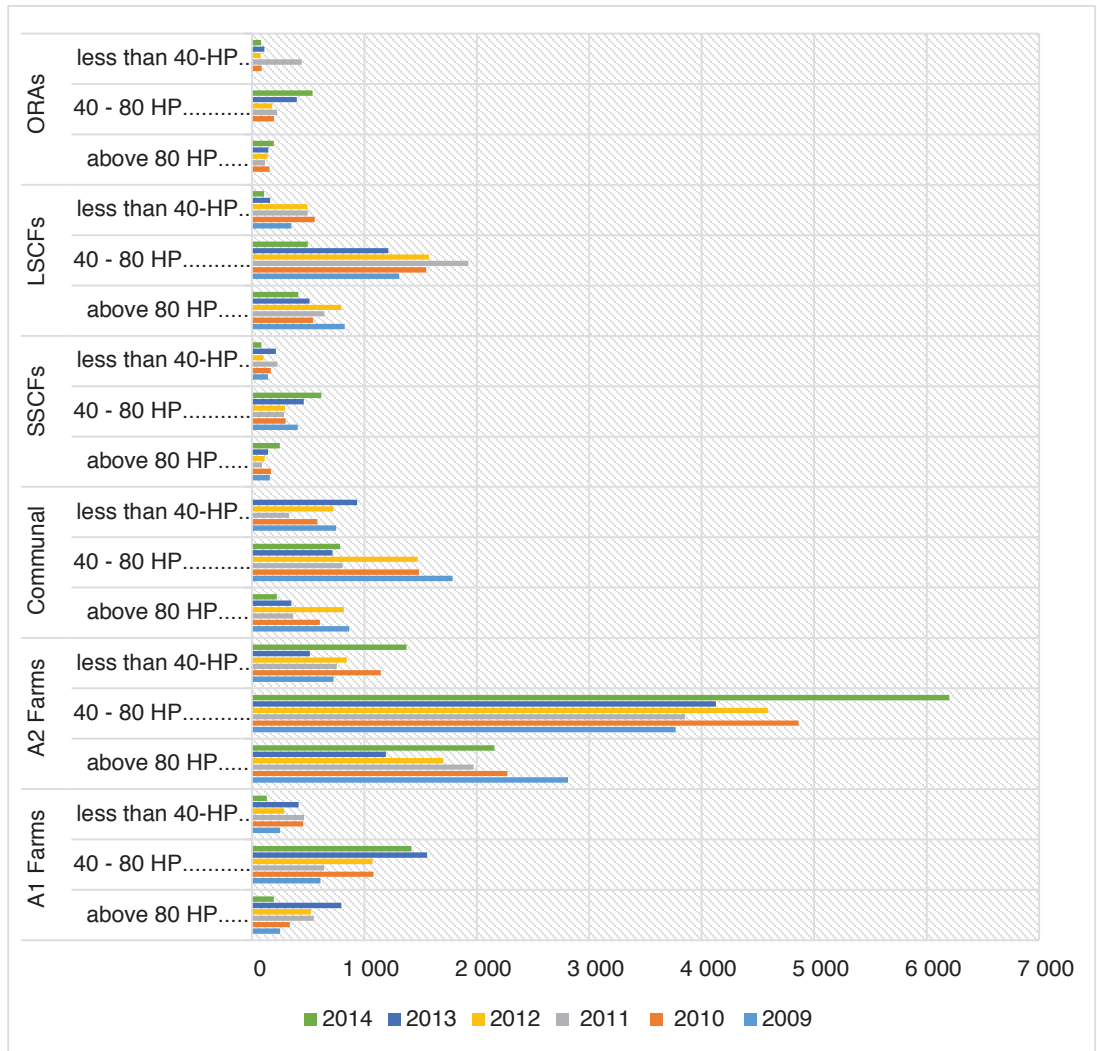
In 2017, the government signed memorandums of understanding with more countries (South Korea and India) for the supply of tractors on concessional terms. Given its success in the 2016/17 and 2017/18 agricultural seasons, the new tractorisation programme

**Figure 4: Tractor (40–80 HP) ownership patterns by sector**



Source: Author's own, compiled from Zimstats (2017)

**Figure 5: Tractor ownership patterns by engine size**



Source: Author's own, compiled from Zimstats (2017)

is now connected to the 'command agriculture', a government- and corporate-funded contract farming arrangement in which commodities are delivered to the Grain Marketing Board under a stop order system. This framework ensures that beneficiaries of the farm machinery are also supported with farming inputs to increase their chances of meeting repayment obligations (personal interview with MAMID official, October 2017).

To promote food security, the programme has shifted its focus from smallholder farmers to medium-scale farmers, defining the emergence of new state-capital relations in which domestic and international capital collaborate with government in agricultural funding arrangements.

# 4 LAND, AGRARIAN REFORM AND AGRICULTURAL MECHANISATION IN MVURWI

Reconfigured agrarian relations in Mvurwi after the FTLRP created new settings and spawned new class dimensions that affected patterns of agricultural mechanisation circuits. In Mvurwi, the emerging land ownership pattern consisting of the LSCF now exists alongside medium-scale and smallholder farmers under the A2 farms, A1 plots and CA respectively (Moyo, 2011). Differentiated demands and supply of tractors, availability of cattle and supply and cost of labour have resulted in changing tractor ownership among farmers in variegated farming settings.

## 4.1 Tractor stocks and ownership in Mvurwi

The economy-wide crisis following the FTLRP led to capital flight (Moyo and Nyoni, 2013) and “machinery exports” (Simalenga, 2013), which led to the depletion of agricultural machinery in Zimbabwe. As Rusike (1978) shows, the first private tractor was introduced in Chiweshe CAs in the 1940s, yet the pace of tractorisation only increased in the 1980s. In the early independence period, communal farmers bought second-hand tractors from the white commercial farmers, who were forced to auction agricultural machinery to repay bank loans. As a result, most of the tractors and equipment were only in a moderate state of repair. After the FTLRP, newly resettled farmers also bought second-hand tractors from dispossessed large-scale commercial farmers using off-farm finance, including retail trading and farm produce sales (70%), with agricultural commodity sales income contributing 26% of the tractor purchases.

