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T.S. Jayne (Professor)

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# LAND DYNAMICS AND FUTURE TRAJECTORIES OF STRUCTURAL TRANSFORMATION IN AFRICA

T.S. Jayne<sup>1</sup>

## INTRODUCTION

It is a great honour and a formidable challenge to have been invited to deliver the 2013 Simon Brand Memorial Address to this gathering of the Agricultural Economics Association of South Africa. The more I read about Simon Brand in preparation for this address, the more humbled I quickly became. His professional achievements, and more importantly his character, have provided inspiration in preparing this address.

Having chosen the commemoration of South Africa's 1913 *Natives Land Act* as its theme for the 2013 Annual Meeting, the AEASA Organising Committee has encouraged me to touch on the major land-related challenges in the broader region of sub-Saharan Africa. As complex and unique as South Africa's land issues are, I increasingly conclude that the same can be said for many if not most African countries, each with their own historical and political peculiarities. Generalisations therefore often invite trouble. However, one of the contributions of our profession derives from being able to identify underlying trends and patterns emerging out of apparent idiosyncrasies that are influencing the trajectory of economic development and which can guide public and private sector stakeholders. Hence, generalise I will – but not without considerable trepidation.

One such generalisation – the main point of this article – is that rising land pressures caused by rural population growth are profoundly affecting the overall trajectory of sub-Saharan Africa's economic systems in ways that are underappreciated in current discourse on the region's development. My aim

1 Paper prepared for the Simon Brand Memorial Address of the Agricultural Economics Association of South Africa 2013 Annual Meetings. Jayne is Professor International Development in the Department of Agricultural, Food and Resource Economics at Michigan State University. Parts of this paper draw extensively from Jayne *et al.* (2014). The author thanks Milu Muyanga, Nicholas Sitko, Antony Chapoto, Jordan Chamberlin, Derek Headey, and Chewe Nkonde for their collaboration on recent studies, many of which serve as foundational material for this article. I also acknowledge many useful discussions on this topic with Nick Vink, Chance Kabaghe, Derek Byrlee, Munguzwe Hichaambwa and Johann Kirsten. Email: jayne@anr.msu



is to show why land pressures are intensifying in countries that are normally characterised as land abundant and review the main consequences of rising land pressures. The article summarises how rising population pressure is linked in one way or another to (i) the shrinking size of most African farms over time; (ii) land degradation and unsustainable forms of agricultural intensification; (iii) the rise of land markets, which are profoundly altering the way in which unutilised land is being allocated; (iv) rapid changes in farm structure; and (v) difficulties in achieving broad-based and inclusive forms of farm income growth. A second generalised conclusion is that policy choices can moderate and “bend” the effects of rising land scarcity in socially desirable ways. Before treating each of these five issues in turn, I will first lay out a conceptual framework for approaching the study of land issues in the region of sub-Saharan Africa north of the Limpopo.<sup>2</sup>

## CONCEPTUAL FRAMEWORK: HOW LAND PRESSURES AFFECT AFRICA'S STRUCTURAL TRANSFORMATION PROCESS

Agriculture-led structural transformation represents the process by which most but certainly not all of the developed world has transitioned from a semi-subsistence agrarian society to a more prosperous, food secure, and diversified economy. The pioneering work of Johnston and Mellor (1961), Johnston and Kilby (1975), and Mellor (1976) first documented the structural transformation process in the regions of Asia that experienced Green Revolutions. The structural transformation process starts with sustained rural income growth (occurring, for example, from the creation and mass adoption of new farm technology), putting a bit of money into the hands of millions of rural farm families. These millions of farmers subsequently spend and re-cycle more money through the economy, igniting demand and employment growth in non-farm sectors, which in turn increases the demand for food and other farm products in a virtuous cycle in which the rural and urban labour forces provide a market for each other. Rising demand for food and fibre products attracts private investment flows into the storage, transport, processing, and retailing stages of commodity value chains, further expanding employment and diversifying the economy. Over time, broad-based income growth causes the share of food in overall consumption to fall, making available more disposable income to fuel the development of non-farm sectors. As the demand for non-farm goods and services rise, the labour force responds by shifting gradually from the farm to non-farm sectors, the demand for education and job skills rises, and the economy becomes increasingly diversified and urban. Rural households are pulled off the farm by better paying non-farm jobs, not pushed into low-paying desperation jobs in the towns due to poor prospects in agriculture.

2 Hereafter SSA for short.

SSA's rural people are quite heterogeneous with respect to education, entrepreneurial ability, and productive assets. Nationally representative farm household surveys consistently show that only 40–60 per cent of households derive any income at all from crop sales. Roughly 5 per cent of the smallholder farms account for half of the grain surplus. At least 50 per cent of farm households control less than one hectare of land and tend to be net buyers of food, not sellers. A sober assessment would convince most that, even with highly supportive policies and public expenditures directed to smallholder farming areas, perhaps 20 to 35 per cent of the smallholder population has the potential to become “commercialised” in the sense of earning cash incomes from farming that are substantially above the poverty line. Hence, it may be unrealistic to expect that more than one-third of Africa's smallholder farms will contribute meaningfully to the region's structural transformation processes. Yet even this would support to some extent the structural transformation process outlined above. Equally important in this context is the need for industry and non-farm service sectors to rapidly create the jobs required to pull the majority of marginalised small-scale farmers off the farm and into productive non-farm jobs. Policy decisions obviously affect the rate and inclusivity of growth in both the farm and non-farm sectors.

How do rising land pressures affect the prospects for this transformation? It is widely agreed that farm labour productivity (the value of net farm output per labour unit in farming) is the most important measure of farmer welfare. The following identity shows how labour productivity in agriculture is functionally related to rising land pressures. Labour productivity ( $Y/L$ ) can be defined as the product of two terms: net farm income per unit of cultivated land ( $Y/A$ ) and the ratio of cultivated land to farm labour ( $A/L$ ).

$$(1) \quad \frac{Y}{L} = \frac{Y}{A} \frac{A}{L}$$

In most areas of Africa,  $A/L$  appears to be declining over time as the rural population engaged in agriculture grows at a faster rate than land under cultivation (Headey and Jayne, 2014; Jayne *et al.*, 2014b). For farm labour productivity to rise over time, therefore, the net value of output per hectare must rise at a faster rate than the decline in land/person ratios.

Achieving rapid growth rates in  $Y/A$  will be especially challenging in the decades to come due to likely changes in weather patterns (Schlenker and Lobell 2010) and widespread land degradation in densely populated farming systems (Tittonell and Giller, 2012; Powlson *et al.*, 2011). And especially for the roughly half of Africa's farms that cultivate less than one hectare, even a doubling of net farm output on existing farmland will not be likely to constitute a sufficiently large absolute increase in incomes to pull households much over the poverty line

(Harris and Orr, 2014). Even if small farms are more productive per unit area than larger farms (a heavily debated issue), their small size constrains Y/L from rising substantially over the poverty line. Over time most rural African households will need to exit from farming, enabling farm consolidation.

