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Land pressures, the evolution of farming systems, and development strategies in Africa: A synthesis

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ABSTRACT

Evidence assembled in this special issue of *Food Policy* shows that rising rural population densities in parts of Africa are profoundly affecting farming systems and the region's economies in ways that are underappreciated in current discourse on African development issues. This study synthesizes how people, markets and governments are responding to rising land pressures in Africa, drawing on key findings from the various contributions in this special issue. The papers herein revisit the issue of Boserupian agricultural intensification as an important response to land constraints, but they also go further than Boserup and her followers to explore broader responses to land constraints, including non-farm diversification, migration, and reduced fertility rates. Agricultural and rural development strategies in the region will need to more fully anticipate the implications of Africa's rapidly changing land and demographic situation, and the immense challenges that mounting land pressures pose in the context of current evidence of unsustainable agricultural intensification, a rapidly rising labor force associated with the region's current demographic conditions, and limited nonfarm job creation. These challenges are manageable but will require explicit policy actions to address the unique development challenges in densely populated rural areas.

Introduction

This special issue is motivated by evidence that rising rural population densities in parts of Sub-Saharan Africa[1] – combined with policy choices, broadly defined – are profoundly affecting farming systems and indeed the overall trajectory of economic systems in ways that are underappreciated in current discourse on the region's development. Contributions to this special issue show that rising population pressure is linked in one way or another to (i) the shrinking size of most smallholder farms over time; (ii) more continuous cultivation of fields, contributing to land degradation and unsustainable forms of agricultural intensification; (iii) the rise of land rental and purchase markets and changes in land allocation institutions, all of which are rapidly altering farm structure; and (iv) the challenges that Sub-Saharan Africa is currently experiencing in achieving broad-based and inclusive forms of farm income growth.

The extent, distribution and exploitation of land are factors that have long been identified as fundamental influences on agricultural development paths and poverty reduction (Malthus, 1798; Boserup, 1965; Ruthenberg, 1980; Binswanger and McIntire, 1987; Binswanger and Pingali, 1988). There is no reason why this statement should be less true in sub-Saharan Africa than in other regions, yet recent research and policy discourses have largely misidentified or underestimated the heterogeneous nature of Africa's land endowment. Africa is typically characterized 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 Africa (Deininger et al., 2011). Yet most of this land is concentrated in just eight countries, while a number of the remaining countries contain large rural populations clustered in remarkably small areas (Chamberlin et al., 2014). Africa is equally heterogeneous at disaggregated levels. Just 1% of Africa's rural land area contains 21% of its rural population, while 20% of its rural lands contain 82% of its rural people. The most densely populated 20% of Africa's arable lands contain 25 times more people than the least densely populated 20%.

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[1] Hereafter "Africa" for short-hand.

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Consequently, our starting point for studying the impacts of population density is the recognition of Africa's spatially heterogeneous distributions of rural populations, giving rise to acute localized land pressures being experienced by many rural Africans coexisting with large swaths of apparently unutilized arable land in other parts of the region. Although policy discourses typically identify challenges facing agricultural development in sub-Saharan Africa as a whole, these "two Africas" – land abundant and land constrained – may face fundamentally different challenges, with commensurately different implications for the types of development strategies that are best pursued in each.

Africa is currently witnessing intense competition for fertile land and water among four main groups: rural communities (mostly smallholder farmers) that are continuing to experience population growth,[2] relatively wealthy urban-based people who are 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 recognized 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 (Deininger et al., 2011). 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 et al., 2011).

This special issue of *Food Policy* has three broad objectives. The first is to determine the extent to which land availability is a constraint on income growth in densely populated rural areas, and to identify different sources of constraints to land expansion. Chamberlin et al. (2014) revisit the question of how much potentially arable cropland exists in sub-Saharan Africa using recent high-resolution spatial data, and building on previous research by using available farm budgets to model the profitability of small-scale and large-scale expansion into new areas. They also discuss the many constraints to cropland expansion, including infrastructure, disease burdens, agroecological limitations and institutional factors. Other papers go deeper into the institutional constraints to cropland expansion and redistribution, with a focus on land markets (Holden and Otsuka, 2014) and land governance (Deininger et al., 2014, 2011). Schoneveld (2014) provides perhaps the most detailed and carefully documented inventory of foreign large-scale land acquisitions in Africa. Other studies explore the factors driving the apparent meteoric rise of medium-scale farmers, who now control more farmland than small-scale farmers in some countries (Sitko and Jayne, 2014, for the case of Zambia; see also Jayne et al., 2014).

A second objective is to document how African farming systems are responding to these varying land constraints. As noted above, many works in the agricultural development literature have extended Boserup's seminal study (1965) examining the endogenous intensification of farming systems in response to mounting land contraints.[3] However, until recently it has been difficult to empirically test Boserup's ideas because of the difficulty of merging localized agro-ecological conditions with farm panel survey data. Several of the articles in this issue have now done so using geo-referenced spatial data to examine farmer behavioral responses to variations in localized population density (Muyanga and Jayne, 2014; Headey et al., 2014; Ricker-Gilbert et al., 2014; Josephson et al., 2014). Two Ghanaian case studies focus on the very different context of agricultural area expansion incentivized by labor and power constraints, what this implies for the demand for agricultural mechanization (Diao et al., 2014) and whether this context is amenable to an Asian-style Green Revolution or some other agricultural development path (Nin-Pratt and McBride, 2014). Finally, several studies compare the different agricultural intensification paths of Africa and Asia, the two developing regions that are most pervasively dominated by smallholder farming (Headey and Jayne, 2014; Mellor, 2014; Liu and Yamauchi, 2014).

A third objective, however, is to go beyond the traditional agrocentric Boserupian approach by acknowledging the fundamental importance of the non-farm sector in providing opportunities for responding to land pressures, as well as the potential for demographic responses in the form of out-migration from land constrained areas, or reductions in fertility rates. Mellor revisits the theory and evidence on the linkages between smallholder commercial farms and broader economic development, while Headey and Jayne examine cross-country evidence of the thus far sluggish pace of diversification out of smallholder farming in Africa, as well as responses in achieved and desired fertility rates.

This article synthesizes the main findings from the special issue and considers how they inform a central policy question: Given what we now know about the continent's complex land and population dynamics, what are the implications for Africa's development strategies? Building on a wide range of existing literatures, the various studies in this issue provide a firmer evidence base for informing this question in a more holistic manner. Spatially, we have a much better sense now of where the potential for land expansion is limited and therefore where land productivity growth will be required for smallholder agricultural growth. And while input intensification will be increasingly important in densely populated areas, evidence suggests that heavy investments in soil fertility restoration will be required to create the conditions for profitable and sustainable intensification (Drechsel et al., 2001; Tittonell and Giller, 2013). Most country studies in this special issue indicate limits to endogenous agriculture intensification in terms of a declining relationship between the value of net farm income per land and labor unit and population density at high levels of density (Ricker-Gilbert et al., 2014; Muyanga and Jayne, 2014; Headey et al., 2014; Josephson et al., 2014). Problems of diminishing returns to agriculture at high levels of rural population density were relieved or avoided in much of Asia through exploitation of irrigation potential as well as through competitive outward-looking non-farm sectors that greatly rewarded personal investment in education and migration (Liu and Yamauchi, 2014). Labor 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 somewhat advanced (Diao et al., 2014; Nin-Pratt and McBride, 2014).[4] Perhaps the most important overarching conclusion, articulated by Mellor, 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 smallholders and depressed their role in driving forward structural transformation, but Asia's *green revolutions* were powered by small-scale farms and provide hope for what Africa might achieve with similarly supportive policies and public expenditures (Mellor, 2014).

The remainder of this synthesis paper is structured as follows. Section 2 elaborates on the various stylized facts raised above,

[2] Africa is the world's only region where rural population is still growing – by a projected 48% between 2012 and 2050 (United Nations, 2013).

[3] See for example Binswanger and Ruttan, 1978; Ruthenberg, 1980; Binswanger and Pingali, 1988; Binswanger and McIntire, 1987.