Records in the MAMID show that out of 9,884 ha of the cropped land in Mazowe area, 95% of the land in the Chiweshe area was tilled using animal draught power, indicating low technological adoption among poor family farms. However, across the settlement models, only 28% of the farmers across the farming sectors in the 2016/17 agricultural season (personal interview with MAMID official, 2017) relied on this source of power. With 72% of the farmers across farming sectors relying on tractors for tillage, this has become the most common source of farm power in the Mvurwi. However, the use of tractors is differentiated across the farming sectors. In

the A1 farming sector, 55% of the land was tilled using tractors, compared to 96% for A2, 100% for LSCF and 36% for the peri-urban sectors (personal interview with MAMID official, 2017). Moreover, the supply chains of tractors are now made up of a combination of private and public-sector initiatives. Evidence of tractor use was also complemented by this study’s primary survey data on tractor ownership. This data indicates that, of the 453 communal area households interviewed, only one farmer (0.2%) owned a tractor, compared to 15 farmers (4.3%) owning 1 or 2 tractors in the A1 sector (Table 2).

**Table 2: Smallholder tractor ownership in Mvurwi per sector**

Sector	Number of tractors owned				total
	.00	1.00	2.00	3.00	
Communal area	452	1	0	0	453
%	99.8%	0.2%	0%	0%	100.0%
A1 sector	338	13	2	0	353
%	95.8%	3.7%	.6%	.0%	100.0%

Source: Author’s own, APRA survey, 2017

As one of the A1 farmers at Hariana farm noted during an interview:

Three of the tractors at Hariana farm were bought using proceeds from tobacco sales. Most of these tractors were bought from the former large-scale commercial farmers or from the newly resettled farmers who were upgrading. Most farmers at this farm joined tobacco growing between 2008 and 2010, as farmers could keep their sales proceeds in foreign currencies after the liberalisation of the economy during this period. Some farmers have also bought tractors from horticultural sales proceeds.

The LSCF sector and the joint venture (JV) were in contrast with the smallholder sector. For instance, Forrester Estates (an agro-estate) have better access to modern farming equipment as they have better access to finance, better contract farming terms and arrangements for tobacco and horticultural export



crops such as mangetout peas and oranges (personal interview, November 2017). On average, each of the six sections of Forrester Estates has 10 functional tractors, as old machinery is generally sold to the newly settled farmers. While the indigenous large scale commercial farms<sup>1</sup> have operational tractors, their general state of repair was observed to be poor when compared with that of Forrester Estates, where a well-manned and -equipped repair and maintenance centre is in operation.

There are five tractors at Makumbire indigenous commercial farm, run by the Mugweni family. The main section has two tractors compared to three at the section run by Mr Mugweni's son. The purchase of tractors for this farm has been financed primarily with off-farm income, as the family runs the only international bus terminus in Harare. The JVs acquired new technologies through foreign direct investment (FDI) mainly from some Chinese nationals, and domestic investment from former white commercial farmers who are also entering into JV arrangements with the new A2 farmers. These investments have included tunnel tobacco barns, tractors and irrigation infrastructure, and were part of the JV agreement between the beneficiary of the land involved and the investors. While the government has been actively involved in the promotion of JVs, it is in the tractor cooperatives that such efforts are most visible in Mvurwi, as the next section will show.

## 4.2 Government-led interventions in Mvurwi

### 4.2.1 Direct government interventions

Providers of tillage services for small-scale farmers have shifted from direct government agencies (ARDA and DDF) to tractor cooperatives and emerging private players. The latter include specialised service provision and farmer-to-farmer services. The tractor cooperatives specifically have replaced ARDA and DDF as the main sources of tractor hiring services in Zimbabwe. In the main, ARDA tractors in Mazowe district are non-functional, hence cooperative tractors have become a major source for tractor hiring by farmers across farming sectors. The replacement of government's aging machinery has been affected negatively by government structural and policy implementation contradictions. MAMID officials revealed in an interview that:

Agricultural mechanisation is facing several challenges. Currently the mandate for tillage

falls under DDF, which is responsible for tractor replenishment and machinery repairs and imports. Yet, the Ministry of Transport, which receives the vote, is not allowed to deal with agricultural equipment issues. This falls under MAMID who, for obvious reasons, would not support efforts involving disbursement of funding through another ministry. This has worked against proper planning as the cropping programme estimates are based on tillage capacity, which falls under another ministry. Moreover, the DDF initiative was set up under a welfarist regime under the Ministry of Local Government to help vulnerable groups, such that commercial tractor hiring was never its purpose.

In Mvurwi, as shown in Figure 5, the architecture of agricultural mechanisation is supplied by imports from both the government and private sector, with government imports brought mainly through concessional loans from Brazil and China (personal interview with MAMID official, October 2017).

### 4.2.2 'Brazilian' tractor cooperatives

Who gained access to the tractor cooperatives? How do they operate? Tractor cooperatives are independent groups of A1 and/or irrigation communal farmers who benefitted from the Brazilian tractor scheme, whereby they received between one to three tractors, some accompanying implements, the provision of tractor hiring services and in some cases engaged in common crop production. There are nine tractor cooperatives in Mazowe district, four of which are situated in Mvurwi – at Hariana farm, Madhidhidhi farm, Donje farm and Chidziva farm – while two are situated in Chiweshe CA. Each of these farms is made up of newly settled households, some of whom are members of tractor cooperatives. Not all the settled A1 farmers chose to join the cooperatives when the program was initiated by the government. Each cooperative is constituted of settled farmers who paid a joining fee of US\$100 and are led by an elected committee of +/-6 cooperative members. The cooperatives are based on an understanding that farmers' groups repay the full value of the tractor through MAMID, who will pass on the funds to the Brazilian government. A MAMID official observed:

The arrangement involves the cooperative hiring out tractor services to their cooperative members and other farmers under the supervision of the district mechanisation extension officer. All the funds are remitted into a central government MAMID account held in Agribank; the remitting agreement is based on repayments of: 75% to Brazil, 24% split between

drivers (14%) and repairs and maintenance (10%) (personal interview, October 2017).