Two factors that will determine the trajectory of the economic transformation will be the rate at which the non-farm economy grows and the educational system. If the non-farm economy is growing rapidly and if rural youth are trained to possess the requisite skills, this economic transition can occur relatively smoothly as rural young people are pulled off the farm into gainful non-farm employment. By contrast, sluggish non-farm employment growth is likely to impede the process of economic transformation, exacerbate unemployment, and raise the spectre of civil instability. Perceptions of weak access to land may only aggravate these problems.

## EVIDENCE OF LAND SCARCITY IN THE REGION

Research and policy discourse on African agriculture have often misidentified or underestimated the heterogeneous nature of Africa's land endowment. Africa is typically characterised as land abundant, with the implication that land endowments pose no serious constraint for agricultural development. At the continental level, this is true. Estimates show that 52% of the world's remaining arable land is in SSA (Deininger and Byerlee, 2011). Yet 85% of this land is concentrated in just eight countries. The remaining 15 per cent of unutilised arable land is sprinkled across the remaining 40 to 45 countries of sub-Saharan Africa (Chamberlin *et al.*, 2014). Africa is equally heterogeneous at disaggregated levels. Based on analysis of the region's thousands of 10km<sup>2</sup> grid cells, it is now apparent that just 1% of sub-Saharan Africa's rural land area contains 21% of its rural population; 20% of its rural lands contain 82% of its rural people.

A visual representation of the dispersion in rural population density on arable land is shown for Kenya and Zambia in Figures 1 and 2. Roughly 72 per cent of Kenya's rural population resides on 10 per cent of its arable land. Three per cent of the population controls 20 per cent of the nation's arable land. Near the other end of the continuum is Zambia, where 34 per cent of the population resides on 10 per cent of its arable land.

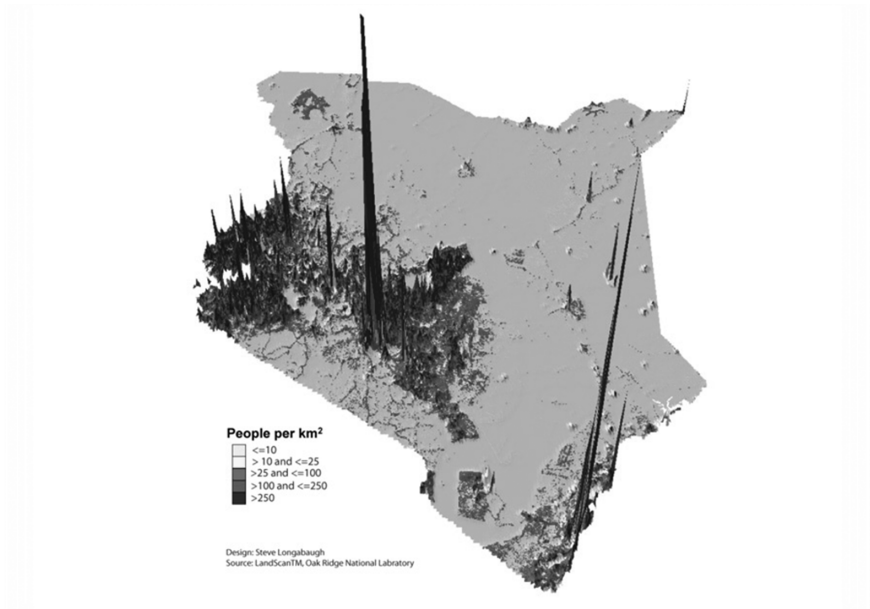


Figure 1. Population density in Kenya

Source: LandScan data for 1999 Census, Kenya

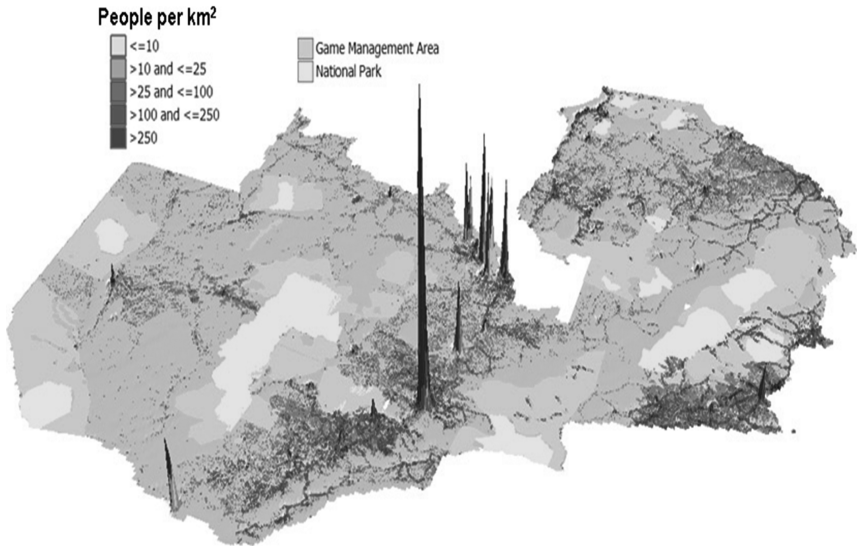


Figure 2. Population density in Zambia

Source: LandScan data based on 2000 National Census.

The main reasons for highly variable localised rural population densities include agro-ecological production potential, disease burdens, infrastructure and market access conditions, conflict, colonial policies concentrating indigenous populations in particular areas and post-independence land reforms (Clarke and Kosinski, 1982; Binswanger and Pingali, 1988). Although spatial clustering of populations is not unique to Africa, such rural clustering does speak to limited ability and/or willingness of rural labour in densely populated areas to relocate to the region's land "surplus" areas.<sup>3</sup>

The magnitude of land available for cropland expansion is still not well established, despite the large number of estimates produced over the past decade.<sup>4</sup> A key point illustrated by Chamberlin *et al.* (2014) is that estimates of potentially available cropland (PAC) are very sensitive to assumptions about what constitutes

3 Note that the foregoing treatment of land scarcity does not engage with institutional constraints to access, such as existing claims on land by traditional authorities, increasingly gazetted lands, or the so-called "new African enclosures", which may exclude a considerable portion of would-be cultivators from expanding (Woodhouse, 2003).

4 See, for example, Alexandratos, 1995, Luyten, 1995, Fischer and Heilig, 1998, Ramankutty *et al.*, 2002, Cassman and Wood, 2005, Fischer and Shah, 2010 (utilized by Deininger and Byerlee, 2011), Alexandratos and Bruinsma, 2012, and Lambin *et al.*, 2013.



“potentially available” (and to a lesser extent to different data sources). There seems to be a consensus that arable land is abundant in the region as a whole, although exactly how much of this stock is utilisable (and by whom) is far from clear. Many estimates have emphasised the production potential of unutilised land, drawing on geo-referenced data on land and climate characteristics and associated biophysical production characteristics, with relatively little emphasis on the extent to which unutilised land is already “owned”, or the forces shaping the current and future allocation of remaining arable lands.