[4] 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 structural transformation plays out. See Glaeser (2013), Jedwab (2013) and Gollin et al. (2013) for recent assessments of urbanization without growth and poverty reduction, which appears to characterize much of Africa.

particularly the complex spatial distribution of rural populations across Africa's land area, the institutional distribution of land within countries, and the under-emphasized secular trends in farm sizes across the "two Africas". Section 3 describes the various ways in which farming systems and rural populations are responding to rising population density and land pressures. Section 4 describes important changes in the regions' rural landscape, including the advent of large-scale land investments (the so-called "land grab" phenomena), the increasing importance of medium-scale farmers, the pressures on traditional land allocation institutions, and the rise of land markets. Section 5 summarizes our basic findings, and discusses the policy implications of the findings in this special issue.

Scarcity amidst abundance: the nexus of land and labor in rural Africa

One objective of this special issue was to better understand the nexus between land resources and demographic forces, including birth and migration rates, and historical settlement patterns. Toward this end, we identify four stylized facts emerging from the assembled evidence.

Fact 1: Africa has surplus land, but it is concentrated within relatively few countries

The magnitude of land available for cropland expansion is still not well established, despite the large number of estimates produced over the last decade.[5] 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 "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 utilizable (and by whom) is far from clear. Many estimates have emphasized the production potential of unutilized land, drawing on geo-referenced data on land and climate characteristics and associated biophysical production characteristics,[6] with relatively little emphasis on the extent to which unutilized 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 available cropland" is that, from a regional perspective, much of Africa's unutilized arable land is found in just a few countries (Chamberlin et al., 2014; Deininger et al., 2011). Depending upon the definitions and assumptions used, as much as 90% of SSA's unutilized arable land is located in just 6–8 countries (Table 1). In 4 of these countries (DRC, Congo Republic, Gabon, and Cameroon), surplus lands are primarily under dense tropical forests, representing a regional resource pool of considerable importance. Even when excluding forested lands, the concentration of unutilized arable land is remarkable and involves mostly this same set of countries.[7] The corollary of this is that many African countries have limited potential for area expansion.

Estimates of the stock of PAC from these estimates for SSA have ranged from 200 to more than 500 million hectares. (Young 1999, 2005) has been a vocal critic of such estimates, noting that they simply do not conform with on-the-ground realities or statistical regularities of smallholder agriculture in the region, particularly the widespread expansion onto marginal lands and the shrinking of farm sizes in many countries. On the basis of these observations, he challenges the integrity of the data used in land balance assessments, suggesting that accounting is likely flawed by overestimation of cultivable land, underestimation of land already cultivated, underestimation of competing non-agricultural land uses, or all three (Young, 1999).

Lambin et al. (2013) similarly attempt to tone down the enthusiasm of earlier estimates by noting that a wide range of constraints and tradeoffs are typically left out of such accounting methods. They employ a "bottom up" approach to identify a number of social, administrative, economic and physical constraints to conversion of potential croplands. They conclude that there is "substantially less potential additional cropland than is generally assumed once constraints and trade-offs are taken into account" (p 892).

In their analysis of cropland expansion potential in SSA, Chamberlin et al. (2014) focus on the quantity of land that would be economically viable for production from a smallholder perspective. Like Young and Lambin et al., Chamberlin et al. conclude that – under current infrastructural conditions, production technologies and farm productivity levels much of the region's potentially available cropland is either economically unviable or effectively out of reach for the majority of smallholder farmers. Using these figures from Chamberlin et al., (2014), Jayne et al. (2014) estimate that the quantity of land available for cropland expansion as a percentage of total arable land ranges from 68% in Zambia to only 22–24% in Kenya and Ghana.

The concentration of surplus land resources in just a few countries – many of them afflicted by long-running civil conflicts means that even improving roads and reducing yield gaps will not be sufficient to improve access to land for smallholders in high-density areas. Furthermore, Chamberlin et al. (2014) argue that their estimates are conservative owing to data limitations on other expansion constraints which are known to be important. For example, in qualitative work for several of the country case studies featured in this special issue, farmers cited human and zoonotic diseases as additional constraints, as well as lack of public services and infrastructure, and fundamental agronomic differences between places of origin and potential migration destinations (e.g. the stark differences between the Ethiopian highlands and lowlands). Fortunately, many of these constraints on smallholder area expansion can be relieved by policy actions.

Fact 2: Despite aggregate land abundance, many African farmers have limited potential for land expansion and are experiencing declining farm sizes

After excluding the few African countries where most of the unutilized 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 threefold. Table 2 separates African countries for which we have farm size data into land constrained and land abundant groups. In most of the land-

[5] See FAO, 1981, 1984; Alexandratos, 1995; Luyten, 1995; Fischer and Heilig, 1998; Ramankutty et al., 2002; Cassman and Wood, 2005; Fischer and Shah, 2010 (utilized by Deininger et al., 2011), Alexandratos and Bruinsma (2012), and Lambin et al. (2013).

[6] Young (2005) notes that most of these studies draw on the same source information, i.e. what is now codified as IASA/FAO's GAEZ database, although the current version has certainly evolved from earlier incarnations.

[7] 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 unutilized land[a] (1000s Ha)	Proportion (%)	Cumulative proportion (%)
Democratic Republic of Congo (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
Central African Republic	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 underutilized land extents are drawn from Fischer and Shah (2010). The methods are explained in Chapter 3 of Deininger et al. (2011).
[a] Defined by Deininger and Byerlee as land under 25 persons per km^2.

Table 2
Patterns and trends in farm sizes in land constrained and land abundant Africa. *Source:* Data collected by Headey and Jayne (2014). The data are a mixture of agricultural census and survey data, and must therefore be treated with some caution.

Country Land constrained Africa[a]	Year	Average farm size	Country Land abundant Africa[a]	Year	Average farm size
Ethiopia	1977	1.4	Botswana	2004	1.9
	1990	0.8	Burkina Faso	1993	3.9
	2002	1.0	Cameroon	1972	1.6
	2012	1.0	Cote d'Ivoire	1974	5.0
Kenya	1974	4.1		2001	3.9
	1980	2.5	Ghana	1970	3.2
	1997	2.4		1999	2.8
	2004	2.5		2006	3.2
	2010	2.1	Madagascar	1961	1.0
Malawi	1969	1.5		1980	1.3
	1981	1.2		2005	0.9
	1990	0.7	Mali	1960	4.4
	2009	1.4		1980	3.3
Nigeria	1994	2.5		2005	4.1
	2010	1.4	Senegal	1998	4.3
Rwanda	1980	1.2	Tanzania	1970	1.3
	2006	0.7		1996	1.0
Uganda	1963	3.3		2003	2.4
	1991	2.2	Zambia	1970	3.1
	1996	1.6		2001	3.6
	2006	0.9		2008	3.7
Average (latest year)		1.2	Average (latest year)		3.0

[a] Defined as countries with population per square km of agricultural land greater than (less than) 100 people.

constrained countries most smallholder farms are gradually shrinking. Headey and Jayne (2014) estimate that average farm sizes in this group of countries have shrunk by 30–40% since the 1970s. Land inequality is also very high, particularly Kenya (with a Gini coefficient of 0.55) and Nigeria (with a Gini of 0.70), with evidence of rising Gini coefficients over time (Jayne et al., 2014). In these countries average farm sizes greatly exceed the farm size of the median farmer. Between 1994 and 2006, the proportion of Kenya's farms smaller than one hectare rose from 45 to 74%. However, over the same period, average farm size among farms over 8 ha grew by 230%, from 13.2 to 31.1 ha (Jayne et al., 2014). 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., 2014).

Fact 3: Africa's rural populations are highly clustered, in both land abundant and land constrained settings

Rural populations in Africa exhibit high degrees of spatial clustering. Linard et al. (2012), using detailed information on spatial population distributions for 2010, find that 90% of Sub-Saharan Africa's population is concentrated in less than 21% of its land surface. Using the same database to undertake similar analysis for *rural* areas, we find similar degrees of spatial clustering in rural settlement patterns.[8] For the region as a whole, 82% of the rural population is found to reside in only 20% of total rural land area, and 62% reside within just 10% of this area (Table 3). Even when considering areas with more than 400 mm of average annual rainfall, similar

[8] See Table A1 for country-specific results and data and methodological details.

findings are obtained: 74% of the population resides in 20% of the rural area, and more than half reside in just 10% of the rural areas.