The survey revealed that the allocation of tractors was uneven and paid no attention to the number of farming households at the farms where the cooperatives were formed.

For instance, while there are 302 households at Hariana farm, 174 of whom were legally settled with 30 households participating in the tractor cooperative, only two tractors were allocated. Yet at Mandindindi farm, with 42 settled households and 21 participating in the cooperative, again only two tractors were allocated. By contrast, three tractors were allocated to Chidziva farm, where only 56 households were settled and only 15 farmers joined the cooperatives. At Donje farm, there are 90 legally and 70 illegally settled farmers, and 41 households are members of the cooperative, yet two tractors were allocated. The cooperatives were also allocated a tractor drawn plough, planters, ridgers and boom sprayers.

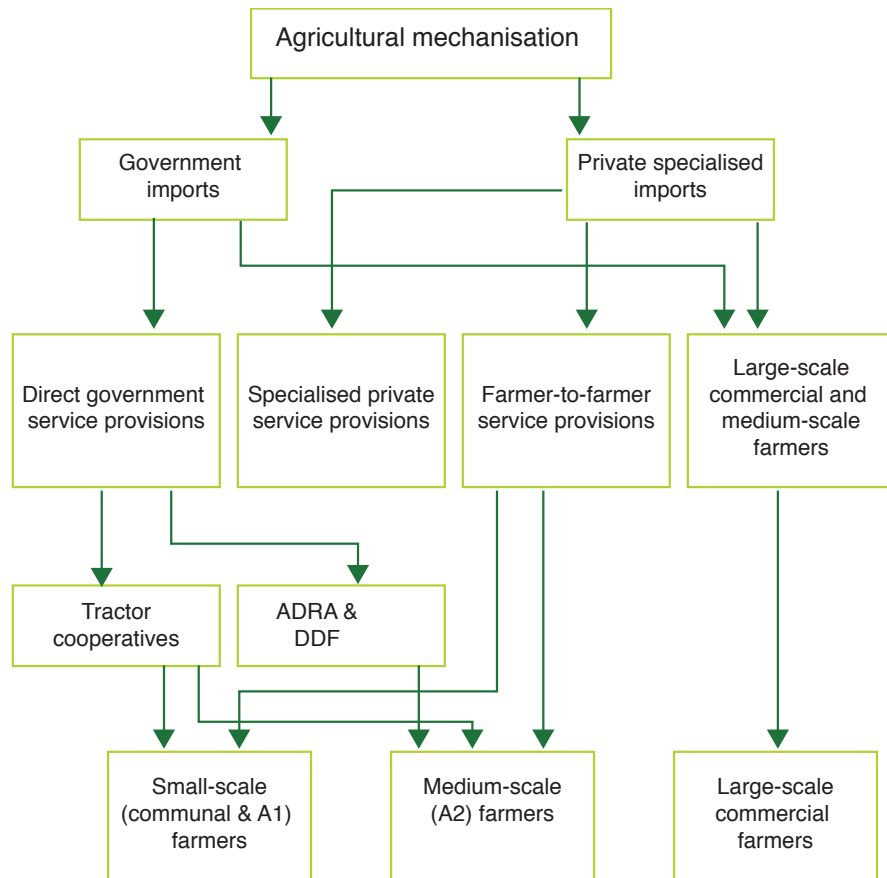
#### 4.2.3 Farmer-led mechanisation

An ongoing agrarian transition largely involving rural agrarian capital accumulated from below; whilst, to a

lesser extent, accumulation from above driven by JVs and tractor cooperatives is reconfiguring agricultural mechanisation in Mvurwi. Smallholder farmers settled under the FTLRP now produce cash crops (tobacco, soya beans and horticulture), sold through global commodity supply chains which has increased agricultural income for the farmers. The new capital accessed by farmers across farming sectors has enabled farmer-driven agricultural mechanisation in rural Zimbabwe. Specialised private tractor services in Zimbabwe involves some A1 and A2 farmers who have acquired tractors, using proceeds from agriculture and some off-farm income from other businesses, as shown in Figure 6.

The three main supply chains for tractors are government imports – often on the back of concessional loans – private company imports and a reliance on second-hand tractors (Diao et al., 2016). Some private sector players have also maintained a reasonable presence in this sector, as discussed in previous sections. For instance, one A1 farmer who owns a 6 ha plot in village 4 of Hariana farm has provided a specialised private tractor hiring service through Muringisi and Company Limited since 2013. As the two tractors were brought in from the company’s Harare-based tractor dealership, the symbiotic interdependence between the dealership

**Figure 6: Emerging mechanisation and tractor supply chains in Mvurwi**



Source: Author’s own

and agricultural activities at Hariana farm fosters the flow of capital between the two operations.

However, as Table 2 shows, tractor hiring services by specialised private service providers are few, even though overall 29% of A1 farmers rely on tractor power hiring-in (including those hired under farmer-to-farmer arrangements for land preparation). In part, the presence of the specialised private hiring services on the farms is often mistaken as farmer-to-farmer services by some tractor hiring farmers. In the CA and A1 farming areas, participation by women remains low (29.5% and 11.1%) as the use of tractors in Mvurwi is dominated by male-headed households, as shall be fully discussed in sections to follow. A reliance on the re-investment of agricultural commodity proceeds to finance tractor hiring services suggests that rural agrarian capital accumulated from below is driving agricultural production in Mvurwi. Regarding sources of tractor hiring services, our survey revealed that 47% of the A1 farmers rely on hiring from fellow farmers (farmer-to-farmer). Our respondents made no reference to tractor cooperatives as a source of services, and this may be because these cooperatives are mistakenly regarded as privately 'owned', or their services may be accounted as farmer-to-farmer provision by hiring farmers.

In the A1 farming area, tractor hiring services are based on the farmer-to-farmer service model, benefiting the A1 and A2 farmers on the farm where they are held and those on the surrounding farms. One A1 farmer who hires out his tractor at Donje farm, stated:

I switched from maize to tobacco farming in 2010 and the next season I was able to buy a tractor, which I then upgraded in 2012 and 2015. I provide tillage services to A1 and A2 farmers at Donje, Sarimba and other surrounding farms. Besides expanding my cropping programme, I plan to buy more tractors so that I can increase my capacity to hire them out, as the demand for tractors is very high in this area.

