

15 How small is beautiful? Farm size and economic development in Africa

Ken E. Giller and Jens A. Andersson

1 Introduction

Small is beautiful (Schumacher, 1973), but how small? Schumacher railed against the trend towards economic domination by big business monopolies and argued for smaller, locally owned and locally adapted intermediate technologies and approaches. An abundant literature builds on Schumacher's arguments for appropriate scale of economic organization. Smallholder farming is held to exemplify how small businesses can be highly productive and provide employment, while being more benign to the environment. Yet the reality is far from romantic, as exemplified by Stephen Carr's (2017) essay entitled "Surviving on Half a Hectare of Land", which explores the plight of rural households in southern Malawi. Farms can become too small to provide for a family's basic needs. This is a far cry from the tendency to romanticize and idealize life on a small farm as self-sufficient, food-sovereign, independent of market forces and in harmony with nature.¹ So, at what point do farms become too small? That is the focus of this chapter.

We draw inspiration from Schumacher's ideas in our research on smallholder farming in sub-Saharan Africa. The huge diversity of African farming systems led Kofi Annan (2008) to call for a uniquely African Green Revolution that recognizes the rich diversity of culture, history, climates and soils in the urgent endeavour to improve agricultural productivity sustainably. Our own research has focused on unravelling and exploring this diversity to tailor technologies to the needs of farmers (Giller et al., 2011). An abundance of agricultural technologies exists to diversify and enhance agricultural productivity – comprising a 'basket of options' that could match the diversity of farmers (Ronner et al., 2021). The sluggish uptake of such technologies has led to the realization that smallholder farmers' investment in agriculture is not only a question of lack of cash or competing demands on labour but also a lack of sufficient land. Small farm size precludes self-sufficiency in food (Hengsdijk et al., 2014) and income (Giller et al., 2021b). Productivity-enhancing technologies, when adopted on small farms, can only generate small absolute gains that are insufficient to lift rural families out of poverty (Harris & Orr, 2013).

This leads us to question at what point small farm size becomes a binding constraint for agricultural development, and whether this is already the case in much of Africa. This question is particularly pertinent given that, despite rapid urbanization, the rural population will continue to grow until 2050 and beyond (van Wissen, this volume). Population pressure on land, although unevenly distributed due to differences in agro-ecological potential and historical patterns of settlement, is thus unlikely to ease. We start by reviewing the literature on farm size in Africa, arguing that farm sizes are often already too small to sustain farming families, let alone generate the investment capital needed to scale up operations and increase farm size, land and labour productivity. We then highlight how smallholder farming has for many become a resource sink,

an activity subsidized and sustained by household income earned in other economic sectors, locally, nationally and internationally.

Our analysis questions the value of the structural transformation model of economic development for understanding current developments in Africa. Based on economic two-sector models (i.e. Lewis, 1954) and theories of modern economic growth (i.e. Kuznets, 1966), structural change or transformation refers to a wide set of changes in economies associated with changes in the distribution of economic activity across sectors of the national economy – agriculture, industry and services. Largely developed through extensive analyses of a limited number of early ‘developed economies’, the structural change model’s applicability to the large and highly diverse economies of the global south is, however, far from straightforward (Kuznets, 1973).

Fundamentally based on the notion that labour productivity differences between economic sectors push or pull labour out of low-productivity sectors – e.g. agriculture – to higher-productivity sectors, the model postulates that this movement also results in (labour) productivity growth in agriculture. Such labour productivity growth in agriculture is associated with technological advancement (i.e. high yield crop varieties, irrigation) and, particularly, labour-saving technologies (i.e. mechanization), which imply increasing farm sizes or an expansion of agricultural lands (per worker). Yet, the structural transformation model provides few clues on the mechanisms that drive this change process: does agricultural productivity growth lead the process? Is the labour pulled out of agriculture, enabling productivity and farm size growth in agriculture? And what role do land- and capital-constrained small farms play?