Table 3 also presents the rural population densities corresponding to these land areas (shown in the last four columns). For example, for the 40% of the rural population of East/Central Africa that resides in the most densely populated 5% of rural land area, the mean population density experienced by this 40% of the population is 264 persons per km^2. West Africa is somewhat less densely clustered: the top 5% of rural grid cells contain 28% of the rural population, but the mean population density in these areas is comparable to that of East/Central Africa at 268 persons per km^2. Thus, this clustering exists across land abundant and land constrained countries, although it tends to be more concentrated in land constrained countries.

Rural clustering in Africa has long been a recognized feature of Africa's geography.[9] The factors which condition rural population distributions include agroecological production potential (a function of many biophysical elements, including temperature, rainfall, soil quality, etc.), 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 labor in densely populated areas to relocate to the region's land "surplus" areas. [10]

Fact 4. Africa's rural population will continue to grow for the next 40 years

A final and emerging cause of increased land scarcity in Africa 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. Fig. 1 shows that Africa will have as many rural people as in China and southeast 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 (Fig. 2). Roughly 122 million young people will enter the labor 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 over this same period, 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 labor force (Losch, 2012). However, for agriculture to effectively fulfill this mandate, young people growing up in densely populated areas will require access to farm technologies that are radically more productive and profitable, as well as access to new land.[11] Hence, even as Africa becomes progressively urbanized, smallholder agriculture will remain fundamental for absorbing much of Africa's burgeoning young labor force into gainful employment (Losch, 2012).

A related consequence of Africa's demographic "youth bulge" is that intergenerational subdivision of land will constrain the options of rural youth entering the labor force. Intergenerational and inter-sibling conflicts may intensify further because rural parents in their 50s and 60s may not yet be ready or able to "retire" and bequeath their land assets to their children, or otherwise subdivide their land. Inheritance of land, long considered a birthright of people growing up in rural areas, will be increasingly difficult. 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 (including migration), to renting land, or to buying land from an increasingly active land sales market (Yamano et al., 2009). Land-related intergenerational conflicts are also likely to rise when younger family members have to rely on land as a source of livelihood as a result of limited non-agricultural income generating opportunities. Youth returning home from cities reproach elderly members for selling or renting out too much land to migrants (Ngaido, 1993; Le Meur, 2006). Evidence from Northern Tanzania shows that as land increases in value due to emerging commercial interests, fathers are less willing to provide land to their children, which further increases the prevalence of intergenerational conflict (Le Meur and Odgaard, 2006). 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).

In summary, SSA is clearly very heterogeneous and many countries do not yet suffer from land scarcity (to the extent we can detect it through labor-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.

Household responses to land scarcity

The foregoing suggests that rural Africans will face increasing difficulties in accessing land. Land scarcity will give rise to adaptation and dynamic changes in farming and broader socio-economic systems. Behavioral responses to land scarcity are anticipated to follow five main pathways. First, following the pioneering works of Boserup (1965) and Ruthenberg (1980), rising population density tends to intensify the use of land (essentially, the application of more inputs – including labor – per unit of land). Other important household responses to rising population density include: (ii) shifting labor to rural non-farm activities, (iii) migration to other rural areas; (iv) migration to urban areas, and (v) reductions in fertility rates (Bilsborrow, 1987; Headey and Jayne, 2014). Fig. 3 provides a pictorial summarization of our framework for analyzing the causes and consequences of rising land pressures, and the factors influencing the particular behavioral responses that households adopt. This section considers the evidence on the extent to which – and how – these five responses play out in practice.

Land intensification: sustainable and unsustainable modes

Many papers in this issue find evidence of Boserupian intensification in response to rising population density, both across countries (Headey and Jayne, 2014) and based on micro survey data (e.g. Ricker-Gilbert et al., 2014; Muyanga and Jayne, 2014; Josephson et al., 2014, and Headey et al., 2014). However, there are two major qualifications.

[9] See, for example, Maro and Mlay's (1982) descriptions of pre-Ujamaa rural population clustering in Tanzania.

[10] 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).

[11] The fact that yield gaps remain on the order of 80% in Africa for current technologies (Deininger et al., 2011) suggests that the existence of improved technologies is not sufficient to guarantee their implementation.

Table 3
Clustering of rural populations in Sub-Saharan Africa.

Region	Percentage of rural population residing within								Average population density within							
	1%	5%	10%	20%	1%	5%	10%	20%	1%	5%	10%	20%	1%	5%	10%	20%
	of total rural land area				of total rural land area (excluding low rainfall areas)[a]				of total rural land area				of rural land area weighted by quality			
East/Central	18	45	65	83	16	42	59	76	525	264	180	112	721	389	277	179
Southern	17	42	61	79	14	37	53	70	267	129	89	58	388	204	141	93
West	13	35	54	75	12	30	45	64	512	268	195	135	929	451	316	216
SSA	17	43	62	82	16	38	55	74	469	235	162	105	709	365	254	166

[a] Low rainfall areas are defined as receiving less than 400 mm average annual rainfall. Only rural areas are considered. Population data come from GRUMP for 2010 (Balk and Yetman, 2004). We consider population within rural areas only, and carry out our analysis on the basis of 5 min pixels. Quality-weighted densities shown in the last 4 columns are constructed as the number of persons divided by land weighted by its potential productivity measured as potential kilocalories of the most productive of 6 staple crops (maize, wheat, sorghum, rice, beans and banana). The weight is constructed such that land capable of producing at or above the 80th percentile (calculated for the agricultural extent within SSA) have land area valued at 100% (i.e. a hectare is a hectare), and less productive land is discounted linearly, such that a hectare of land which is half as productive as the baseline value is given an effective land area of 0.5 ha. This discounting is given a minimum value of 0.1, such that hectare is re-scaled to values less than a tenth of a hectare.

First the forms of land intensification in high-density SSA are quite different from that of high-density Asia. Intensification in Asia featured increased use of fertilizer per hectare, irrigation investments, increased mechanization, 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. Fertilizer use intensity has risen much more slowly, and the efficiency of fertilizer use in raising output per unit of land is significantly lower than in Asia (Headey and Jayne, 2014). The difference in irrigation investments 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. Several studies in this issue find that beyond 500 persons per km^2, measures of land productivity and intensification plateau and then decline after roughly 600 persons per square kilometer.[12] 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.[13] More continuous cultivation of existing plots would not necessarily pose problems to sustainable intensification if soil quality were maintained or improved over time, e.g. through adequate soil amendment practices, use of fertilizers and other inputs. However, a major body of evidence in Africa points to 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, 2013).[14] Nitrogen is one of the major nutrients being mined from African soils and sufficient quantities of inorganic fertilizer can address this constraint. However, there are many aspects of soil quality that cannot be addressed by conventional inorganic fertilizers. These "non-nitrogen" constraints on soil quality tend to depress the efficiency of inorganic fertilizer in contributing to crop output (Shaxson and Barber, 2003; Pieri, 1989) and thereby depress the effective demand for inorganic fertilizer. 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 (Burke, 2013; Obura et al., 2010). Soil acidification is exacerbated by extensive use of inorganic fertilizers without concurrent steps being taken to raise soil pH. Micronutrient deficiencies constitute a second yield-inhibiting category of soil degradation that can only be ameliorated if greater efforts are made to blend inorganic fertilizers to suit a greater diversity of local conditions and needs. Third, and perhaps most importantly in densely populated areas, soil organic carbon levels 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). Loss of active carbon in soils is a leading explanation for why farmers in many areas complain of having to apply greater doses of nitrogen-based fertilizer in order to maintain their yields over time (Sileshi et al., 2011). Most production systems in high-density Africa are so heavily prioritized to meeting the next year's staple food needs that crop rotations and the use of cover crops or intercrops to raise soil carbon levels 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 fertilizer 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 fertilizer application. Tittonell and Giller (2013) recommend thinking about sustainable intensification efforts in terms of three categories of fields: those which are (i) responsive to fertilizer 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

[12] These findings are upheld by both unconditional bivariate relationships as well as in econometric work which controls for household and community-specific characteristics. For evidence in Malawi, Kenya and Ethiopia, see Ricker-Gilbert et al., 2014; Muyanga and Jayne, 2014; and Josephson et al., 2014.

[13] Fuglie and Rada (2013) reports that fallowed land as a proportion of total farmland in sub-Saharan Africa has declined from 40% in 1960 to roughly 15% in 2011. Survey data used for analysis in the Malawi, Ethiopia and Kenya studies in this issue show that less than 5% of landholdings in the villages with over 250 persons per km^2 are under fallow.