The development of tractor hiring markets has presented an opportunity for livelihood diversification for those engaged in service provision, which in some cases includes the establishment of transport businesses and trading stores alongside farming activities.

### 4.3 Access to tractors and tractor services and gender dimensions

The survey data reveals a bias in asset ownership and hiring towards male farmers, among smallholders. Whereas 60.3% of the men in the communal area owned and relied on their cattle for tillage, only 48.2% of the women owned cattle. As a result, more women (32.6%) hire animal power from other farmers for tillage purposes than men – 25.3% of whom hire cattle. In the A1 farming area, more women (52.1%) rely on their own cattle for tillage services compared to men (50.7%). However, 83.6% of the tractors are owned by male smallholder farmers. In the tractor cooperatives, women's participation is low, although a small number of women occupied key leadership positions. For instance, at Chidziva, out of 16 cooperative members, there are only three women and one youth in the cooperative, compared to four women and one youth at Mandindindi farm out of 21 cooperative members, and there are six women out of 41 members at Donje farm. At Hariana, out of 30 cooperative members, only 6 are women and 4 are youth.

The few women holding cooperative leadership secured these by party positions held before the introduction of the tractor cooperative; however, they remained marginalised in decision-making processes. For instance, the secretary of the cooperative complained that men have not respected her contributions towards the development of the initiative, and was contemplating resigning (personal interview, Hariana farm, February 2017). To the extent that women and youth own fewer productive assets, agricultural commodity production among them remains low and therefore prospects for accumulation are limited.

**Table 3: Tractor distribution by farming sector**

Settlement type and gender		Land preparation type used							Total
		0	Own oxen	Hired oxen	Own tractor	Hired tractor	Hand hoeing	Specialised private hiring service	
CA	Count	1	256	125	1	16	52	2	453
	%	0.2%	56.5%	27.6%	0.22%	3.5%	11.5%	0.44%	100%
A1	Count	0	180	55	15	102	1	0	353
	%	0%	51%	16%	4%	29%	0%	0%	100%

Source: Author's own, APRA survey, 2017–2018



**Table 4: Tractor distribution by gender and farming sector**

Settlement type and gender			Land preparation type used							Total
			0	Own oxen	Hired oxen	Own tractor	Hired tractor	Hand hoeing	Specialised private hiring service	
CA	Male	Count	0	188	79	1	9	33	2	312
		%	0	60.3%	25.3%	0.32%	2.88%	10.6%	0.64%	100%
	% of Total		0	73.4%	63.2%	100%	56.3%	63.5%	100%	70.50%
	Female	Count	1	68	46	0	7	19	0	141
		%	0.7%	48.2%	32.6%	0%	5%	13.5%	0%	100%
% of Total			26.6%	36.8%	0%	43.8%	36.5%	0%	29.5%	
A1 <sup>1</sup>	Male	Count	0	143	39	13	87	0	0	282
		%	0%	50.7%	13.8%	4.6%	30.9%	0%	0%	100%
	% of Total		0%	79.4%	70.9%	86.7%	85.3%	0%	0%	79.9%
	Female	Count	0	37	16	2	15	1	0	62
		%	0%	52.1%	22.55	1.3%	21.1%	1.4%	0%	100%
% of Total		0%	20.65	27.6%	16.7%	14.7%	100%	0%	11.1%	

Source: Author's own, APRA survey, 2017–2018

#### 4.4 Impact on land use, livelihoods and productivity

The demand for tractor hiring services in response to agricultural intensification and increased tobacco contract farming from 2009, and the subsequent re-introduction of government command agriculture in 2016, amplified the need for government intervention. The MFI tractor scheme aimed to provide tillage services for cooperative and non-cooperative farmers in the smallholder sector to advance family farming. Besides providing tillage services to small-scale farmers in the CA and A1 farms, A2 farmers also hire tractors from tractor cooperatives in Mvurwi. The chairman of Mandindindi farm tractor cooperative advised that:

We were assisted by the Provincial Minister to get our tractors under the Brazilian scheme. This tractor is helping us to increase the land we put under crop. For us on the A1 farm, we rely on it for disc tillage while the A2 farmers use it for planting command agriculture crops such as maize and soya beans. However, some farmers in our cooperatives still prefer to use animal power or a combination of both because they consider tractor hiring to be expensive, even if we charge a dry (lower) fee to our members (personal interview, 18 December 2017).

Cooperative members interviewed added that access to tractors also had a positive impact on farm productivity. For instance, committee members at Chidziva farm observed that “tractors had improved soil management and planting efficiency and therefore increased their yields” (focus group discussion, November 2017). Furthermore, although most arable land had already

been cleared and was therefore suitable for tractor use before the FTLRP, access to tractors presented options to deal with difficult soils. As shown in Table 3, tractors were mostly hired and used by farmers tilling sandy, loamy soils (33.8%), red clay soils (22.5%), black clay soils (21.2%), as opposed to those tilling loamy soils (16.2%) and sandy soils (6.2%).

Arguably, responses on soil quality show that those who hired tractors made technical considerations. With at least 54% of the main crops (tobacco, maize and groundnuts) being grown on sandy, loamy soils in Mvurwi, use of hired tractors for land preparation is most prevalent on these types of soil, as the survey revealed. The use of own and hired oxen is also more common for black clay soils, which are less suitable for the major commodities, at 50% and 48.2% respectively. In the communal area, the use of hired tractors is most common for better soils such as clay and loamy soils, where 26.3% for both rely on this source of draught power. For instance, while some farmers own and therefore do not hire-in tractors, 36.8% of A1 farmers who hired tractors viewed their soils to be good and 54.6% thought the soils were fair, compared to 10.5% who perceived their soil to be in poor condition.