2 Farm size and its implications

2.1 How large are farms in Africa?

Unsurprisingly, different approaches to estimating farm size yield different results, yet the divergence of estimates is alarming. Based on the World Programme for the Census of Agriculture from 2010, Lowder et al. (2021) conclude that the average farm size for sub-Saharan Africa (excluding South Africa) is 1.6 ha. To provide more current estimates of the number of farms, Erenstein et al. (2021) harmonized rural population and farm data sources to produce estimates of the number of farms for 2020 and projections for 2030. However, they estimated farm size by dividing the area of “agricultural land” (from FAO, 2021) by the number of farms – suggesting an average farm area of 8.2 ha! This is misleading, as the category “agricultural land” includes communal grazing land, which is often unsuitable for crop production. Samberg et al. (2016), using a similar approach based on a dataset harmonized for 2010, did not provide an average value but estimated a similar number of farms in sub-Saharan Africa fell into the 2–5 ha category as those smaller than 2 ha.

Analyses based on household surveys support the conclusions of Lowder et al. (2021). A large proportion of rural households have farm sizes far smaller than 1 ha (Giller et al., 2021b; Julien et al., 2019). A disadvantage of using household surveys to assess farm size is that they do not include the large estates captured by the agricultural census. For instance, in Tanzania, c. 1,000 large estates account for 7% of the agricultural land. They produce 80% of the country’s wheat and, respectively, 63%, 34% and 15% of the country’s tea, tobacco and coffee (Lowder et al., 2021). Household surveys also tend to miss ‘middle-sized’ farms, which are increasing in number, mainly due to wealthier urban households investing in land (Jayne et al., 2016). Nonetheless, most rural households in Africa have much less than 2 ha of land for crop production. Indeed, for eight out of nine countries for which we could access large datasets, we found median farm sizes well below 1 ha (Giller et al., 2021b) (Figure 15.1).