A striking aspect of the distribution of “potentially arable cropland” is that, from a regional perspective, much of Africa’s unutilised arable land is found in just a few countries (Deininger and Byerlee, 2011; Chamberlin *et al.*, 2014). Depending upon the definitions and assumptions used, as much as 90% of SSA’s unutilised arable land is located in just six to eight countries (Table 1). In four of these countries (DRC, Congo Republic, Gabon, and Cameroon), surplus lands are primarily under dense tropical forests. Converting this land to crop land would most likely have major regional (and possibly global) environmental effects. Even when excluding forested lands, the region’s unutilised arable land is still highly concentrated in mostly the same set of countries.<sup>5</sup>

After excluding the few African countries where most of the unutilised arable land is located, the remaining 40 or so countries are either already land constrained, or close to approaching the full extent of their arable land area (Chamberlin *et al.*, 2014). The list of countries with little surplus land remaining includes some of Africa’s most populous countries (Nigeria, Ethiopia, Uganda) as well as countries where land pressures have contributed to fomenting civil conflicts (Kenya, Rwanda, Burundi). In east and southern Africa, the amount of arable land has risen only marginally over the 1980–2010 period, but the percentage of households engaged in agriculture has grown three-fold.

5 The relative ranking of some land-abundant countries, like Zambia, Angola and Madagascar, is highly dependent upon whether or not forests are included, as well as on how forests are measured in land cover data used in such analysis.

Table 1. Land availability in African countries

	Non-forested unutilised land <sup>1</sup> (1000s Ha)	Proportion	Cumulative Proportion
DRC	84824	46.5%	46.5%
Angola	18889	10.4%	56.9%
Congo	12872	7.1%	63.9%
Zambia	10834	5.9%	69.9%
Cameroon	10447	5.7%	75.6%
Mozambique	8994	4.9%	80.5%
CAR	7049	3.9%	84.4%
Gabon	6534	3.6%	88.0%
Sudan	5803	3.2%	91.2%
Tanzania	4313	2.4%	93.5%
Madagascar	2718	1.5%	95.0%
Zimbabwe	2142	1.2%	96.2%
Chad	1520	0.8%	97.0%
South Africa	1219	0.7%	97.7%
Kenya	807	0.4%	98.2%
Mali	800	0.4%	98.6%
Burkina Faso	655	0.4%	99.0%
Ethiopia	651	0.4%	99.3%
Rest of Africa	1259	0.7%	100.0%

Notes: Estimates of underutilised land extents are drawn from Fischer and Shah (2010). The methods are explained in Chapter 3 of Deininger and Byerlee (2011)<sup>1</sup> defined by Deininger and Byerlee as land under 25 persons per km<sup>2</sup>.

A final and emerging cause of increased land scarcity in SSA concerns the region's unique demographic trends. There are two relevant features of this trend. First, Africa is the only region in the world that will experience continued rural population growth until 2050. Rural Africa's population is estimated to be 48% larger in 2050 than it is now. Figure 3 shows that Africa will have as many rural people as in China and south-east Asia combined by 2050. In contrast, China is already experiencing declining rural populations, and most of Asia will do so by 2030.

Second, Africa is only beginning its demographic transition, and the share of young people in the total population will be unusually high for the next several decades. In 2015, 63% of its rural population will be under 25 years of age (Figure 4). Roughly 122 million young people will enter the labour force between 2010 and 2020, with slightly more than half of them from rural areas, putting immense pressure on both agriculture and non-farm sectors to generate employment opportunities. However, even under highly favorable conditions, Fine *et al.* (2012) estimate that non-farm sectors can generate only 70 million wage jobs – mainly in manufacturing, retailing, hospitality, and government. This means that farming will be called upon to provide gainful employment for at least a third of Africa's young labour force (Losch 2012). However, for agriculture to effectively fulfill this mandate, young people growing up in densely populated areas will require access to technologies that are radically more productive and profitable, as well as access to new land. Hence, even as Africa becomes progressively urbanised, smallholder agriculture will remain fundamental for absorbing much of Africa's burgeoning young labour force into gainful employment (Losch, 2012). Failure to make land available for employment generation through farming may carry considerable political risks.<sup>6</sup>

In summary, sub-Saharan Africa is clearly very heterogeneous and many countries do not yet suffer from land scarcity (to the extent we can detect it through labour-land ratios). However, most of the region's rural people already live in relatively highly densely populated areas where the potential for crop area expansion is very limited. The demographic forecasts for the region suggest that the scarcity of land resources will intensify over the next several decades.

6 Land-related conflicts may be part of broader processes undergirding recent evidence of a strong correlation between countries prone to civil conflicts and those with burgeoning youth populations (e.g., Fuller, 1995; Beehner, 2007).

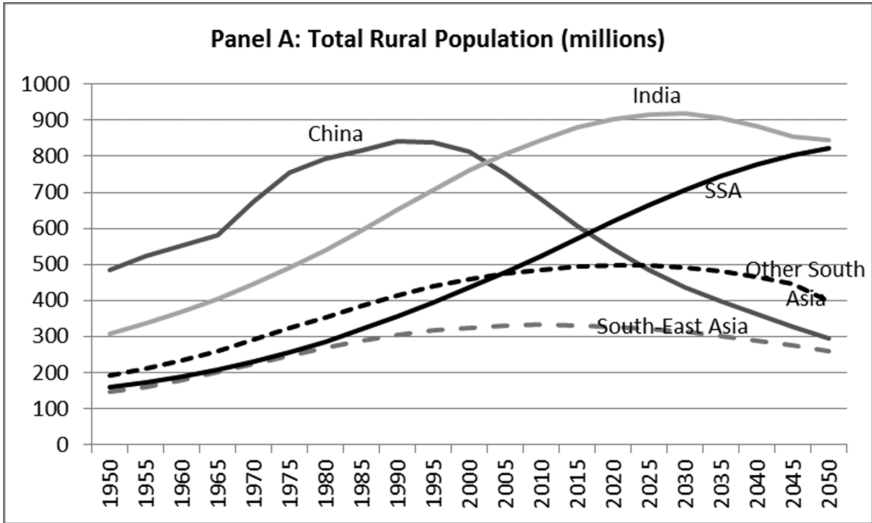


Figure 3: Rural population trends (millions) in Africa and other developing areas

Source: United Nations, 2013.

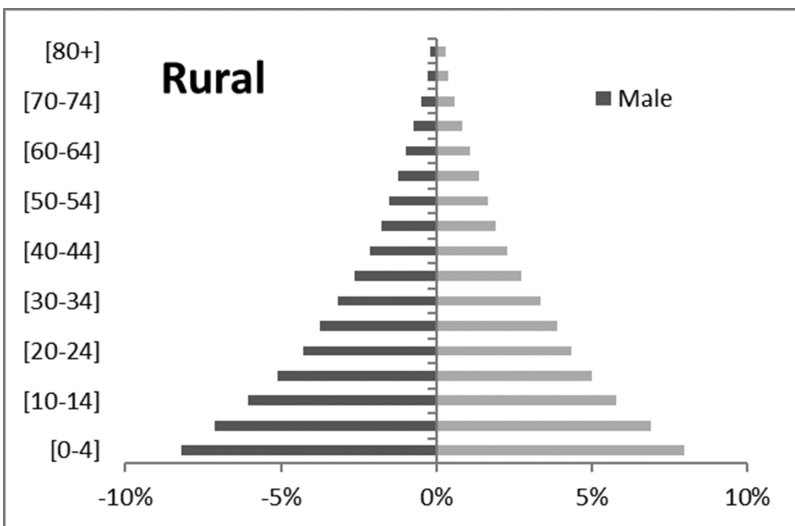


Figure 4: Age pyramid for rural SSA, 2015

Source: United Nations, 2013.