The A1 farmers now plough bigger acreage and harvest a greater yield per unit. As a result, in the 2016/17 season, all the members of the Chidziva tractor cooperative were able to deliver maize to the Grain Marketing Board (GMB). Farmers are acquiring more farming assets and are more organised, diversifying into non-farm enterprises. The interview held with committee members of the Chidziva tractor cooperative revealed that cooperative members were

**Table 5: A1 farms tillage sources by soil type**

Predominant soil type		Land preparation type used					Total
		Own oxen	Hired oxen	Own tractor	Hired tractor	Hand hoeing	
Black clay	Count	78	27	2	17	0	124
	%	50.0%	48.2%	33.3%	21.2%	0.0%	41.5%
Sandy soil	Count	12	2	1	5	0	20
	%	7.7%	3.6%	16.7%	6.2%	0.0%	6.7%
Loamy Soil	Count	26	12	1	13	0	52
	%	16.7%	21.4%	16.7%	16.2%	0.0%	17.4%
Red Clay	Count	16	3	0	18	0	37
	%	10.3%	5.4%	0.0%	22.5%	0.0%	12.4%
Sandy loamy	Count	24	12	2	27	1	66
	%	15.4%	21.4%	33.3%	33.8%	100.0%	22.1%
Total	Count	156	56	6	80	1	299
	% of Total	52.2%	18.7%	2.0%	26.8%	0.3%	100.0%

Source: APRA Zimbabwe survey, 2017–2018

now engaged in the collective production of maize. One on the leaders said that “we now have a maize scheme in which members contributed US\$150 for inputs and grow on land donated by some of our members.” The cooperative has plans to increase the area under cultivation, to buy irrigation equipment and to procure a combine harvester as commercialisation intensifies.

At Mandindindi farm, the utilisation of free-flowing irrigation water and access to tractor power has reduced drudgery and improved crop yields, despite shortages of labour. The interview with cooperative committee members at Mandindindi farm revealed that most of them “now produce horticultural commodities to supply to Harare and other urban centres, besides tobacco and other summer food crops”. As a result, farmers have been able to acquire more household and farming assets, expanding production at household level. However, other cooperatives have not been able to enter into horticultural production because irrigation infrastructure on members’ farms is insufficient. What, then, was the rationale for tractor allocations in the Mvurwi? How does the pattern of state-led mechanisation map onto local agricultural politics? The next section turns to this important discussion.

#### 4.5 Patronage politics

Anthony (1988) observed that post-colonial Zimbabwe state was faced with a fragile political and economic order at independence, such that one of the goals of the new government was to create a stable political constituency upon which to secure and protect its political power. The selection of farms for inclusion in the Brazil tractor scheme was both technical and political. At the technical level, the government’s criteria for inclusion involved the identification of farms with sound

sources of water, established irrigation infrastructure and electrical power supply. To this extent, all the chosen sites met the conditions stipulated by the government. Some cooperatives were established as a voter incentive during electoral periods; the Mandindindi farm cooperatives, for example, were established with the help of Provincial Minister Dinha, who was a candidate in a parliamentary bi-election in the area in 2016.

Moreover, even though participation in the tractor cooperatives was by individual plot holders’ choice, the leadership of the cooperatives were generally a mere renaming of the ruling Zanu PF branch structures, and therefore viewed as an extension of its patronage system. Focus group discussions revealed that farmers were not made aware of the full extent of their indebtedness for the Brazilian tractor scheme, yet they are expected to repay the loans. Moreover, there is no communication between MAMID and cooperatives on loan repayments. As a result, cooperatives do not feel obliged to meet repayment requirements, and hope that this will be treated as previous government support programmes, where beneficiaries ended up not repaying loans. While the cooperatives had deposited amounts ranging from US\$8,000 to US\$16,000 into the MAMID Agribank account, limited supervision by the government undermines the full potential for resource mobilisation to this end.

Given that tractor cooperatives are renamed Zanu PF local structures or ward development committees linked to the ruling Zanu PF, the implementation of the Brazilian tractor project is generally believed to be intended to benefit its members. For instance, at Hariana farm, the Zanu PF branch committee was ‘renamed’ as a tractor cooperative, while at Chidziva, it was the village development committee (aligned

with Zanu PF) that was 'renamed'. As a result, some Zanu PF leaders who are not a part of the cooperative leadership demand preferential treatment, in reduced fees and demand to be moved up the waiting list for tillage services. Committee members at Mandindindi were "facing a serious challenge with some Zanu PF leaders who use very abusive language to try and get preferential treatment and to not pay the required tractor hiring fees" (personal interview, Mandindindi farm, November 2017). The committee was unhappy and felt that the independence of the tractor cooperative was being compromised.

In cases where there have been accountability problems for cooperative finances, Zanu PF district leaders were approached to ensure cooperatives

leaders were called to account. In one such case at Hariana farm, the Chairman of the cooperative had 'conveniently' tried to dissociate the cooperative from politics, declaring the cooperative a government independent of party. This is in contrast to the observations of Mkodzongi (2013) in Mhondoro Ngezi, where tendencies of 'acting Zanu PF' were common. In this instance, farmers may be said to be 'acting anti-Zanu PF' for convenience purposes. In this instance, cooperative leaders tend to act 'anti-Zanu PF' to avoid patronage demands, electoral expectations and demands for preferential treatment by Zanu PF local leaders.

# 5 MECHANISATION, AGRARIAN CHANGE AND ACCUMULATION

Under the reconfigured agrarian structure emerging from the FTLRP, an increased number of smallholder farmers now co-exist alongside more medium-scale farmers, and fewer large-scale farmers. The ownership of farming equipment is now tilted in favour of medium-scale farmers, whose supply routes have shifted to the former white commercial farmers, who themselves previously dominated tractor ownership. Due to the economy-wide crisis experienced after the FTLRP, government and private sector capacity to import new and second-hand tractors declined immensely. The few tractors imported by the RBZ were distributed to medium-scale farmers in the A2 farms on a patronage basis. In the private sector, capital flight and reduced access to agricultural credit has led resettled farmers to rely on proceeds from the sale of agricultural commodities to invest in farming machinery or hiring services.

While contract farming accounts for increased production of cash and export crops, agricultural mechanisation under this arrangement has until recently been confined to the remaining large-scale commercial farmers who till larger plots. Yet, the new agrarian structure, new agricultural production patterns and shortages of agricultural labour caused by movement into the informal sector have induced renewed demand for tractor tillage beyond the large-scale sector.