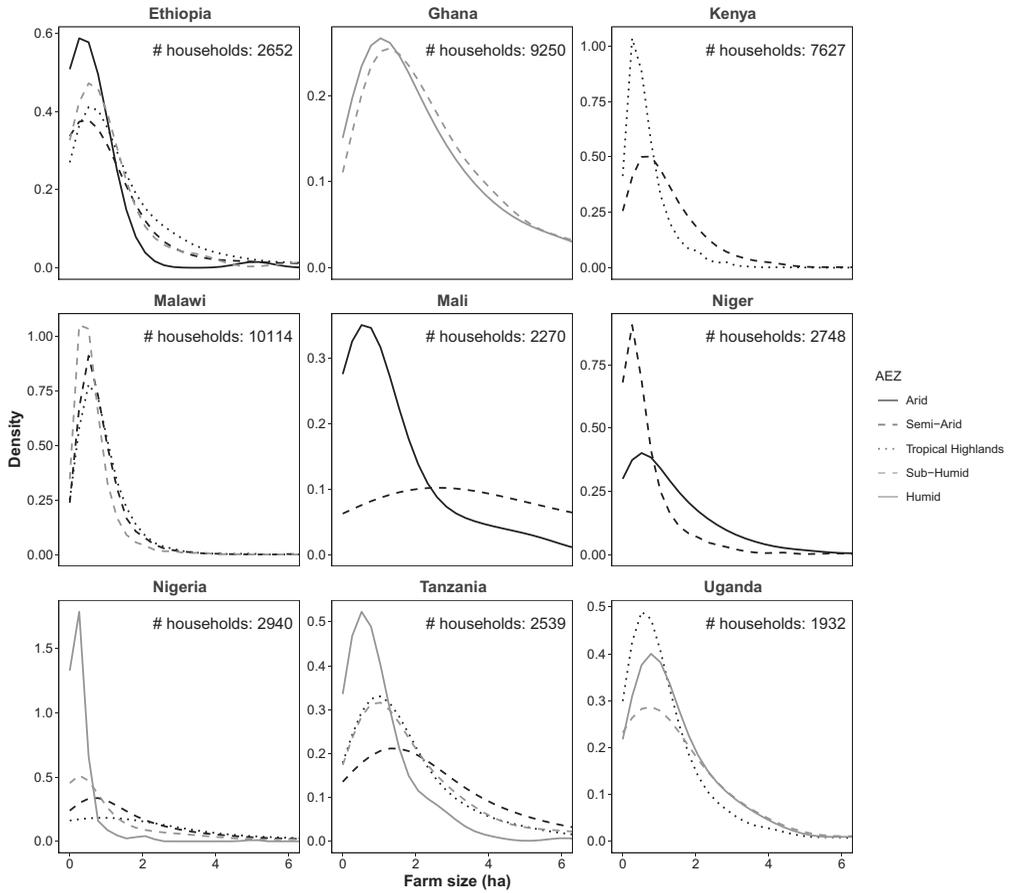


Figure 15.1 Density distributions of farm size across different agro-ecological zones for selected countries in sub-Saharan Africa based on LSMS-ISA (World Bank, 2020) and the FAO RuLIS data (FAO, 2018) – from Giller et al. (2021b).

In many Asian countries, where farm sizes may be even smaller than in Africa, smallholder production is often highly subsidized through complex price and input support arrangements (i.e. India) or is more productive due to the widespread use of irrigation, allowing for two or more cropping cycles per year. In Africa, less than 2% of the cultivated land is said to be irrigated (Sheahan & Barrett, 2017), although this is certainly an underestimate (see Veldwisch et al., this volume). In other words, small farms in Africa are far less productive than similar-sized small farms in Asia. In addition, there is an important historical difference: unlike in the past, Africa’s small farms now have to compete in global markets, with farms that can produce at lower costs due to lower labour and input costs (i.e. in Asia), agricultural subsidies and import restrictions (i.e. the European Union), and/or through considerable economies of scale (Giller et al., 2021a)

2.2 Small farm size and low productivity as poverty traps

As farm sizes shrink, the opportunity disappears to allow land to lie fallow to recover its soil fertility. The link between shortening of the length of the fallow period and declining soil fertility

as a result of increasing human population has long been recognized (Nye & Greenland, 1960). In particular, poorer households with small land areas do not have the luxury of leaving land fallow to regenerate their soils. If the nutrients removed are not replenished, crop productivity inevitably declines. Smallholder farmers have four principal sources of nutrients: (1) the recycling of crop residues; (2) animal manures; (3) symbiotic nitrogen fixation by legumes and (4) mineral fertilizers. Animal manures are often used but are limited in supply. Further, the poorest households generally lack livestock to generate manure that can be recycled to maintain soil fertility (Zingore et al., 2007). Coupled with their lack of cash for investment in fertilizers, this leads to their land being managed with few inputs (Tittonell et al., 2005; Zingore et al., 2007). Continuous cultivation without the return of nutrients in organic manures or fertilizer leads to decline in soil organic matter and nutrient depletion (Zingore et al., 2007). Thus small farm size and poor soil fertility among the poorest households represent a double poverty trap²: they can neither produce enough for household needs nor restore the productive capacity of the soil (Hengsdijk et al., 2014; Tittonell & Giller, 2013).

2.3 *For whom does farm size become a binding constraint?*

Recognition of the diversity of rural households, and their diverse needs, has stimulated a substantial body of research. Considerable focus was placed on characterizing the diversity of farms and creating typologies that could be used for targeting or tailoring of agricultural technologies (Giller et al., 2011). Often four or five different farm types were identified to inform further development interventions. With the benefit of hindsight, it became clear that farm types that could benefit the most from productivity-enhancing agricultural technologies were those with sufficient land, labour and cash to invest (Franke et al., 2014). Yet, such farms typically represent only a small fraction of the overall rural population. Moving away from farm typologies, research has focused more on understanding the frequency distributions of households in terms of farm size (Giller et al., 2021b; Hengsdijk et al., 2014) or food self-sufficiency (Frelat et al., 2016). Such studies reveal surprisingly similar distribution patterns across diverse locations, confirming that the ‘better-off’ households who can make a ‘living income’ from farming are a small fraction of the rural population (Giller et al., 2021b). Examples that support this conclusion include not only farming systems focused on annual crops (Franke et al., 2014; Marinus et al., 2022) but also perennial cash crops such as cocoa (van Vliet et al., 2021).