[14] 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 (2014) note that population densities during the period studied by Tiffen et al., were generally below 400 persons per km^2, that densities of some divisions have risen well over 800 km^2, and that there is widespread evidence of soil degradation and unsustainable forms of intensification.

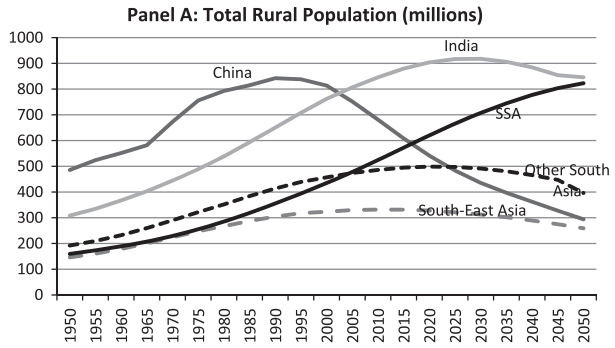


Fig. 1. Rural population trends (millions) in Africa and other developing areas. *Source:* UN 2013b.

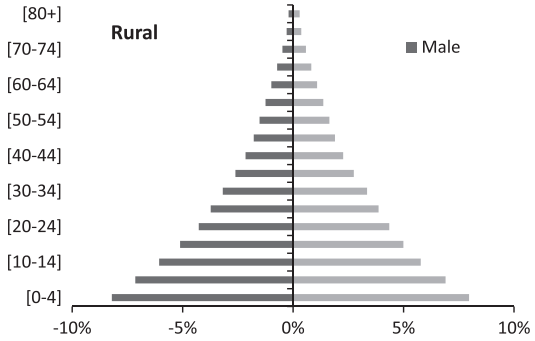


Fig. 2. Age pyramid for rural SSA, 2015. *Source:* United Nations, Department of Economic and Social Affairs, Population Division, Urban and Rural Population by Age and Sex, 1980–2015 (version 2, August 2013). Available at: https://www.un.org/en/development/desa/population/publications/dataset/urban/urbanAndRuralPopulationByAgeAndSex.shtml.

is 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 fertilizer application. This has enormous consequences for policies designed to enhance productivity in a region increasingly dominated by smallholder production in high-density environments.

This narrative of soil quality decline in farming systems in high-density Africa is our leading hypothesis for why the studies in this volume consistently found a leveling-off of land productivity and intensification beyond a threshold level of population density. A low degree of irrigation and other forms of water control also appear to constrain intensification. If upheld by future research, this finding would require a major qualification to the Boserupian intensification narrative and a consequent rethinking of conventional approaches to sustainable agricultural productivity growth. There is increasing recognition that raising organic matter, moisture retention, and other forms of soil rehabilitation in addition to greater inorganic fertilizer use are preconditions for sustainable agricultural productivity growth in densely populated rainfed farming systems of Africa (Powlson et al., 2011; Snapp et al., 2010; Tittonell and Giller, 2013).

Shifting labor to rural non-farm activities

Rural households may also respond to rising labor/land ratios by shifting labor to non-farm activities. Although much has been made in recent years of the growth in the rural non-farm economy (RNFE), the nature of this sector and its impact on poverty is still the subject of some uncertainty (Haggblade et al., 2010). Haggblade (2005) describes two stylized movements into the RNFE: one characterized by "pull" factors, in which rising farm productivity and farm incomes stimulate a diverse and vibrant non-farm sector, attracting labor from agriculture through enhanced income and welfare gains, and another movement dominated by "push" factors in which "falling agricultural labor productivity, low opportunity cost of labor, and declining household purchasing power induce diversification into low-return, labor-intensive nonfarm activities such as basket making, gathering, pottery, weaving, embroidery or mat making" (p5). Such a process of "agricultural involution" is characterized as a "bleak, downward spiral" (Geertz, 1963).

The picture remains unclear about which of these stylized pictures best characterizes RNFE growth in different settings within the region. However, examination of the specific non-farm activities and their income shares from rural survey data generally corroborates the notion that push factors are significant (e.g., Ricker-Gilbert et al., 2014). Off-farm income shares are in the range of 20–40% and slightly higher for households with the smallest farms. A high proportion of off-farm income features low entry-barrier, low-return informal employment, raising concerns of unskilled rural labor being pushed out of agriculture rather than being pulled into productive non-farm jobs (Haggblade, 2005; World Bank, 2007).

With regard to the question as to whether rural households respond to population density by diversifying into off-farm employment, Appendix Table A2 presents estimation results for the determinants of rural household off-farm income, based on four countries for which survey data was available (Kenya, Malawi, Zambia, and Mozambique, representing a pair of high-density and low-density countries, respectively). While the association between local population density and off-farm income levels is statistically significant in two cases, the elasticities are small in all cases, indicating that rural non-farm income shares are only marginally sensitive to population density. Other factors, such as family size, farm size, and proximity to towns and markets had considerably greater power in explaining the variability of non-farm incomes across households. Headey and Jayne's cross-country analysis (this issue) also finds no systematic response of rural non-farm employment shares to higher population density. Instead they find stronger associations with agricultural productivity, education and infrastructure.

Liu and Yamauchi's study of rural Indonesia (2014) also examines these different drivers of nonfarm diversification, particularly education. Poor people possess two major assets: their land and their labor. As land assets diminish, it becomes increasingly important to bolster the labor assets of the poor (i.e., the returns to labor) through human capital, infrastructure and other non-farm job creating investments. Liu and Yamauchi show that rural households containing more educated members were able to achieve much higher levels of consumption expenditure and were not adversely affected by small farm sizes, in contrast to more poorly educated households. These findings all point to the importance of supporting rural households' efforts to educate their children so that the region's future labor force will better compete for good jobs in the local and global economy.

The need for skill training also applies to farming, though the skill set required for successful farming is rapidly evolving.[15] Given these realities, Africa's young rural people entering the labor force will need to be equipped with the skills needed for them to make viable and meaningful livelihoods from farming. This has major implications for the future development of the region's educational systems. Successful entrepreneurs in farming will increasingly require access to skilled agricultural and marketing extension

[15] This skill set includes skills in using improved technologies (e.g., herbicides, conservation farming practices, use of cell phones for accessing soil testing services, market information and finance), accounting skills, navigating state and private sector institutions for accessing services such as finance, extension support, veterinary services, and marketing support.

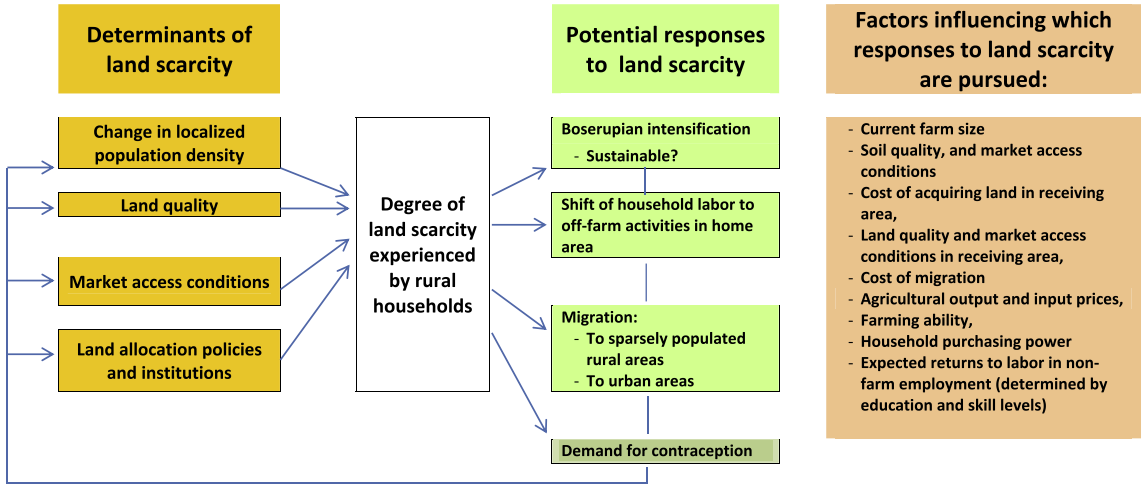


Fig. 3. Conceptual framework for examining the determinants of and responses to land scarcity.

workers through the use of ICTs, but the quality of these workers will only be as good as the local agricultural and vocational colleges that train them. Anticipating the nature of these shifts and supporting educational supply chains to provide them is a huge challenge.