## FOUR CONSEQUENCES OF RISING LAND SCARCITY

Rising population pressure is driving four major trends: (i) the shrinking size of most African farms over time; (ii) land degradation and unsustainable forms of agricultural intensification; (iii) the rise of land markets, which are profoundly altering the way in which unutilised land is being allocated; (iv) rapid changes in farm structure; and (v) increasing difficulties in achieving broad-based and inclusive forms of agricultural growth.

### The shrinking size of most African farms

Most of sub-Saharan Africa has witnessed a gradual but steady decline in mean farm size over the past 50 years as rural population growth has outstripped the growth in arable land. Table 2 presents basic information on farm size and distribution within the smallholder farm sector in six countries for which nationwide survey data were available. As shown in column b, mean farm size in the small farm sector range from 2.76 hectares in Zambia to 0.71 hectares in Rwanda in 2000. The three Rwanda surveys indicate that mean household land access has declined significantly over the past 15 years.

Table 2. Land distribution within the smallholder farm sectors in selected African countries

Country (year of survey)	(a) Sample size	(b) Mean farm size (ha)	(c) Farm Size (hectares per capita)					(d) Gini Coefficients			
			Mean	Quartile				Land per household	Land per capita	Land per adult	
				1	2	3	4				
Kenya (1997)	1146	2.28	0.41	0.08	0.17	0.31	1.10	0.55	0.56	0.54	
Kenya (2010)	1146	1.86	0.32	0.07	0.12	0.25	1.12	0.57	0.59	0.56	
Ethiopia (1996)	2658	1.17	0.24	0.03	0.12	0.22	0.58	0.55	0.55	0.55	
Rwanda (1984)	2018	1.20	0.28	0.07	0.15	0.26	0.62	--	--	--	
Rwanda (1990)	1181	0.94	0.17	0.05	0.10	0.16	0.39	0.43	0.43	0.41	
Rwanda (2000)	1584	0.71	0.16	0.02	0.06	0.13	0.43	0.52	0.54	0.54	
Malawi (1998)	5657	0.99	0.22	0.08	0.15	0.25	0.60	--	--	--	
Zambia (2001)	6618	2.76	0.56	0.12	0.26	0.48	1.36	0.44	0.50	0.51	
Mozambique (1996)	3851	2.10	0.48	0.1	0.23	0.4	1.16	0.45	0.51	0.48	

Source: Kenya: Tegemeo Rural Household Surveys, Tegemeo Institute, Nairobi. Ethiopia: Central Statistical Authority surveys 1995 and 1997, Government of Ethiopia. Rwanda: 1990 Ministry of Agriculture Survey. Malawi: Profile of Poverty in Malawi, 1998, National Economic Council, 2000. Zambia: Central Statistical Office Post-Harvest Surveys. Mozambique: 1996 Ministry of Agriculture and Rural Development (MADER) Smallholder Survey.

Note: Numbers for Ethiopia, Rwanda, Mozambique, and Zambia, including Gini coefficients, are weighted to be nationally representative.

On a per capita basis, farm sizes range from 0.56 hectares per person in Zambia to 0.16 hectares per person in Rwanda in 2000 (Table 2, column c). Mean farm size figures mask great variations in land access within the smallholder sector. After ranking all smallholders by household per capita farm size, and dividing them into four equal quartiles, households in the highest per capita farm size quartile controlled between eight to 20 times more land than households in the lowest quartile. In Kenya, mean landholding size for the top and bottom land quartiles were 1.10 and 0.08 hectares per capita, respectively. These figures already include rented land.

In each country, the bottom 25 per cent of small-scale farm households are approaching landlessness, controlling less than 0.12 hectares per capita. In Ethiopia and Rwanda, the bottom land quartile controlled less than 0.03 hectares per capita. These surveys contain only households engaged in agricultural production; households not engaged in farming are not in the sample.

Land inequality is also very high in comparison to area of green revolution Asia, with evidence of rising Gini coefficients over time (Jayne *et al.*, 2014c). Between 1994 and 2006, the proportion of Kenya's farms smaller than one hectare rose from 45 to 74 per cent. However, over the same period, average farm size among farms over 8 hectares grew by 230 per cent, from 13.2 to 31.1 hectares (Jayne *et al.*, 2014c). These developments underscore the potential for misinterpretation of changes in mean farm size over time. The rise in the number of medium-scale farms in recent years may raise mean farm sizes even as the majority of farms are declining in size (Jayne *et al.*, 2014c).

## Land degradation and unsustainable forms of agricultural intensification

There is considerable research evidence of land intensification in response to rising population density. However, the forms of land intensification in densely populated SSA are in general quite different from those of densely populated Asia. Intensification in Asia featured increased use of fertiliser per hectare, irrigation investments, increased mechanisation, and impressive cereal yield growth. This is in stark contrast to many areas of Africa where the net value of output per unit land has increased more slowly and unevenly over time and has been mainly associated with more continuous cultivation of existing cropland (higher "cropping intensities") and shifts to relatively high-value crops. Fertiliser use intensity has risen much more slowly, and the efficiency of fertiliser use in raising output per unit of land is significantly lower than in Asia. The difference in irrigation investments and outcomes between Africa and Asia is even more stark, with only a small fraction of Africa being irrigated (Headey and Jayne, 2014).

The second qualification to the Boserupian intensification concept concerns what happens at relatively high levels of population density. Consistent with Boserup, we see a positive relationship between population density and measures of land intensification – up to a point. Recent studies find that beyond 500 persons per km<sup>2</sup>, measures of land productivity and intensification plateau and then decline after roughly 600 persons per square kilometer.<sup>7</sup> This finding requires additional scrutiny, but may be related to several factors.

As population pressures cause a gradual shrinking of farm sizes over time, smallholder farmers respond by more continuously cropping their fields every year. Fallows have largely disappeared in densely populated areas.<sup>8</sup> More continuous cultivation of existing plots would not necessarily pose problems to sustainable intensification if soil quality were maintained or improved over time, for example, through adequate soil use of fertilisers and other soil augmenting practices. However, there is much research evidence indicating soil degradation arising from unsustainable cultivation practices in high density areas of the continent (e.g., Stoorvogel and Smaling, 1990; Drechsel *et al.*, 2001; Tittonell and Giller, 2012).<sup>9</sup> Nitrogen is one of the major nutrients being mined from African soils; this problem can be addressed if sufficient quantities of inorganic fertiliser are added back into the soil. However, there are many aspects of soil quality that cannot be addressed by conventional inorganic fertilisers. Moreover, these “non-nitrogen” constraints on soil quality tend to depress the efficiency of inorganic fertiliser in contributing to crop output (Shaxson and Barber, 2003) and thereby depress the effective demand for inorganic fertiliser. Some of these constraints are related to current forms of continuous cultivation.