3 **Smallholder farming as teleological pathway to proletarianization?**

In agrarian economies, farm sizes tend to decrease over time as population grows. However, the movement of labour from agriculture into more productive economic sectors has not followed a ‘classic’ structural change process during Africa’s colonial past. As population densities on the continent were low, the colonial expansion of capitalist-organized economic sectors did not spontaneously draw large numbers of Africans away from agriculture (Amin, 1972). On the contrary, in many areas, the expansion of non-agricultural sectors and commodity trade posed new opportunities for smallholder farmers, who expanded their operations into new lands, producing food and cash crops for upcoming (export) markets, sometimes assisted by the introduction of new technologies such as the ox-drawn plough (Baudron et al., 2012). Contrary to early structural change thinking (Lewis, 1954), underemployment in agriculture and the emergent colonial economy thus did not create a situation of ‘unlimited supply of labour’ for the expanding modern economic sectors. African labour had to be mobilized, through taxation, forced labour services and the undermining of smallholder farmers’ productive capacity.

How the productive capacity of smallholder farmers was undermined during the colonial era became a major theme in political economy-inspired historical analyses in the 1970s and 1980s. Viewing smallholder agriculture as a transitional phase in the development of capitalist agriculture, Marxist-inspired scholars studied how discriminatory policies of colonial states and capitalist market forces ‘secured’ the unlimited supply of labour for the modern capitalist sector (Arrighi, 1970; Palmer & Parsons, 1977). In the settler economies of East and Southern Africa, land alienation policies and the concentration of African smallholder farmers in designated rural areas called ‘reserves’ were, arguably, the most visible attempts to undercut smallholder farmers’ productive capacity, and to increase their dependency on other sources of income; the ‘reserves’ were often dubbed ‘labour reserves’. Although these land policies further reduced smallholders’ holdings, actual farm sizes received scant attention in these political economy analyses – possibly because farm sizes were not regarded a binding constraint (cf. Phimister, 1993). Rather, scholarly attention was focused on what was seen as the inevitable process of proletarianization, the moment when smallholder farmers became unable to reproduce themselves through farming – e.g. when they became proletarians. Yet, smallholder farms did not disappear, making way for large-scale capitalist farms, neither in the colonial era, nor thereafter. Rather, they increased in number and became increasingly smaller.

More recently, development economists have started to pay explicit attention to farm size distributions, land (mis)allocation and the productivity of large versus small farms (e.g. Adamopoulos & Restuccia, 2014). Perhaps this interest is informed by the experiences of some structurally transforming Asian economies which do not witness clear farm size growth (Giller et al., 2021a; see below). Different perspectives can be discerned in this economic literature. Many scholars seem to view productivity growth on small farms as the (necessary) prime driver of poverty reduction and the process of structural transformation, building on the inverse productivity-farm size relation (McMillan & Headey, 2014). Farm size growth is seen as a function of labour productivity growth in agriculture. Yet, some development economists contest this perspective for Africa, contending that the evidence for smallholder-led growth and transformation is weak (Barrett et al., 2017; Collier & Dercon, 2014). Observing that ‘African smallholders have not chosen to be entrepreneurs’ but are farming ‘by default’, they argue for a shift in policy focus towards ‘the desirable size and composition of the large farm sector, (...) and on facilitating migration’ to achieve ‘a shrinking of the labour force dependent on agriculture’ (Collier & Dercon, 2014). But while these perspectives differ on whether small farms can drive farm size growth, they both view labour productivity growth and farm size increase as linked and desirable outcomes of development policies that aim to achieve rural poverty reduction and structural transformation.

Although ideologically opposed, development economists and the political economists of the 1970/1980s view a movement of labour out of agriculture as necessary for structural transformation to occur. Both assume that a movement of labour out of agriculture will either enable farm consolidation or result from farm size and labour productivity growth in agriculture. Yet, neither scholarly tradition provides clues on how small farms persist despite productivity and wage differences between sectors. Nor do they consider how persistently small farm size impedes (labour) productivity growth in agriculture and structural transformation.