Rural–rural migration

The classic Harris and Todaro (1970) and Tiebout (1956) models of migration and their extensions offer important theoretical perspectives on rural–rural migration.[16] In the Harris-Todaro model migration is a function of the relative expected returns to labor in the source and potential destination areas, influenced by relative land/labor ratios, agroecological potential, and market access conditions. In the Tiebout model migration is also a function of public services (health, education, transport), and in an extension to African settings, the degree to which local institutions in the destination area are hospitable to settlement by migrants (Hsiang, 2013).

Data on rural-to-rural migration is surprisingly thin, and constitutes an important research gap. Migration flows can tell us a great deal because they reflect dynamic changes in economic opportunities (Potts, 2013). The few available African studies show rural-rural migration flows to be substantial and greater than rural–urban migration in some cases (Bilsborrow, 2002). Survey data consistently show a high degree of rural labor mobility and relocation. For example, Beegle et al.'s (2011) study of household mobility in Kagera, Tanzania, indicates that about half of surveyed individuals moved from their home village within a single decade (about half of which moved to other rural areas). The search for more land, better land, and jobs appears to drive rural-rural migration, with outflows from more densely populated areas and inflows to relatively sparsely populated areas.[17] Rural labor mobility in SSA is believed to be highly sensitive to the functioning of land and labor markets, as well as government land policies and customary institutions; though again, there is a paucity of evidence on the subject.

Despite evidence of significant rural mobility in much of Africa, the equilibration of land-labor ratios over space appears to be occurring at a very slow pace given the high levels of spatial clustering that we observe at present. Slow equilibration of land/labor ratios over space may suggest institutional factors impeding the free flow of labor into other areas, which could be interpreted as signs of land or labor market failures, or alternatively as means to protect the rights of indigenous communities.[18] Several articles in this issue summarize the reasons inhibiting the rise of land markets (Holden and Otsuka, 2014; Deininger et al., 2014, 2011). Among the most prominent are that: (i) customary land tenure institutions are purposefully designed to inhibit the introduction of land transferability to ensure access to land for local people; and (ii) land is the principal *de facto* source of local power of chiefs and other traditional authorities, and as such, they tend to resist the introduction of market-based land transfers. Nonetheless, where land is abundant, inflows by outsider groups may not be uncommon (e.g., Mutabazi et al., 2010).

Rural–urban migration

Much of Africa's economic situation in the next several decades will depend on the pace of growth in non-farm sectors. Rapid non-farm employment growth would relieve land pressures by pulling rural labor out of agriculture. As mentioned in Section 2, Africa has a unique age demographic in which over 60% of its rural people are under 25 years of age. Roughly 21 million people will enter the labor force each year over the next decade, with at least half of them originating from rural areas. The "youth bulge" will put immense pressure on both agriculture and non-farm sectors to generate enough jobs to absorb this burgeoning labor force.

Land scarcity may influence the difference between the expected returns to labor in agriculture versus migrating to seek employment in urban areas (Todaro, 1970; Bilsborrow, 2002). Rural–urban migration would not necessarily be a problem if the region's urban economies were growing quickly enough to absorb the rapidly growing labor force into productive jobs. Recent analyses differ tremendously on this question. Some analyses see evidence of remarkable economic growth and the rise of an African middle class, while others see relatively fewer signs of broad-based changes.

For example, a relatively bullish study by Fine et al. (2012) points to rapid non-farm and mainly urban job growth potential, but also indicates that the labor force is growing faster than that

[16] The Harris-Todaro model was originally applied to understand rural–urban migration, but its basic premise that labor flows are influenced by expected returns to labor in the source and potential destination areas apply to rural–rural migration as well.

[17] Jayne and Muyanga (2012) found that the net outflow of adult labor in Kenya is four times higher from the top 20% of villages ranked by population density than from the bottom 20% of villages.

[18] In response to perceived constraints on movement from land constrained to land abundant areas, some countries (e.g. Ethiopia, Zimbabwe) have significantly engineered such flows, either directly or indirectly, through governmental resettlement programs and policies (e.g., Chambers, 1969, Adepoju, 1982; Maro and Mlay, 1982; Kinsey and Binswanger, 1993). The success of such schemes, however, has been decidedly mixed, highlighting the fact that the barriers to land-labor equilibration are complex and not always obvious.

of wage jobs. Other analysts argue that, unlike most areas of the world where urbanization has been associated with domestic agricultural productivity growth and industrialization, urbanization in most of Africa has been driven by primary product exports with limited impact on employment growth (Fox, 2012; Gollin et al., 2013; Potts, 2013; Glaeser, 2013).[19] No country in SSA has a manufacturing sector that accounts for more than 10% of GDP.

While some sources point to a rising middle class in Africa (e.g., African Development Bank, 2011; Tschirley et al., 2013), these conclusions are highly sensitive to how "middle class" is defined.[20] Ravallion et al. (2007) show that headcount poverty rates in sub-Saharan Africa fell slightly in rural areas between the early 1990s and early 2000s, but rose slightly in urban areas. Africa's urban population is clearly very poor by global standards. UN-Habitat estimates that around 62% of Africa's urban population lives in slums, and show that slum-dwellers in Kenya do not see their relative incomes increase over time, suggesting slum-based poverty traps (United Nations, 2010). Other studies are more skeptical that Africa's urban population is really growing quickly (Potts, 2012, 2013; Gollin et al., 2013). Several studies argue that the UN's model-based estimates of rapid urbanization in Africa are based on thin empirical evidence (Bocquier, 2005; Potts, 2012), and that in several instances urbanization has been much slower than the UN models predict.

Why is urbanization in Africa not systematically contributing more to poverty reduction in high density Africa? One explanation of this phenomenon is offered above in the context of "push migration" in the rural nonfarm sector: when farm sizes are shrinking without appreciable growth in output per hectare, then rural labor (the young, in particular) are driven to urban areas, where unskilled wages adjust downwards in response to this influx. Other factors constant, this process would slow down the rate of rural–urban migration, and keep more people at last partially dependent on farming.

Upward shifts in the demand for labor could work in the opposite direction. In theory, relatively low wages could attract investment in manufacturing, as has been the case in much of Asia. Supportive industrial, infrastructure, and skill training policies to attract both local and foreign investment capital in labor-intensive manufacturing and industry would offer the greatest prospects for non-farm job creation and urban income growth, which would in turn relieve land pressures in rural areas, and raise the returns to labor in family farming in a virtuous cycle.

Another explanation for the observed urbanization without economic growth and poverty reduction centers on the composition of the urban non-farm sector (e.g. Gollin et al., 2013). This explanation follows from the argument that the tradable manufacturing sector is capable of higher labor productivity growth than non-tradable services (Timmer & Vries, 2007; Rodrik, 2011), along with the already-mentioned observation that most African urban economies are heavily based around non-tradable services, rather than manufacturing and other tradables. Thus, given the economic structure of Africa's urban growth (in which such "consumption cities" predominate), Africa experiences lower rates of labor productivity growth than would otherwise be expected (e.g. following the Asian pattern).

[19] Most natural resource industries employ less than 1% of Africa's work force. Mining and quarrying accounted for 0.9% of Africa's urban workforce in 2000. While the share of Angola's urban population rose from 15% in the 1970s to 58% in 2010 thanks in part to crude oil, which accounts for 62% of GDP, oil employs fewer than 10,000 nationals (Jedwab, 2013).

[20] The AfDB defined middle class as per capita daily consumption of $2–$20 in 2005 PPP US dollars, and found that this group has risen from 27% to 34% of the population between 1990 and 2010. However, about 60% of the middle class in 2010 were in the $2–$4 per capita consumption group, barely out of the poor category and in constant threat of falling back into it (AfDB 2011). If this group is excluded, the rise in Africa's middle class would over the past two decades would be quite modest. However, there is some evidence of rising incomes among a small segment at the top end of the income distribution.