The first of these non-nitrogen soil quality elements is soil acidity. Acidic soils lock up phosphorus in the soil and prevent it from being available to the plant, thereby depressing crop response to nitrogen application. Soil acidification is exacerbated by extensive use of inorganic fertilisers without concurrent steps being taken to raise soil pH, which is a leading explanation for why farmers in many areas complain of having to apply increasing doses of nitrogen-based

7 For evidence in Malawi, Kenya and Ethiopia, see Ricker-Gilbert *et al.*, 2014; Muyanga and Jayne, 2014; and Josephson *et al.*, 2014.

8 Fuglie and Rada (2013) report that fallowed land as a proportion of total farmland in sub-Saharan Africa has declined from 40% in 1960 to roughly 15% in 2011.

9 An important contrasting study by Tiffen *et al.* (1994) argues that population pressures between 1950 and 1980 in the Machakos District of Kenya induced households to make land-augmenting investments that contributed to sustainable intensification. However, in a more recent revisit to these same areas in 2014, Kyalo and Muyanga (forthcoming) note that population densities during the period studied by Tiffen *et al.*, were generally below 400 persons per km<sup>2</sup>, that densities of some divisions have risen well over 800km<sup>2</sup>, and that there is widespread evidence of soil degradation and unsustainable forms of intensification.



fertiliser in order to maintain their yields over time (Sileshi *et al.*, 2011; Obura *et al.*, 2010). Micronutrient deficiencies constitute a second yield-inhibiting category of soil degradation that cannot be ameliorated by conventional inorganic fertilisers. Third, and probably most important, is the problem of low soil organic carbon levels, which have reached very low levels in high-density Africa (Powlson *et al.*, 2011; Vanlauwe *et al.*, 2011). Nitrogen use efficiency on cereals tends to be strongly inversely related to soil organic carbon (Marenya and Barrett, 2009; Vanlauwe *et al.*, 2011). Most production systems in high-density Africa are so heavily prioritised to meeting the next year's staple food needs that crop rotations and the use of cover crops or intercrops are difficult to adopt. On very small farms, households cannot afford to sacrifice a whole year by planting green manures or crops for which there is limited consumption value because they need to produce as much food as possible for the coming year. For these reasons, many existing production systems lack access to sufficient organic matter to enable recycling of crop residues to restore favorable soil carbon levels, especially where zero-graze livestock has not taken hold. Many households therefore continue to grow staple crops on the same fields year after year, continuing to obtain very low efficiency of inorganic fertiliser application, effectively mining their soils of a range of nutrients and depressing their potential to be productive in future years.

Giller *et al.* (2006) and Tittonell *et al.* (2007) conclude that smallholder farmers are largely unable to benefit from the current yield gains offered by plant genetic improvement due to their farming on depleted soils that are non-responsive to fertiliser application. Tittonell and Giller (2012) recommend thinking about sustainable intensification efforts in terms of three categories of fields: those which are (i) responsive to fertiliser use; (ii) non-responsive but still productive; and (iii) non-responsive and degraded. The third category of fields will require rehabilitation of several years before yields can be improved (Vanlauwe *et al.*, 2011). Rising population pressures and more continuous cropping are shifting the relative proportion of cropped area in much of Africa from category (i) to categories (ii) and (iii), where yields are less responsive to fertiliser application. This has enormous consequences for policies designed to enhance productivity in a region dominated by small-scale farms in high-density environments. There is increasing recognition that raising organic matter, moisture retention, and other forms of soil rehabilitation in addition to greater inorganic fertiliser use are preconditions for sustainable agricultural productivity growth in densely populated rain-fed farming systems of Africa (Powlson *et al.*, 2011; Tittonell and Giller, 2012).

Problems of diminishing returns to agriculture at high levels of rural population density were relieved or avoided in much of Asia through competitive outward-looking non-farm sectors that greatly rewarded personal investment in education and migration (Liu and Yamauchi, 2014). Labour was essentially "pulled" out

of rural areas into urban-based employment. There still remains great potential for such processes to unfold in Africa (with appropriate policies and incentives), and in some countries, such as Ghana, these processes are already occurring (Diao *et al.*, 2014; Nin-Pratt and McBride, 2014).<sup>10</sup> Perhaps the most important overarching conclusion is that we should not interpret missed opportunities as a lost cause; decades of policies and regressive public investment patterns may have created an unbalanced playing field for African farmers and depressed their role in driving forward structural transformation, but Asia's *green revolutions* were powered by the more commercialised small-scale farms and provide hope for what Africa might achieve with similarly supportive policies and public expenditures (Mellor, 2014).

## The rise of land markets

Africa is in the process of witnessing intense competition for fertile land and water among four main groups: rural communities (mostly smallholder farmers) that are continuing to experience population growth, relatively wealthy urban-based people who appear to be investing in land at a rapid pace, foreign companies attracted to Africa's abundant and relatively cheap supply of agricultural land, and national governments. State leaders have long recognised the political economic dimensions of control over the allocation of land (Herbst, 2000). In recent years, as land values have risen dramatically in parts of the region, states have tended to more aggressively wrest control of it from traditional authorities. Demand for fertile land in Africa will almost certainly intensify along with rapidly increasing global demand for food, in part because the potential for crop area (and water use) expansion in North America, Europe and most of Asia is very limited (Deininger and Byerlee, 2011).

The rising competition for agricultural land is starting to give rise to land markets. In the past several decades, and especially since the rise of world food prices in 2008, there have been concerted efforts to transfer land out of customary tenure (under the control of traditional authorities) to the state or to private individuals who, it is argued, can more effectively exploit the productive potential of the land to meet national food security objectives. For example, the quantity of recorded new land titles in Zambia over 10 hectares since 1995 amounts to 12% of the land cultivated nationally, with the mean title deed size being roughly 52

10 It is important to note, however, that the urban manufacturing sector featured heavily in the Asian transformation, while manufacturing is a notably weak component of most of Africa's urbanization, which may impose significant limitations on how the structural transformation plays out. See Jedwab (2013) and Gollin *et al.* (2013) for recent assessments of urbanization without growth and poverty reduction.

hectares (Sitko and Jayne, 2014). New titles connote the acquisition of land from customary authorities and conversion to newly privatised land owned by the title holder. This process is increasing the supply of titled land that can be bought and sold by individuals, hence contributing to the development of land markets.

However, the distributional effects of converting land from customary to state titled land continue to be contested (Holden and Otsuka, 2014; Deininger and Byerlee, 2011). The conversion of land from customary to state tenure generally reflects the ceding of power and authority from traditional authorities to the functioning of land markets, and ultimately to the state (Herbst, 2000), since the rules and institutions of all markets are determined by the state. The nature of agricultural development will also be influenced by the extent to which unutilised land remains under the allocative control of chiefs or the state. Although traditional institutional norms are increasingly vulnerable to the sale of land by chiefs to non-local buyers, land under customary tenure is designed to provide free “birthright access” to land for local people and generally does so where the traditional authorities still have land left to allocate (Cotula, 2007). By contrast, land transferred from customary to privatised title deed land provides “bonanza” discount purchases to the first buyer, generally privileged people, and then afterward is bought and sold based on willingness to pay, giving rise to land markets. Once converted out of customary tenure, land becomes largely inaccessible to indigenous local people. Tenure structure – an outcome of the struggles between traditional authorities and the modern state – therefore has major implications for whether the region’s remaining unutilised cropland is reserved for allocation to members of rural communities or according to market transactions favouring the expansion of medium and large-scale farms.