4 Households rely on diverse income streams

Although it has long been recognized that rural households rely on highly diverse sources of income (Ellis, 1998), our persistence in referring to them as ‘smallholder farmers’ perpetuates the idea that they *depend solely* on farming. Farming is undoubtedly a central part of household

food and income security, but income diversification is the norm rather than an exception. In a cross-sectional study (>13,000 households, 93 locations in 17 countries), the ‘better off’ households had more income from all sources – sale of food and cash crops, livestock and off-farm (Frelat et al., 2016). This raises the ‘chicken and egg’ question as to whether investment in farming leads to increased earnings on-farm, which in turn leads to better opportunities to find employment outside agriculture. Or conversely, whether increased earnings off-farm allow for greater investment in agriculture to boost production and income on-farm. No doubt, both are true in different situations, and there is a clear generational dimension to this; rural households generally prioritize children’s education to enhance their ability to find secure employment, and older farming households, rather than young ones, are often the technologically more advanced. They can invest in farming (technologies) using their off-farm income or pension (i.e. Mutungi et al., 2023). In migrant labour societies, rural households’ livelihood security is often located in (family) networks spanning both rural and urban areas, with income earned in different economic sectors (Andersson, 2002).

In Africa, the question ‘What farm size sustains a living?’ (Marinus et al., 2022) – for food self-sufficiency, food security or a living income – is thus merely a hypothetical one, rather than a reflection of a common reality. This pattern is widely visible throughout the continent: the most successful and technologically advanced smallholder farmers are those who earned their investment capital outside agriculture, working in service and industrial sectors of the economy. Investment in agriculture may thus be regarded as a reflection of the common adage of ‘eating one’s money’.

5 Food system change, structural transformation and African agriculture

In the opening chapter of this book, de Haas et al. (this volume) discuss four possible paths within which African food systems might develop in the coming decades. The defining dimensions – the axes of Figures 1.5 and 1.6 – of these different pathways are sustained changes in agricultural productivity and the transition of labour out of agriculture, both major features of the classic economic structural transformation model. As the discussion above has shown, increases in agricultural productivity, the movement of labour out of agriculture *and* increases in farm size are generally seen as interrelated developments which follow productivity growth in non-agricultural (urban) sectors. Yet, despite sustained, albeit slow economic growth of non-agricultural sectors in many African economies (de Haas et al., this volume), we find ongoing growth of urban *and* rural populations, and remarkably little evidence of a movement of people out of agriculture (Bandiera et al., 2022).

5.1 Rural population growth, agricultural intensification and marginalization

Although urban sectors – both formal and informal – absorb increasing numbers of labourers, so does the agricultural sector in many places. For instance, Sida et al. (this volume) report significant increases in agricultural productivity in Ethiopia over the past decade, but no evidence for a decrease in the number of people involved in agriculture. This represents the upper left quadrant of “intensive agricultural growth” of Figures 1.5 and 1.6. In terms of future trends, the rural population of Ethiopia will continue to grow, despite even faster urban growth, suggesting a further fragmentation of farms. The potential repercussions of such fragmentation are highlighted by studies on land pressure in the densely populated southern highlands of Ethiopia. In response to the scarcity of grazing land and fodder for their animals,

households scaled-down their livestock holdings, shifting from cattle to small ruminants (Mellisse et al., 2017). In turn, less manure was available to maintain soil fertility, which led to declining yields of the perennial crop enset (*Enset ventricosum*). Households could maintain their food security by switching to cultivation of khat (*Catha edulis*) in areas with good market linkages, and to cereal crops in remoter areas (Mellisse et al., 2018). Given the already dense population of >500 people/km², to what extent such farming systems will be able to absorb and feed an even larger population is unclear. A similar pattern is repeated across the East African highlands where farms are smallest in areas that have long been settled – parts of western Kenya had population densities exceeding 300 people/km² already a century ago (Crowley & Carter, 2000). But unlike in Ethiopia, agricultural productivity is hardly rising in western Kenya (Giller et al., 2021b).