Fertility changes

In addition to migration, another potentially important demographic response to rising land constraints is the reduction of fertility rates. Debates over the extent to which fertility is a choice variable go back as far as Malthus (1798). In his original treatise Malthus assumed that population growth would be inexorable, even in the face of the cyclical booms and busts in food production that his model predicted. Subsequent scholarship on the subject has tended to conceptualize fertility as a choice variable, i.e. fertility outcomes are at least potentially reactive to household resource constraints and opportunity costs (Becker and Lewis, 1973; De Tray, 1973). A sizeable economics literature has explored some of the key economic drivers of fertility reduction, such as increased female labor force participation, female education, and increases in household wealth (see Schultz, 1997 for a review). In contrast the demographic literature on this subject points more to inadequate supply of family planning technologies, though this literature acknowledges the importance of economic factors as well (Kohler, 2012). Though the efficacy of family planning interventions remains controversial (following Pritchett, 1994, in particular), there is evidence that these interventions played an important role in reducing fertility rates in a number of Asian countries, which in turn created a demographic dividend involving higher savings and investment, and faster economic growth (Bloom et al., 1999).

In the context of rising rural labor-land ratios, however, Bilsborrow (1987) is one of the few authors to consider the possibility that rural households reduce fertility rates in response to land constraints, although there is little prior research directly testing this hypothesis. Headey and Jayne (2014) conduct cross-country tests of whether rural fertility rates respond to land constraints, as measured by rural population density. They find that while realized fertility rates are largely unresponsive to higher population density, the fertility rates desired by African women declines sharply and significantly as population density increases. Controlling for agricultural income and female education, they find that women in a high density country like Rwanda (with a population density of 420 people per km^2) desire about 1.5 fewer children than a low density country Tanzania (with a population density of 90 people per km^2). These are large differences in desired fertility rates which, if achieved, would have sizeable impacts on long term population growth. It also suggests an "unmet demand for contraception", though critiques of this concept by Pritchett (1994) warrants caution about relying solely on family planning interventions to close this gap. A big push on female education and empowerment, for example, might also contribute to lower fertility and simultaneously produce other important social and productivity-related goals. Another point of note is that while investments in reducing fertility rates will obviously not ease land pressures in the short term, they have the potential to make a large difference in reducing land pressures over the next 20 to 50 years.

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 implicitly assume the potential for smallholder area expansion. 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. According to our analysis, this is equivalent to roughly 9.7% of total area under cultivation in sub-Saharan Africa, and 15–35% 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% of them pertain to basic food crops. Instead, these investments are heavily geared towards oilseeds (60%), timber and pulpwood trees (15%) and sugar crops (13%) (Schoneveld, 2014).

The rise of medium-scale farmers

The most 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 in all three countries the land controlled by medium-scale farms now exceeds that of foreign and domestic large-scale holdings combined (Jayne et al., 2014). Moreover, holdings between 5 and 100 ha now account for more land than small-scale farms (0–5 ha) 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% 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 roughly 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. (2014), the Gini coefficients of landholdings rose in all three countries substantially, e.g., 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 ha 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.[21] Woodhouse (2003), Flintan (2011) and others also write of the growing enclosure movement in Africa, which may result in hidden land shortages in countries that might appear to be low-density.

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; see also Jayne et al., 2014). 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% of the sampled medium-scale farmers in Kenya and 58% 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 commercialized medium-scale stature under favorable land access conditions.

The combination of "concentrated land abundance" with weak governance raises some complex tradeoffs. Where land is scarce, land concentration among domestic or foreign investors 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. As Mellor (2014) discusses, there is still a strong poverty reduction argument for investing in small commercial farmers rather than large-scale models. Much of Africa's remaining unutilized land is in tropical lowland areas that are well suited to non-food cash crops, such as palm oil and rubber. Byerlee's (2014) review of oil palm and rubber in 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 are overwhelmingly dominant and have taken over the industry from plantations. However, where the state is weak or is biased toward large-scale enterprises, producers are much more heterogeneous with the growing role of medium- and large-scale producers. Policy decisions obviously have a major influence on farm structure, which then affects employment patterns and the inclusivity of agricultural growth.

[21] Electronic mail from K. Stambuli to Professor Michael Weber, Michigan State University, February 13, 2003, subject: "Elitist Land and Agricultural Policies": *I have seriously deplored the social injustice and economic marginalization associated with land conversion from communal tenure to leasehold tenure mostly enjoyed by the elite who also enjoyed a monopoly in the production of export crops. Most deplorable is the fact that the abundance of idle land among estates explains much of the low equilibrium trap to which our countries have been subjected. The economic hegemony of the agricultural elite was compounded by state enterprise expansion into the private sector, over-regulation, a stifling bureaucracy, and totalitarian politics. Inadequate amounts of land available to farmers remain a major constraint to supply response.*

Table 4
Changes in farm structure among small- and medium-scale farmers in Zambia.

Landholding size category	Number of farms			% Change (2001–2012)	% of total farmland		Share of landholding cultivated (2012) (%)
	2001[a]	2009	2012		2009	2012	
0–2 ha	638,118	916,787	748,771	17.3	24.1	16.2	91.2
2–5 ha	159,039	366,628	418,544	163.2	33.8	31.7	66.4
5–10 ha	20,832	110,436	165,129	692.6	20.3	25.0	49.5
10–20 ha	2352	35,898	53,454	2272.7	12.3	15.0	36.7
20–100 ha	–	9,030	13,839	53.3[b]	9.5	12.0	10.9
Total	820,341	1,438,779	1,399,737	70.6	100.0	100.0	

Source: Ministry of Agriculture and Livestock and Central Statistical Office Crop Forecast Surveys.
[a] 2001 Figures are land under cultivation.
[b] Computed from 2009 to 2012 only.

Land markets are developing rapidly in more densely-populated areas

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 ha since 1995 amounts to 12% of the land cultivated nationally, with the mean title deed size being roughly 52 ha (Sitko and Jayne, 2014). New titles connote the acquisition of land from customary authorities and conversion to newly privatized 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). 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 unutilized land remains under the allocative control of chiefs or the state. Although traditional institutional norms are increasingly vulnerable to corruption as the value of land rises, land under customary tenure is designed to provide free "birthright access" to land by smallholder farmers in the community and generally does so where the traditional authorities still have land left to allocate (Cotula, 2007). By contrast, land transferred from customary to state tenure provides "bonanza" discount purchases to the first buyer, generally privileged people, and then afterward is bought and sold based on willingness and ability to pay. Land under this tenure structure almost never goes to poor smallholder farmers. Tenure structure – an outcome of the struggles between traditional authorities and the modern state – therefore has major implications for whether the region's remaining unutilized cropland is allocated to members of rural communities (favoring a smallholder development pathway) or according to market transactions (favoring medium and large-scale investors) (e.g., Cotula, 2007).

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, land 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 that land markets (especially rental markets) support equity outcomes, this is not a foregone conclusion (Colin and Woodhouse, 2010; Holden et al., 2009). Distress sales may exacerbate distributional inequalities (Deininger et al., 2014, 2011). Furthermore, if title conversion mechanisms are fronts for 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 unutilized 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 labor force access land, but because renting land generally involves providing the equivalent of one-third or more of the crop proceeds to the landlord (Jin and Jayne, 2013; Holden et al., 2009), tenants must be extremely productive to make a reasonable livelihood by renting land.[22]

Are the region's governments able to harness the rising demand for land and water for promoting national developmental objectives? Deininger et al. (2014, 2011) document the problems of land governance of large-scale land acquisitions by applying their Land Governance Assessment Framework (LGAF) to seven African countries and three non-African countries for comparison. The LGAF module on this component comprises 16 different dimensions of the governance of these acquisitions. We tally up the country scores for these dimensions and scale them between zero and 100 to provide a broad comparison across countries (Fig. 4). Strikingly, many of the African countries surveyed score very poorly, even those otherwise thought of as having relatively good governance, such as Ghana. The LGAF provides a practical framework for improving land governance, but it also shows that a great deal of work is needed to improve both legal protection, policy design and policy implementation of land governance in Africa.

Conclusions and implications

This article synthesizes emerging research on rural land access in Africa and considers its implications for development policy. Evidence indicates that *access constraints are increasingly important* for the region's smallholders, even outside of the obvious hotspots, and that *such constraints are increasing over time* as the amount of land under customary tenure declines while populations within

[22] 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)%, 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.

customary tenure areas continue to rise. While there is great heterogeneity in the region's spatial continuum of land pressures, many of the region's most populous countries will soon exhaust their land frontiers (e.g. Uganda, Nigeria, highland Ethiopia), and others have largely exhausted it already (e.g. Kenya, Rwanda, Burundi, Malawi). This means that agricultural development strategies that tacitly or explicitly expect production growth to come from area expansion will be increasingly untenable in many areas.