Tenure changes are linked with changes in land markets. Theoretically, enhanced tenure security (brought about by titling or other means) is an important enabler of land sales and rental markets and associated productivity gains (Holden and Otsuka, 2014; Fenske, 2011). Empirically, the incidence of titling and the development of land markets are more pronounced in areas with better access to markets, services and infrastructure – which tend to be the areas with the highest rural population densities (*ibid.*). While there is some evidence to support the contention that land markets (especially rental markets) support equity outcomes, this is not a foregone conclusion (Holden *et al.*, 2009). Distress sales may exacerbate distributional inequalities (Deininger *et al.*, 2014). Furthermore, if title conversion mechanisms allow relatively affluent domestic and international investors to obtain land relatively cheaply, then the rise of these institutions may be exacerbating land pressures in high-density areas by restricting the supply of unutilised land that would otherwise support voluntary rural-rural migration.

Land rental markets are developing rapidly in the more densely populated areas (Woodhouse, 2003; Holden *et al.*, 2009). Land rental markets generally improve both efficiency and equity by transferring land from less productive users with relatively large landholdings to more efficient and land-constrained farmers (Migot-Adholla *et al.*, 1994; Pender and Fafchamps, 2006; Otsuka, 2007). The rise of land rental markets may also help the growing rural labour force access land, but because renting land generally requires that the tenant pays the equivalent of at least one-third of the value of the crop to the landlord (Jin and Jayne, 2013; Holden *et al.*, 2009), tenants must be extremely productive to make a reasonable livelihood by renting land.<sup>11</sup>

### Difficulties in achieving broad based rural income growth

Recent experiences in countries such as Zambia and Malawi illustrate how land distribution patterns within smallholder agriculture are weakening the link between agricultural growth and poverty reduction. Both countries have succeeded in doubling maize production between the early and late 2000s. In both countries, the marked increase in maize production coincides with the scaling-up of government input subsidy programmes.<sup>12</sup> In Zambia's case, farmers have benefited from the purchase of maize at above-market prices by the national marketing board, the Food Reserve Agency (FRA). Together the input subsidy and maize price support programmes in Zambia accounted for over 60 per cent of the Ministry of Agriculture's public budget over the past five years and over 2 per cent of the country's GDP in 2010. In Malawi, the input subsidy programme alone has exceeded 10 per cent of the national budget in at least two of the past five years.

In spite of the impressive growth in grain yields and production, rural poverty in both countries has declined very little over the past decade, and the benefits of growth have been heavily concentrated among the largest farms. Table 3 shows data from the nationally representative 2011 Crop Forecast Survey to show how maize production has varied according to farm size. Column A of Table 3 shows the number of farmers in five farm size categories. Overall Zambia has an estimated 1 471 221 "smallholder" farmers, defined as farmers cultivating between 0.1 and 20 hectares. Farmers cultivating less than two hectares accounted for 75 per cent of the total number of farmers in Zambia's smallholder farm sector (column B).

11 While Jin and Jayne (2013) found that households leasing land in Kenya were able to increase their net farm (net total) incomes by 25.1 (6.6) per cent, these percentage increases in the incomes of renters are often not large in absolute terms, and hence participation in rental markets alone is not sufficient to meaningfully affect rural poverty rates.

12 Known in Zambia as the Farm Inputs Support Programme (FISP).

Table 3. Smallholder maize production growth from the baseline period (2006-2008 harvest years) to 2011, by farm size category

Total area cultivated	Number of farmers, 2006-08 to 2011	% of farms	% of farmers receiving FISP fertiliser	Subsidised fertiliser received per household (kg)	change in total maize output (2011 minus 2006/08 baseline period) (MT)	Increase in maize output per farm (E*1,000/A) (kg)
	(A)	(B)	(C)	(D)	(E)	(F)
0-0.99 ha	616,867	41.9%	14.3%	24.1	96,989	157.2
1-1.99 ha	489,937	33.3%	30.6%	69.3	326,145	665.7
2-4.99 ha	315,459	21.4%	45.1%	139.7	640,425	2,030.1
5-9.99 ha	42,332	2.9%	58.5%	309.7	297,871	7,036.6
10-20 ha	6,626	0.5%	52.6%	345.6	41,732	6,298.4
Total	1,471,221	100%	28.6%	77.1	1,403,161	953.7

Source: MACO/CSO Crop Forecast Surveys, 2005/06-2007/08, 2010/11.

Column E shows the increase in maize production for each farm size category between 2011 and annual levels during the 2006/08 period prior to the major ramp-up of government subsidies to maize producers. Farmers cultivating less than one hectare contributed an additional 96 989 tonnes to national maize production in 2010/11 compared with their average maize production during the three-year period 2005/06–2007/08. By dividing the additional maize production in column E by the number of farms in each category as shown in Column A, we derive the additional maize production per farm for each of the farm size categories, as shown in Column F. When expressed on a per farm basis, it is apparent that farmers cultivating less than one hectare produced 157.2 additional kilograms of maize per farm in 2011 compared with the earlier baseline period. Farmers cultivating one to two hectares contributed 326,145 additional tonnes of maize in 2010/11, which amounts to 666 kilograms of additional maize per farm. Farmers cultivating two to five hectares contributed an additional 640 425 tonnes to national maize production in 2010/11, or 2.03 additional tonnes per household. The 2.9 per cent of the farmers cultivating five to 10 hectares contributed an additional 297 871 tonnes to national maize production in 2010/11, which amounted to 7.04 tonnes of additional maize production per farm. And lastly, the 0.5 per cent of farmers cultivating 10–20 hectares increased their maize production in 2010/11 by 6.3 tonnes per household compared with the earlier baseline period. The additional maize production among farms cultivating over five hectares was 30 times greater

than the increase in maize production among farms under one hectare.

Table 3 also shows the percentage of farms receiving subsidised fertiliser in each farm size category (column C). Slightly over 14 per cent of the farmers cultivating less than one hectare received subsidised fertiliser in the 2010/11 crop season. The average quantity of fertiliser they received was 168kg. Across all 596 334 households in the category, the average household received 24.1kg of fertiliser (column D). By contrast, over 50 per cent of farmers in the 10–20 hectare cultivated category received subsidised fertiliser in 2010/11, receiving 657kg per farm. The average amount of fertiliser received by farmers in the 10–20 hectare category was 346kg, about 14 times more per farm than those in the less than one hectare category.