5.2 Rural population growth, and expansion into fragile lands

In relatively sparsely populated areas, such as Bougouni in Mali (Ollenburger et al. (2019), ongoing rural population growth generally results in an expansion of the agricultural area, rather than agricultural productivity growth, suggesting that Africa's Sleeping Giant (Morris et al., 2009) will remain in hibernation (Ollenburger et al., 2016). Baudron et al. (2012) concluded that African farmers are predisposed to extensification rather than intensification, based on a historical analysis of technology adoption.

Given that much of Africa's fertile land is already used for agriculture, this raises the alarm that further agricultural expansion will extend into increasingly fragile and marginal lands, making farming-dependent livelihoods increasingly risky and vulnerable to droughts and climate change (Andersson, 2007). The push for expansion into marginal land is strongly driven by lack of employment opportunities elsewhere (Giller et al., 2013), suggesting that future expansion of cropland and livestock grazing will also be at the expense of biodiversity (see Sassen, this volume).

6 Rural-urban linkages: the internationalization of remittance flows

While during the colonial era, labour for the expanding wage labour economy (mines, farms, urban centres) gradually increased and was sometimes actively mobilized through taxation, the outflow of labour from agriculture was limited as urban workers returned to their rural homes in case of unemployment, or upon retirement. Although urbanization has progressed and become more permanent in nature in many areas, the links of farming households with urban areas and the wage labour economy have persisted. For instance, international migration within Africa and beyond its borders has resulted in massive remittance flows, by which a diverse category of migrants sustain both rural and urban livelihoods of family members and agricultural production on smallholder farms. While figures on the importance of remittances for sustaining smallholder agricultural production are hard to come by and often hidden from view by a burgeoning industry of money transfers (Mpesa, Moneygram, Western Union, etc.), numerous African economies and, notably, rural and urban households are increasingly dependent on international money transfers (Figure 15.2). Such transfers, formal and informal, international and local, are likely to increase in significance for sustaining rural livelihoods (Crush, 2013), food and nutrition security (Zezza et al., 2011). Small farms and their production will continue to, and increasingly, be subsidized by such off-farm incomes.

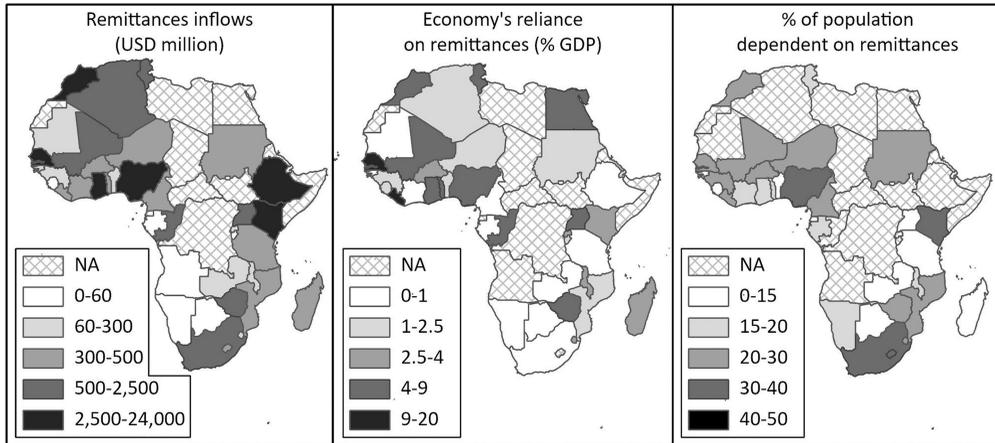


Figure 15.2 Remittance inflows, percentage of GDP and percentage of the population dependent on (inter)national remittances.

Data source: <https://remitscope.org/africa/themes/> (Accessed: 23 November 2022).