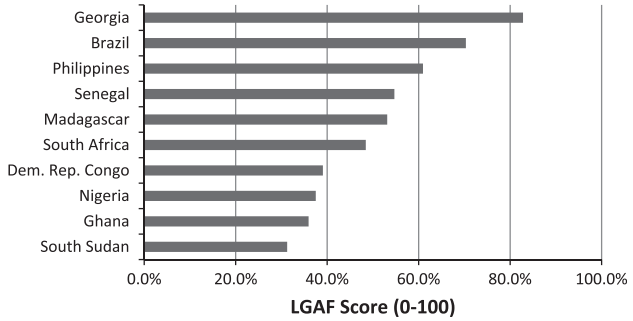
The much ballyhooed urbanization of Africa does not mean that agriculture will decline in importance as a source of livelihood for many if not most of sub-Saharan Africa's population. Recent surveys show that a high proportion of urban households still depend on farming for some of their livelihood, and there is pervasive circular migration of urbanites to rural areas during the crop growing season to generate income and reduce dependence on the market for food.[23] Moreover, the jump in world food prices since 2008 has made farming very profitable for those with sufficient capital to acquire good agricultural land and use modern inputs. Wealthy urbanites are increasingly investing in land for both speculative reasons and for income generation through farming. The demand for cropland, being a derived demand for food, is rising rapidly especially as the region has transitioned almost fully to import parity price levels for both grain and animal products. Some cropland will be lost over time as small hinterland towns grow into cities and attract new investment for non-farm purposes in surrounding lands. Hence the urbanization of Africa will simultaneously reduce the supply of arable land by converting it to urban and industrial areas and raise the demand for agricultural land. For both reasons, as long as long-term real world food prices do not decline, the price of land in much of Africa over the next several decades is likely to increase substantially.

In areas where the localized land frontier has been exhausted, most rural young people entering the labor force will have less access to less land than their parents due to subdivision among siblings. We anticipate that intensifying land scarcity will increase rural-rural migration to areas where land is still available and will put greater pressure on non-farm sectors to absorb rural labor in densely populated areas. Recalling the four possible means of coping with rising land scarcity, we reach the following conclusions on the policy challenges going forward.

Land intensification remains an important pathway, but *sustainable* intensification may not occur without more holistic and more effective public support for smallholder agriculture. The large gap between observed and potential crop productivity, even when recommended rates of inorganic fertilizer are used, reflect constraints related to soil fertility and moisture. Limited crop responsiveness to conventional inorganic fertilizers on degraded soils indicates the need for a more holistic approach to sustainable intensification in densely populated areas – ironically, in the very areas where land productivity improvements are most expected according to the Boserupian framework and where they are most required for sustainable rural livelihoods.

A shift in labor from farm production to rural non-farm employment holds some promise but is currently constrained by the lack of broad-based income growth in rural areas that would support the rise of rural non-farm employment. Investments in physical infrastructure and supporting services may help, as will investments in human capital development, but ultimately a farm structure that is egalitarian enough to support broad based income growth from agriculture is decisive, especially given the thus far stunted growth of African manufacturing.

[23] For example, Hichaambwa et al. (2009) show that more than half of the households residing in four cities in Zambia grow food crops, with the largest share of their cultivated area being in rural areas and accounting for just under 10% of the area cultivated nationally. See also Zezza and Tasciotti (2010) for a cross-country assessment.



Source: Author's calculations from Table 9 of Deininger *et al.* (this issue).

Fig. 4. Land Governance Assessment Framework (LGAF) scores for large scale land acquisitions. *Source:* Author's calculations from Table 9 of Deininger et al. (2014).

Economically rewarding relocation to urban areas is obviously desirable but constrained by the rate of growth in remunerative urban non-farm jobs. The ability to absorb workers with limited skills and abilities will be particularly challenging. The most effective long-term strategy will involve upgrading the educational system (including universities, vocational schools and agricultural colleges) to provide the skills required by a competitive twenty-first century work force – recognizing that the quality of the work force depends on the quality of local educational systems – as well as an industrial policy that attracts new investment and employment opportunities.

Migration to the more land abundant rural areas may be greatly facilitated by targeted investments that "open up" such regions (in countries where they still exist). Lack of transport infrastructure, in particular, is often a binding constraint (Chamberlin et al., 2014), but so too is the inadequate provision of health and other services for more remote areas. More generally it is still unclear what the right balance is between smallholder and large farm expansion in low density areas. This would be a fruitful area for future research.

Promoting (and responding to) household demand for fertility control may be targeted by policies and investments in family planning, education and health systems. Naturally, such investments may have long lag periods before their effects are felt, but may pay large dividends in the long run. Moreover, the unmet demand for contraception in land constrained countries suggests that these kinds of interventions could be very effective in these contexts (Headey and Jayne, 2014).

In thinking about these five responses to rising land constraints, it is clear that all five responses are feasible with supportive policies, though the relative importance of them will vary according to countries' endowments and conditions. Indeed, our perception of Asia's experience is that the more successful countries in that region increased yields (particularly of rice and wheat), expanded land area for rural-rural migration (particularly Indonesia, Malaysia and Thailand), experienced a relatively successful industry-led urbanization path (with human capital accumulation playing a significant role), and very actively sought to reduce fertility rates through family planning and investments in women's education., Addressing the challenges of sustainable intensification and poverty reduction in Africa will require many of the same types of policies and investments strategies. This, of course, implies the importance of a holistic cross-sectoral harmonization of policies – i.e. in agricultural, land, and urban industrial policies, as well as public investments in physical infrastructure, health, education, family planning, etc.

But within this list of essential investments, we perceive land issues to be the most neglected. Our review of the changing rural landscape of actors, institutions and the allocation of land resources indicates a major "disconnect" between current land allocation policies and national aspirations for inclusive economic growth. In many countries prospects for broad-based agricultural

Table A1
Distribution of population density in rural Africa, 2010 and 2050.

	% Of rural population contained in the most densely populated 1%, 10%, and 20% of rural grid cells			Rural population per km^2 arable land in the most densely populated 1%, 10%, and 20% of rural grid cells							
				2010				2050			
Country	Top 1%	Top 10%	Top 20%	National	Top 1%	Top 10%	Top 20%	National	Top 1%	Top 10%	Top 20%
Angola	16	43	62	15	313	80	53	25	505	130	85
Benin	11	51	65	46	510	241	152	74	822	388	244
Botswana	18	62	77	10	178	58	41	16	286	94	67
Burkina Faso	7	30	48	41	340	120	92	65	549	194	148
Burundi	2	19	34	313	667	596	541	504	1075	960	871
Cameroon	15	56	74	28	438	158	104	45	706	254	168
Central African Republic	11	40	61	6	65	23	18	9	105	37	28
Chad	14	56	72	11	85	37	27	18	137	59	43
Congo	10	43	61	4	41	17	12	6	65	28	19
Ivory Coast	4	27	45	51	199	134	125	82	320	216	201
Djibouti	10	32	45	290	11106	2235	1218	467	17896	3601	1963
Equatorial Guinea	16	34	46	27	367	90	61	43	591	146	99
Eritrea	9	42	59	137	995	463	330	221	1603	746	531
Ethiopia	8	40	63	90	608	318	247	145	980	512	398
Gabon	31	50	62	4	216	29	16	7	347	47	26
Gambia	3	17	31	57	118	98	88	92	190	158	141
Ghana	6	30	48	75	373	202	164	121	602	326	264
Guinea	10	32	46	35	496	130	90	57	800	210	146
Guinea-Bissau	5	29	46	31	177	93	73	51	285	150	117
Kenya	18	72	89	69	990	417	269	111	1595	671	434
Lesotho	2	19	35	107	154	152	136	173	249	245	218
Liberia	14	52	66	40	584	212	134	64	942	342	216
Madagascar	14	47	64	33	594	171	113	54	957	276	182
Malawi	4	28	47	120	425	315	274	193	685	507	442
Mali	10	54	79	18	151	71	56	29	243	115	90
Mauritania	38	79	93	18	949	142	84	29	1529	229	136
Mozambique	11	42	61	20	275	86	62	33	443	138	100
Namibia	37	74	84	6	157	40	22	10	252	64	36
Niger	17	74	93	24	370	152	102	39	597	245	164
Nigeria	10	38	55	126	1385	510	364	203	2232	821	587
Rwanda	3	19	35	419	1029	783	719	675	1659	1262	1159
Senegal	9	43	62	87	1145	396	283	140	1846	639	456
Sierra Leone	5	27	44	80	303	309	212	129	489	499	342
Somalia	20	49	63	84	1898	393	260	136	3058	633	418
South Africa	19	74	90	45	651	292	189	73	1048	470	305
Sudan	17	48	66	40	1131	233	136	65	1823	376	219
Swaziland	2	14	27	73	125	99	92	118	202	159	149
Togo	6	30	49	64	308	160	167	103	496	257	269
Uganda	6	35	56	130	690	434	356	209	1113	700	574
Tanzania	8	35	52	39	448	147	105	62	722	238	169
Congo, Democratic Republic	13	45	61	24	335	110	74	38	540	177	119
Zambia	6	32	47	11	61	34	25	17	99	55	41
Zimbabwe	5	25	41	48	496	134	99	77	799	216	159
Africa	21	65	82	50	1498	322	197	81	2413	520	318