The reliance on rural agrarian capital in the form of proceeds from agricultural sales by medium-scale and smallholder farmers indicates that a process of accumulation from below may be unfolding. Yet, Shonhe (2018) examines the persistence of primitive capital accumulation linked to export finance capital from the developed countries, deployed through contract farming. This tends to undermine smallholder farmers' capacity for accumulation from below, as primary commodities are exported in a semi-processed form, limiting returns for these farmers. The re-investment of agricultural proceeds in agricultural mechanisation by farmers involved in contract farming seems to contradict these findings. Yet, notwithstanding the accumulation of tractors by

medium-scale farmers, the full potential for agricultural development – including agricultural mechanisation – remains constrained by adverse incorporation and primitive capital accumulation, particularly among smallholder farmers where access to tractors remains low. As such, and as our survey revealed, 84.1% and 70.9% of the communal farmers and A1 farmers respectively continue to rely on animal-drawn implements for land preparation. Arguably, notwithstanding ownership of more than 5 head of cattle, 65.5% A1 farmers tend to prefer to hire tractors for land tillage purposes, reflective of increased commercialisation of agriculture in resettled areas. A different dynamic is unfolding in the A2 sector, as 45.3% rely on their own cattle and only 17.7% of those with more than five cattle hire tractor services. In this sector, 76.9% of the farmers who own more than 5 cattle also own and rely on their own tractors, which is indicative of increased tractorisation and a shift away from animal power for tillage services.

For Rusike (2008, 224), the design of an agricultural mechanisation programme “boils down to issues trade-offs on allocating resources” by the government. The paper reveals that a political economy tradition that recognises the role of institutions and its linkages, including government policies, reveals dynamics of technological innovation processes in variegated farming settings. This allows for an analysis that goes beyond neo-classical economics where only supply and demand market forces are prioritised. In Mvurwi, changing land/labour ratios and induced innovation are only one part of the story. Investment in mechanisation is dependent on politics, patronage, changing agrarian structures and private farmer needs and capabilities.

Concessional inter-governmental loans from China and Brazil and other new partner countries have dominated government mechanisation programmes after the FTLRP. While for Brazil the tractorisation programme was framed to advance family farming, political gain was certainly an accompanying motivation for the ruling Zanu PF party. Yet, cooperative members have ‘acted anti-Zanu PF’ in order to gain independence. Beyond

geopolitical dynamics associated with the tractor supply chains, local-level farmer associations have gained agency where political forces from above are being defied and intended patronage-networked gains fail to bear the intended results. Resettled farmers in medium-scale and small-scale farms acknowledge the reduction in drudgery, improved production techniques and yields and increased capital accumulation potential in the agrarian sector.

## 6 CONCLUSION

Zimbabwe's agricultural mechanisation policy has been shaped by state-capital relations or interests favouring powerful groupings linked to the politics and economics. After 2000, the medium-scale farmers replaced large-scale commercial farmers in proximity to political connections, and benefited from government and private sector agricultural mechanisation processes. As such, resettled A2 farmers are the majority of new tractor owners, acquired mainly patronage, but also investing themselves through accumulation from below. Rural capital accumulation driven by the reinvestment of agricultural sales proceeds in the rural economy is shaping agricultural mechanisation among some A1 and A2 farmers in rural Zimbabwe. Contract farming and command agriculture, the main sources of finance for agricultural production, are indirectly financing technological innovation, presenting new opportunities for agricultural commercialisation and agrarian transformation, with some gender and generational dimensions. Medium-scale farmers in joint venture arrangements and smallholder farmers with access to irrigation infrastructure have tended to benefit more from agricultural mechanisation.

Yet tractors are political, as evidenced by the dynamics in state/party patronage, aid programmes/concessional loans (Brazil, China, Belarus, Iran, etc.), JVs with investors and old-style service provision (DDF, for example) which now barely exists. However, there is a growing private sharing/hiring market with A1/communal farmers that is far more important than government/aid-supported cooperatives/projects, which is also shaped by social relations in rural Zimbabwe.

Given the emerging agrarian structure after the FTLRP, the effects of climate change and increasing demand for food commodities raise questions about the appropriateness of technologies such as the big 4WTs – which, being more useful on larger farms than smaller farms, limits the possibilities for tractor hiring-out services. As such, there is a need for innovations in which 2WTs are introduced, accompanied by irrigation infrastructure. Importantly, livestock tillage remains vital across the farming sectors, despite increasing access to tractors.