The smallest farmers in Zambia – those cultivating less than two hectares who account for over 70 per cent of all the smallholder farms in the country – participated only marginally in the maize production expansion of 2010/11. These farmers received relatively little FISP fertiliser and sold very little maize, hence they were unable to benefit from the FRA producer price of 65 000 kwacha per bag. The farmers benefiting the most from the government’s expenditures on supporting maize prices were clearly those selling the most maize. This disaggregated picture of Zambia’s maize production expansion may reveal why rural poverty rates remain so high despite the record maize harvests in the past several years. Given the highly variable land distribution patterns found in much of Africa, conventional approaches such as those focusing largely on farm price supports and input subsidy programmes may increase aggregate farm output but have tended to produce highly concentrated benefits that are correlated with farm size and asset wealth (Jayne, Mather and Mghenyi, 2010).

## UPDATING THE RURAL LANDSCAPE: NEW ACTORS AND CHANGING INSTITUTIONS

The rush for African land by foreign investors in the wake of the 2008 food price spike has drawn considerable attention to the availability of land for African agriculture (e.g., Schoneveld, 2014). Recent global policy attention to “land grabs” by international investors, while important, has arguably diverted attention from two other processes that may be even more fundamentally affecting Africa’s economic development trajectory: the pace of land acquisitions by medium-scale African investors, and the overall impact of land transactions on the viability of African governments agricultural development plans, which are implicitly based on assumptions of area expansion potential for smallholder agriculture. This section addresses these issues within the context of the region’s rapidly changing dynamics of land allocation and farm structure. We highlight three features: (i) the pace of large-scale foreign acquisitions in Africa; (ii) the rise of medium-scale

farmers and investors and their characteristics; and (iii) the associated transfer of lands from customary tenure to state titled land.

## Large-scale acquisitions account for a significant portion of Africa's remaining arable land

The comprehensive study by Schoneveld (2014) estimates that 22.7 million hectares of arable land in sub-Saharan Africa has been acquired by large-scale entities, with roughly 90% of this involving a foreign primary shareholder. This is equivalent to roughly 9.7% of total area under cultivation in sub-Saharan Africa, and 15 to 35 per cent of the region's remaining potentially available cropland (PAC) if forestland is excluded, and somewhat less if forestland is included in PAC (Chamberlin *et al.*, 2014). Strikingly, though, around half of these investments are located in just six countries: Ethiopia, Ghana, Madagascar, Mozambique, South Sudan, and Zambia. Notably, the list does not include the DRC or other Central African countries with sizeable land, water and forest resources. Another important feature of these investments is that only 7 per cent of them pertain to basic food crops. Instead, these investments are heavily geared towards oilseeds (60%), timber and pulpwood trees (15 per cent) and sugar crops (13 per cent) (Schoneveld *et al.*, 2014).

## The rise of medium-scale farmers

Another revolutionary change in farm structure has been among medium-scale holdings. In spite of the international media's focus on *land grabs* by foreign investors, a recent study of Ghana, Kenya and Zambia indicate that the land controlled by medium-scale farms now exceeds that of foreign and domestic large-scale holdings combined (Jayne *et al.*, 2014c). Moreover, holdings between 5 and 100 hectares now account for more land than small-scale farms (0–5 hectares) in two of the three countries examined (Ghana and Zambia).

There is a strong inverse correlation between landholding size and the proportion of landholdings under cultivation (e.g., see Table 4 for Zambia). The fact that almost 90 per cent of the land owned by Zambian farms in the 20 to 100 hectare landholding category remains uncultivated may explain the paradoxical appearance of land abundance in a country where most small-scale farmers complain of an inability to acquire more land for themselves (e.g., Jayne *et al.*, 2008). In Ghana, by contrast, medium-scale farms cultivate over half of the land under their control and are contributing substantially to food production growth in the country (Chapoto *et al.*, 2013). The overall impact of medium-scale farms may therefore vary substantially across countries and is an important topic for further study.

The rapid rise of medium-scale farms has led to a concentration of landholdings. In the study of Ghana, Kenya and Zambia by Jayne *et al.* (2014c), the Gini coefficients of landholdings rose in all three countries substantially, for example, in Ghana from 0.52 in 1992 to 0.65 in 2005. While landholdings in most of Africa are not as concentrated as in Latin America, where Gini coefficients can be as high as 0.90, the Ginis in the three African case studies are substantially higher than most Asian countries. Clearly, the idea of a unimodal and egalitarian farm structure within Africa's indigenous farming population has become outdated.

Disturbingly, national survey data on landholdings may obscure land acquisitions of very large sizes by private individuals. Namwaya (2004) reports that over 600 000 hectares of land, or roughly one-sixth of Kenya's total land area, are held by the families of the country's three former presidents, and that most of this land is in relatively high-potential areas. Evidence of this is not apparent in official nationally representative survey data. Shortly before his assassination in 2003, the Economic Advisor to the President of Malawi, Kalonga Stambuli, wrote that the concentration of land among a small domestic elite was a central explanation of the country's poverty trap. Woodhouse (2003), Flintan (2012) and others also write of the growing enclosure movement in Africa, which may result in hidden land shortages in countries that are not especially densely populated.

Who are these new entrants to the sector? Life history surveys of medium-scale farmers reveal that they are predominantly men; their primary jobs were in the non-farm sector, the majority of these being in government (Sitko and Jayne, 2014; Jayne *et al.*, 2014c). Many of these farmers live in urban areas. They are relatively well educated. The majority in Zambia acquired their farms after the age of forty. Using their savings from their non-farm jobs, they were able to acquire farms and enter farming during their mid-life stages. This profile fits roughly 60 per cent of the sampled medium-scale farmers in Kenya and 58 per cent in Zambia. A smaller but still important category of medium-scale farmer is relatively privileged rural-born men who were able to acquire large landholdings as they started out their careers. Only in Ghana was it found that significant proportion of medium-scale farmers started out with less than five hectares of land. The Ghana findings provide at least some room for optimism that small-scale farmers can expand into commercialised medium-scale stature under favourable land access conditions.

The combination of "concentrated land abundance" with weak governance raises some complex trade-offs. Where land is scarce, land concentration among domestic or foreign investors in more land-constrained countries hardly seems a pro-poor development path for countries in which poor rural people have limited alternatives to farming for their livelihoods. For land abundant countries, the picture is more complex. Much of this abundant land is located in tropical Africa and will be best suited to non-food cash crops, such as palm oil and rubber.



Byerlee's (2014) review of tropical Asia concludes that where the state has actively supported smallholders, such as for rubber in Thailand and Malaysia, and tea in Sri Lanka, smallholders have retained a sizeable share of the overall market. However, where the state is weak or is biased toward large-scale enterprises, medium- and large-scale producers are dominating. Policy decisions obviously have a major influence on farm structure, which then affects employment patterns and the inclusivity of agricultural growth.