Notes: The first three columns in this table show the percentage of the rural population residing in the most densely populated 1%, 10% and 20% of rural areas, by country. The other columns of the table show the localized population density per km^2 of arable land at the national level and then for the most densely populated 1%, 10% and 20% of 5 decimal minute gridcells. The middle columns provide these estimates for 2010 and the right-hand size columns present those estimated for 2050. Computed by authors using 2010 data from the AfriPop population database (Linard et al., 2010). We ruled out urban areas on the basis of urban boundaries from the GRUMP database, urban areas in the GlobCover 2009 land cover dataset, and any remaining areas with more than 1500 persons per square kilometer. We conducted our analysis at a coarser spatial resolution: 5 decimal minutes, or roughly 10 km^2 at the equator. The AfriPop dataset is a "semi-modeled" dataset, wherein the total population within a reporting unit (such as a district) is allocated over space in a way that is weighted by remotely sensed data on land use and land cover. In order to verify that our analysis was robust to such data assembly methods, we replicated this analysis with data from the Global Rural–Urban Mapping Project (GRUMP) described by Balk and Yetman (2004). Results from both datasets were very similar.

Table A2
Factors associated with household off-farm income.

	(1) Zambia	(2) Mozambique	(3) Kenya	(4) Malawi
Dependent variable: log (off-farm income)				
Female head	−0.339***	−0.282***	−0.273***	−0.186***
	(−4.77)	(−5.20)	(−3.86)	(−4.12)
Age of hh head	−0.00789***	−0.00867***	−0.00405	−0.00138
	(−4.03)	(−5.13)	(−1.64)	(−1.17)
Educ. of hh head	0.156***	0.189***	0.0962***	0.0866***
	(17.82)	(24.27)	(12.25)	(16.18)
Adult equiv. in hh	0.107***	0.134***	0.0978***	0.102***
	(7.77)	(14.00)	(8.79)	(9.96)
Farm size (ha)	−0.00522	0.0198***	0.100***	−0.0333
	(−0.46)	(2.58)	(6.45)	(−1.53)
km to nearest district town	−0.00134		−0.00695**	
	(−1.40)		(−2.08)	
km to tarmac road	−0.00157		−0.00263	−0.00668***
	(−1.61)		(−0.56)	(−7.03)
hours to city	−0.0102*	−0.000168***	−0.0417***	−0.0381***
	(−1.88)	(−3.41)	(−2.87)	(−7.22)
log pop. density	0.0977**	0.0253	−0.104	−0.124***
	(2.39)	(0.90)	(−1.57)	(−2.82)
R-squared	0.201	0.233	0.256	0.200
N	5629	10372	2059	6364

Estimates based on OLS. *t* statistics in parentheses. Data sources: Zambia: Supplemental Surveys to the Central Statistical Office Post Harvest surveys, 2001, 2004 and 2008. Mozambique: TIA 2005/06, Ministry of Agriculture. Kenya: Tegemeo Rural Household Surveys, 2000, 2004, 2007, 2010. Malawi: Integrated Household Survey-II, 2003/04.
* $p < 0.10$.
** $p < 0.05$.
*** $p < 0.01$.

growth are threatened by status quo land policies, which are actively or passively supporting medium- and large-scale land acquisitions by both domestic and foreign investors, while simultaneously constraining the amount of land that could potentially be accessed by rural households in densely populated areas through rural–rural migration. As several papers in this special issue show, many African governments are devoting state resources to developing land for large-scale commercial investment (e.g., investments in irrigation, electrification, and road infrastructure in "block farms" or commercial farming zones), with little public or scientific debate as to whether similar public investments in customary tenure areas could generate even greater payoffs in terms of agricultural productivity growth and poverty reduction. Instead, rural poverty is increasingly being viewed as a problem to be addressed through input subsidies, cash transfers, and other forms of social protection and safety nets.

Unless corrected, such policies may effectively foreclose on smallholder development options in the not-too-distant future, since high levels of land concentration have all too often become very difficult to reverse (Binswanger et al., 1995). The reluctance of ministries of agriculture and land to view poverty reduction as part of their mandate is perversely consistent with land policies that seek to transfer land out of customary systems – where it is reserved for future generations of smallholder farmers – and into private titled and state land, which tend to be less accessible for small farm households. Institutions for protecting the stock of unutilized land for future generations of indigenous rural populations are extremely fragile. Indeed, there are irresistible incentives motivating the state to continue to wrest control of customary land and allocate it to domestic and foreign investors, and to public–private joint ventures such as block farms. These incentives include the rising value of land for commercial exploitation since the 2008 surge in global food and energy prices, the understandable incentives to achieve national food self-sufficiency, and the potential for land allocation to be an effective form of political patronage.

Under the continuation of status quo land policies, the two most promising avenues for improved livelihoods in the densely populated rural areas are diversification into non-farm employment and sustainable forms of intensification and productivity growth on existing lands. Achieving these goals will not be easy, but they will be more likely to occur with an inclusive smallholder-led commercialization strategy. This is because 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, 2014). 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 labor and services markets can be developed, then other employment opportunities should be easier to create in the very locations where more commercial smallholders are investing and raising their output and productivity (Mellor, 2014).

Apart from the desirability of an inclusive growth strategy, achieving it is likely to require greatly increased state support for specific kinds of public investments, including education, health and family planning, agricultural research and development, major farmer extension programs focusing on sustainable soil fertility management, investments in irrigation and electrification, and other forms of infrastructural investments to leverage productive private investment in both urban and rural areas. Despite skepticism in some quarters about the prospects for achieving smallholder-led development (Collier and Dercon, 2014), this path has been the way out of hunger and poverty for much of Asia and, historically, most other areas of the world (Lipton, 2006). Successful small farm intensification will also help to conserve the world's remaining forestland and biodiversity. For all of these reasons, it would seemingly be in governments' and development agencies' interests to redouble their efforts to support small farm productivity growth.

A looming policy question is, therefore, whether agricultural and land policy should focus on promoting efficiency and productivity in land use and seek to achieve poverty reduction goals through some other means (such as social protection and transfer programs) or whether agricultural policy should retain poverty

reduction as a primary goal alongside productivity and national food security. While there has been increasing attention devoted to how to best utilize Africa's vast unexploited land resources, this focus is arguably diverting attention from the longstanding and more central development issue regarding what kind of strategy is necessary to reduce rural poverty and promote broad-based rural income growth. There is a strong likelihood that agricultural and land policies and associated public investments could indeed succeed in achieving these twin goals if the requisite political commitment exists. Achieving these goals will be more likely once land and agricultural policies are conceived of as components of an overarching rural development strategy dedicated to broad based structural transformation that explicitly acknowledges land constraints in densely populated areas, and not confined to narrow objectives of how to rapidly convert customary land to state titled land that can then be allocated to commercial farming interests and capitalized local entrepreneurs.

These questions are often missing from discussions of rural development in the region. The analyses assembled within this special issue indicate that the challenges associated with increasingly limited access to land will seriously constrain opportunities for growth and poverty reduction within the region unless they are explicitly recognized and addressed within a holistic policy response framework. It is our hope that this special issue of *Food Policy* will further catalyze such a recognition by policy makers and researchers concerned with the region's development prospects.

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Appendix

See Tables A1 and A2.

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