## 8. REFERENCES

- Adekunle, A. (2015) 'Agricultural Mechanisation. Background paper', Feed African Institute for Agrarian Studies Baseline Survey, 2009. Inter-district household and whole farm survey database. Harare: African Institute for Agrarian Studies (AIAS).
- Anthony, C. G. (1988) Reviewed Work(s): 'Mechanization and Maize: Agriculture and the Politics of Technology Transfer in East Africa' by Constance G. Review by: Jane I. Guyer *African Economic History*, No. 19 (1990 - 1991), pp. 211-212. University of Wisconsin-Madison: African Studies Program. Accessed at : <http://www.jstor.org/stable/3601924> Accessed: 01-11-2016 11:02 UTC
- Baudron, F. Sims, B. Justice, D. G. K. Rose, R. Mkomwa, S. Kaumbutho, P. Sariah, J. Nazare, R. Moges, G. and Gérard, B. (2015) Re-examining appropriate mechanization in Eastern and Southern Africa: two wheels tractors, conservation agriculture, and private sector involvement. *Food Security* 7.4:889//doi.org/10.1007/s12571-015-0476-3
- Biggs, S. D. (1990) 'A multiple Source of Innovation Model of Agricultural Research and Technology Promotion'. *World Development*, Vol.18 No. 11.pp 1481-1499.
- Biggs, S. Justice, S. and Lewis, D. (2011) 'Patterns of Rural Mechanisation, Energy and Employment in South Asia: Reopening the Debate'. *Economic and Political Weekly*, Vol. XLVI, No. 9, pp. 78-82.
- Binswanger, H. P. (1986) 'Agricultural Mechanization: A Comparative Historical Perspective' *The World Bank Research Observer*, Vol. 1, No. 1 (Jan. 1986), pp. 27-56. Oxford University Press. Accessed at: <http://www.jstor.org/stable/3986307>.
- Binswanger, H. and Ruttam, V. W. (1978) *Induced Innovation: Technology, Institutions and Development*. Baltimore and London: The Johns Hopkins University Press.
- Binswanger, H. P. (1978) *The Economics of Tractors in South Asia*. New York: Agricultural Development Council.
- Binswanger, H. P. and Pingali, P. (1988) 'Technological priorities for farming in sub-Saharan Africa'. *The World Bank Research Observer* 3.1.81-98.
- Cabral, L, Favareto, A, Mukwereza, L, and Amanor, K. (2016) 'Brazil's Agricultural Politics in Africa: More Food International and the Disputed Meanings of "family farming," *World Development* 81.May: 47-60. Accessed at: <http://doi.org/10.1016/j.worlddev.2015.11.010De>
- Chancellor, W. (1971). *Mechanisation of small farms in Thailand and Malaysia by tractor hire services*, Trans. ASAE, 847-854.
- Chancellor, W. (1986) 'Improving Access to and Use of Appropriate Technology Machinery by Small-Scale Farmers', in *Small Farm Equipment for Developing Countries: Past Experiences and Future Priorities*. Phillipines: IRRI.
- Chipato, A. Houssou, N. Mabiso, A and Cossar, F. (2014) *Medium and Large-scale farmers and agricultural mechanisation in Ghana: Survey Results*. The Ghana strategy Support Program (IFPRI) in collaboration with the Savanna Agricultural Research Institute (CSIR)

- De Janvry, A. (1978) *Social Structure and Biased Technical Change in Argentine Agriculture*, in *Induced Innovation: Technology, Institutions and Development*, Binswanger, H. (Ed) Baltimore, MD: Johns Hopkins University Press.
- Diao, X. Cossar, F. Houssou, N. Kolavalli, S. Jimah, K. and Aboagye, P. (2012) *Mechanization in Ghana. Searching for Sustainable Service Supply Models* (IFPRI Discussion Paper). Washington DC: International Food Policy Research Institute.
- Diao, X. Silver, J. and Takeshima, H. (2016) *Agricultural Mechanization and Agricultural Transformation*, IFPRI Discussion Paper 1527, Washington DC: IFPRI. Accessed on March 2, 2017 at: <http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/130311>
- Food and Agriculture Organization of the United Nations (2013) 'Agricultural mechanization in India'. Singh, G. In: Kienzle, J., Ashburner, J. & Sims, B.G. (eds) *Mechanization for rural development: a review of patterns and progress from around the world. Integrated crop management 20*: 99-119. Rome, Italy: Food and Agriculture Organization of the United Nations.
- Food and Agriculture Organization of the United Nations (2018) *Mechanisation and Animal Stocks in Zimbabwe*, FAOSTAT Database.
- Gass, G. M. and Biggs, S. D. (1993) *Rural Mechanisation: A Review of Processes, Policies, Practice and Literature*, Project Appraisal, 8:3, 157-187, DOI: 10.1080/02688867.1993.9726905.
- Hayami, Y. and Ruttan, V. M. (1970) *Agricultural Productivity: Differences Among Countries*, *American Economic Review*, Vol 60, number 5: 895–911.
- Hayami, Y. and Ruttan, V. M. (1971) *Agricultural Development: An International Perspective*, First Edition. Second Edition, 1985. Baltimore, M.D. Johns Hopkins University Press.
- Hazell, P. B. R. (2009) *The Asian Green Revolution. Proven Successes in Agricultural Development A Technical Compendium to Millions Fed*, Eds David J. Spielman and Rajul Pandya-Lorch. Washington, D.C. International Food Policy Research Institute.
- Hodder-Williams, R. (1983) *White Farmers in Rhodesia, 1890-1965: A History of the Marandellas District*. London and Baingstoke: Macmillan.
- Houmy, K. Clarke L..J. Ashburner, J. E. and Kienzle, J. (2013) Food and Agriculture Organization of the United Nations. Rome, Italy. *Integrated crop management 22*. ISBN 978-92-5-107762-7.
- Janvry, A. (1978) 'Social Structure Model of Induced Innovations for Argentine Agricultural Development'. *The Quarterly Journal of Economics* 87:3 (August 1973): 410-435.
- Justice, S. and Biggs, S. (2013) 'Diverse Patterns of Rural and Agricultural Mechanisation in Bangladesh and Nepal: Status and Emerging Themes. In J. Kienzle, J. E. Ashburner, & B. G. Sims (Eds.), *Mechanization for Rural Development: A review of patterns and progress from around the world*. Rome: Food and Agriculture Organization of the United Nations.
- Kassie, G. T., Erenstein, O., Mwangi, W., La Rovere, R., Setimela, P., and Langyintuo, A. (2012) *Characterization of maize production in Southern Africa: synthesis of CIMMYT/DTMA household level farming system surveys in Angola, Malawi, Mozambique, Zambia and Zimbabwe*. Scoio-Economics Program Working Paper 4, Mexico, D.F.: CIMMYT
- Kienzle, J. Ashburner, J. E. and Sims, B. G. (2013) *Mechanisation for rural development: A review of patterns progress from around the world*. Rome: Food and Agriculture Organization of the United Nations.
- Lal, R. (2004) 'Carbon Emission From Farm Operations'. *Environment International*, 30, 981–990.