## Policy challenges: Land policies and trajectories of future development

Despite the fact that sub-Saharan Africa in 2014 contains much of the world's unutilised and underutilised arable land, a significant and growing share of Africa's farm households are living in densely populated areas. These areas are characterised by small and declining farm sizes for the majority of people living in them. Sub-Saharan Africa's rural "youth bulge" – characterised by 62 per cent of its population being under the age of 25 – will mean that over 350 million young people will be entering the labour force between now and 2035. Projections of non-farm job opportunities suggest that perhaps half to two-thirds of this labour force will be able to be absorbed into wage employment, meaning that agriculture will still need to provide gainful employment for much of the remainder. This will increase the demand for arable land to accommodate family farming at a time when high agricultural prices are generating great competing demand for land by relatively wealthy people as well as by more commercialised investors. Ironically, inadequate access to land are issues that almost never feature in national development plans or poverty reduction strategies, which continue to be predicated on assumptions of unconstrained area expansion for broad-based smallholder-led agricultural development. There has been seemingly little recognition of the potential challenges associated with increasingly densely populated and land-constrained areas of rural Africa, despite the fact that a sizeable and increasing share of its rural population live in such areas.

Nationally representative farm surveys consistently show the following regularities: First, there are great disparities in landholding size within smallholder farming areas. While the top 10 per cent of the rural population reside on farms ranging from five to 25 hectares, half or more of Africa's smallholder farms are below 1.2 hectares in size, and a quarter of the farms are below 0.5 hectares, with limited or no potential for area expansion. Second, because of this pattern of landholding size distribution, farm production and marketed surplus are similarly skewed. In most nationally representative surveys throughout the region, the top 5 per cent of farmers (not counting large-scale commercial farmers) account for 50 per cent of the marketed grain surplus (Jayne *et al.*, 2010). Third, and in stark

contrast, half or more of rural farm households are unable to produce enough grain to feed themselves and are either buyers of grain or go hungry because they are too poor to afford to buy food. Most of the households owning less than one hectare of land fall into this category regardless of their agro-ecological or market access conditions, and their incomes tend to be below the poverty line. After controlling for agro-ecological conditions, small farm size is highly correlated with income poverty. Fourth, a high proportion of farmers in densely populated areas perceive that it is not possible for them to acquire more land through customary land allocation procedures, even in areas where a significant portion of land appears to be unutilised. Land markets, both formal and informal, appear to be on the rise. In Kenya, roughly a quarter of young men and women born in rural areas start their families without inheriting any land from their parents, forcing them to either commit themselves to off-farm employment or buy land from an increasingly active land sales market. And fifth, survey evidence points to increasing concentration of landholdings over time as well as declining mean farm size.

These concerns lead to policy questions about the feasibility of smallholder-led agricultural strategies in the context of land-constrained farming systems and limited off-farm employment opportunities to absorb redundant labour in densely populated rural areas. Associated issues for research revolve around whether many farms are becoming, or have already become “too small” to generate meaningful production surpluses and participate in broad-based inclusive agricultural growth processes given existing on-shelf production technologies. Evidence presented earlier about population density being inversely related to soil fertility and farm size might suggest the presence of threshold effects in the relationship between population density and farm productivity, especially labour productivity, as the intensification of labour and capital per unit of land may lead to diminishing returns to labour and capital beyond some point. Other reasons for declining agricultural productivity at high levels of rural population density may include reduced fallows leading to soil fertility depletion, and the tendency to produce little or no surplus production on very small farms with many residents, leading to difficulties of purchasing needed cash inputs in the presence of incomplete rural financial markets. All of these dynamics may be mutually reinforcing in the threshold relationships between population density, farm sizes, and farm productivity. These relationships are likely to be strongly conditioned by variables such as agro-ecological and market conditions. Future empirical research is needed to investigate these conditioning influences.

Certainly, most of sub-Saharan Africa’s land area is not characterised by such dilemmas. Most of the continent is sparsely populated. Yet many if not most of the people in rural sub-Saharan Africa live in areas facing land scarcity, a condition that is being exacerbated by the rapid rise in demand for land from domestic

investors and outside commercial interests. In areas where the localised land frontier has been exhausted, most rural young people entering the labour force will have less access to less land than their parents due to subdivision among siblings. More acute land scarcity will have four main effects on the trajectory of Africa's economies: (i) land intensification; (ii) a shift of labour from farm to rural non-farm employment; (iii) migration to urban areas; and (iv) migration to rural areas where access to unutilised arable land is still feasible (Jayne *et al.*, 2014).

Especially since the rise of world food prices, there have been concerted efforts to transfer land out of customary tenure (under the control of traditional authorities) to the state or to private individuals. Such efforts have nurtured the growth of a relatively well-capitalised class of "emergent" African farmers, most of whom did not start out in agriculture but rather bought land earned from salaried employment in the towns (Sitko and Jayne, 2014; Chapoto *et al.*, 2013). These farmers are well represented in many African countries' powerful farm lobbies, disproportionately enjoy the benefits of input subsidy and price support programmes due to their relatively large farm sizes, and become major forces lobbying for the continuation of such programmes.

Can smallholder agriculture be a sector that can modernise Africa's economies? Some farms with the requisite entrepreneurial ability and productive assets can do, but most will not. But this sector still plays a crucial role in successfully managing the transition to a modernised Africa. It must remain viable at least over the next several decades for two reasons. First, we must acknowledge that even in 2014, most African countries are primarily inhabited by unskilled and semi-skilled rural people who are primarily engaged in farming. While most rural people might wish to put down their hoes and walk into white collar office jobs tomorrow, their levels of education and skills will prevent this from happening quickly. Secondly, the growth of non-farm sectors and employment opportunities will rely on effective demand. When a country's population is 70 per cent rural, it is difficult to generate effective demand for non-farm goods and services without at least some portion of the countryside having enough money to participate in the cash economy. The literature on growth linkages indicates that the first-round beneficiaries of agricultural growth generate important multiplier effects by increasing their expenditures on a range of local off-farm and non-farm activities that create second-round benefits for a wide-range of other households in the rural economy (Johnston and Mellor 1961; Mellor 1976). In much of Africa, the consumption growth linkages have been found to be especially important (Delgado and Minot, 2000). The extent and magnitude of these second round effects depend on how broadly spread the first-round growth is. The initial distribution of land and other productive assets will clearly affect the size of these multipliers. If dynamic labour and services markets can be developed, then other employment opportunities

should be easier to create in the very locations where the larger smallholders are investing and raising their output and productivity. Pro-active public sector investment and policy support in developing these labour and service markets will be a key determinant of the magnitude of the growth linkages to be derived from agricultural growth.

Thus, while migration from farms to non-farm sectors, and from rural to urban areas will provide the brightest prospects for the transformation and modernisation of Africa's economies, it will happen only as fast as educational advances and growth in the non-farm job opportunities will allow. This certainly will not happen quickly without major government commitment. This transformation is likely to take at least two to three decades and maybe more, depending on the extent to which governments pursue policies that support industrial/manufacturing development, support for broadly based and inclusive forms of agricultural and rural development, and government commitment to major improvements in the primary, secondary and tertiary systems of public education. Education, which played a crucial role in Asia by allowing households to exit agriculture into more lucrative off-farm jobs, is relatively low in most areas of rural Africa by world standards. Investments in rural education and communications are likely to become increasingly important to facilitate structural transformation.

The challenges identified in this paper are formidable, but manageable. Government policies and public investment policies are decisive, as these will determine the incentives and scope for investment by the private sector, and will largely determine whether the region's economic transformation is a relatively smooth, robust and peaceful process or a painful and protracted one.

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