- London, T. and Hart, S. (2010) *Next Generation Business Strategies for the Base of the Pyramid: New Approaches for Building Mutual Value*. New Jersey: FT Press.
- Magistro, J. Roberts, M. Haggblade, S. Kramer, F. Polak, P. Weight, E. and Yoder, R. (2007) 'A Model for Pro-poor Wealth Creation Through Small-plot Irrigation and Market Linkages'. *Irrigation and Drainage*, 56, 321-334.
- Mkodzongi, G. (2013). 'Fast Tracking Land Reform and Rural Livelihoods in Mashonaland West Province of Zimbabwe: Opportunities and Constraints', 2000–2013. PhD Thesis, University of Edinburgh.
- Mlambo, B.T. (2004) *The Status of Farm Level Mechanization, Facilities Services. Access Mechanisms and Strategies for Improving Mechanization in Zimbabwean Agricultural Systems*. Harare. FAO assessment mission report.
- Moyo, S. (2011) 'Three Decades of Agrarian Reform in Zimbabwe'. *The Journal of Peasant Studies* 38.3: 493–531
- Moyo S. and Nyoni, N. (2013) 'Changing Agrarian Relations after Redistributive Land Reform in Zimbabwe'. In Sam Moyo and Walter Chambati (eds.), *Land and Agrarian Reform in Former Settler Colonial Zimbabwe*,. Council for the Development of Social Science Research in Africa, Angle Canal IV BP 3304 Dakar, CP 18524, Senegal
- Moyo, S. (2013) 'Land reform and redistribution in Zimbabwe since 1980', *In Land and agrarian reform in former settler colonial Zimbabwe*. S. Moyo & W. Chambati, Eds. Dakar, CP 18524, Senegal: Council for the Development of Social Science Research in Africa.
- Moyo, S. (1991) *Zimbabwe's Agrarian Reform Process: Lesson or Domino Strategies*. Harare: Zimbabwe Institute of Development Studies.
- Mukwereza, L. (2013) Reviving Zimbabwe's Agriculture: The Role of China and Brazil. *IDS Bulletin*, 44.4.
- Mukwereza, L. (2015) *Zimbabwe-Brazil cooperation through the More Food Africa programme* (working paper 116). Future Agricultures Consortium, Brighton.
- Napasintuwong, O. and Emerson, R. D. (2003) 'Farm Mechanisation and the farm labour market: A Socioeconomic Model of Induced Innovation', Selected paper for presentation at the Southern Agricultural Economics Association Annual Meeting, Mobil, Alabama, February 1-5, 2003.
- Nhau, B. (2006) *Public-private Sector Roles in Farm Mechanisation*. Position paper prepared for FAO TCP/ZIM/3002. Harare
- Pingali, P. P. Y. (1987) *Agricultural Mechanization and the Evolution of Farming Systems in Sub-Saharan Africa*. Baltimore: The Johns Hopkins University Press.
- Ranger, T. (1977) 'The People in African Resistance: A review'. *Journal of Southern African Studies*, 4(1), pp.125-146.
- Reserve Bank of Zimbabwe (2008) 'Extraordinary Interventions by the Reserve Bank of Zimbabwe.' Supplement to the second half Monetary Policy Review Statement.
- Roy, K. C. and Singh, G. (2008). 'Agricultural mechanization in Bangladesh', *Agricultural Mechanization in Asia, Africa & Latin America*, 39, 83–93.
- Rukuni, M. Tawonezvi, P. and Eicher, C. (2006) *Zimbabwe's Agricultural Revolution Revisited*. Harare: University of Zimbabwe Publications.
- Rusike, J. (1988) 'Prospects for Agricultural Mechanization in Communal Farming Systems: A Case Study of Chiweshe Tractors. Mechanization project'. Unpublished MPhil. thesis, Faculty of Agriculture, Department of Agricultural Economics, University of Zimbabwe, Harare.

- Ruttan, V. W. (2002) 'Productivity Growth in World Agriculture: Sources and Constraints' *Journal of Economic Perspectives*, 16 (4): 161–184
- Sanders, J. H. and Ruttan, V.W. (1978) *Biased Choice of Technology in Brazilian Agriculture' in Induced innovation: technology, institutions, and development*. Baltimore: Johns Hopkins University Press.
- Schultz, T. W. (1964) *Transforming Traditional Agriculture*. New Haven, Conn.: Yale University Press.
- Scoones, I. Marongwe, N. Mavedzenge, B. Mahenehene, J. Murimbarimba, F. and Sukume, C. (2010) *Zimbabwe's Land Reform: Myths and Realities*, Suffolk, Harare and Johannesburg: James Currey, Weaver Press and Jacana Media.
- Selby, A. (2006) *Commercial Farmers and the State: Interest group politics and land reform in Zimbabwe*. Oxford: Oxford University Press.
- Shivji, G. (2009) *Accumulation in an African Periphery*. Dar es Salaam: Mkuki na Nyota Publishers, Ltd.
- Shonhe, T. (2018) *Reconfigured Agrarian change in Zimbabwe, Langaa Research & Publishing Common Initiative Group*. Cameroon: African Books Collective.
- Simalenga T. E. (2013) *Agricultural mechanization in Southern African countries*. Silverton, Pretoria, South Africa: Institute for Agricultural Engineering,
- Simalenga, T. E. (2005) 'Framework for developing mechanization strategic plans and programs.' FAO mission report. Harare.
- Stoneman, C. (1981) *Zimbabwe's Inheritance*, (Vol. 1). London: Macmillan.
- Stoneman, C. (1988) *Zimbabwe's Prospects: Issues of Race, Class, State and Capital in Southern Africa*: London, Macmillan.
- Tshuma, T. (1997) *A Matter of (In)Justice: Law, State and the Agrarian Question in Zimbabwe*. Harare: SAPES Books.
- Triad Discussion With Three Tractors Committee Members, Mandindindi farm, November 2017
- Zimbabwe Central Statistical Office, Ministry of Finance, Economic Planning and Development (1984) Zimbabwe National Household Survey Capability Programme.
- Zimstats (2017) *Agricultural Statics, National Production Report*. Harare: Zimbabwe.

# INTERVIEWS



Personal interview, Haryana farm, Chairman of the Tractors Committee – Mr. Alexio Muvhuri, 26 February 2017

Personal interview, Haryana farm, Secretary of the Tractors Committee – Mrs. Mercy Muteswa, 26 February 2017

Personal interview, Mvurwi, MAMID official 13 October 2017

Personal interview, Omen Muzadzi, 18 December 2017

Focus group discussion, Donje farm, tractors members 21 November 2017

# ENDNOTES



- 1 These are LSCF owned by black indigenous Zimbabweans who got access to the land before the FTL RP OF 2000

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