7 What will lead to consolidation of land?

So the question remains, what are the likely implications of the shift of livelihood focus towards non-agricultural sources of income on farm size? Whereas in Europe's process of structural transformation migration to expanding urban centres, sometimes assisted by deliberate government policies, led to consolidation of small, unviable farms into larger units, it seems unlikely that the same trends will be observed in Africa. An important reason for this is that the farm often functions as a fall-back option – albeit insufficient – given the uncertainty in (international) migration and of urban jobs, as well as a safe-haven for retirement given the lack of pensions or other forms of social security. It is noteworthy to mention that agricultural mechanization, scale enlargement and land consolidation in post-World War II Europe took place in a situation of both rapid growth of non-agricultural sectors *and* the emergence of welfare states, providing livelihood security to pensioners and the unemployed. Second, land and the rural home is much more than a productive resource – a place of belonging and tradition, where ancestors are buried (Andersson, 2002). Given the time frame of our analysis, the prospects for substantial consolidation of land before 2050 thus appear small.

8 Conclusion – revisiting the model of structural transformation

It seems that the concept of structural transformation is so deeply ingrained in our thinking that we interpret developments in its categories of thought and are unable to question the assumptions on which it is based. Africa is unique in many ways, and its late demographic transition, coming at a time when other economies are already industrialized and the world has globalized, blocks many avenues for export-oriented economic development. Structural transformation assumes labour productivity growth in agriculture and movement of people out of agriculture, with consolidation of land into larger, more economic units, a natural accompanying process. However, in Asia there is limited evidence that substantial land consolidation has taken place

(Giller et al., 2021a). No doubt, the Green Revolution led to increases in agricultural (labour) productivity, which was an essential part of ensuring the food security of countries in South and South-east Asia. But despite rapid industrialization and urbanization it did so without a concomitant change in farm size (Liu et al., 2020). Concerning the future of farm size, the speed of transition of the population into employment outside agriculture will be key. A recent estimate suggests that 420 million of the 428 million prime-age workers entering the job market between 2020 and 2040 will be in Africa, 98% of the global labour force growth (Goldstone & May, 2023). The potential “demographic dividend” this presents can only be realized if labour markets thrive, can absorb these workers and provide for salaries that enable workers to sustain themselves and their families (Paice, 2021). Many African countries are experiencing, or have experienced, growth in agricultural productivity. But this has not led to the expected transition out of agriculture, not least due to the lack of jobs to pull people away (Sumberg et al., 2021). Rapid urbanization no doubt creates substantial informal employment in all manner of service roles (hospitality, transport, domestic help, etc.) – but not necessarily the means to grow the economy. Pieters (this volume) shows that work outside agriculture in Africa is concentrated in low-productivity, self-employment. She further emphasizes that, given the technological advances in manufacturing leading to labour saving, it is difficult for low-income countries to benefit from low-wage labour.

Given that Africa is facing rapid demographic growth in both urban and rural areas, coupled with sluggish non-agricultural employment growth (see Pieters, this volume), let alone the lack of welfare-state-like securities for pensioners and the unemployed, the prospects for consolidation of land into larger farms are bleak. The arguments raised in this chapter lead us to question the explanatory power of the structural change model and its value as a roadmap for rural development in Africa.

In terms of food security in Africa, the past and current gains in agricultural productivity are unable to keep pace with the rate of population growth (Schut & van Ittersum, this volume). This is due, at least in part, to the slow uptake of agricultural technology in Africa (Suri & Udry, 2022). But small farm size is also a cause of such slow uptake; productivity gains often translate into only small gains in household food security. Thus, small farm size becomes a major barrier to achieving greater food self-sufficiency at a *national* scale. As there are few incentives for households to invest in agriculture, this leads to stagnation in agricultural productivity – i.e. the African ‘Food Security Conundrum’ (Giller, 2020). Rural households reluctant to invest in boosting agricultural productivity occupy the majority of the land. As Hazell et al. (2010) bemoan, governments tend to focus on short-term horizons with support such as subsidies without sufficient attention to long-term investment in agricultural infrastructure. Meanwhile, we keep searching for the magic (suite of) technology improvements to improve the yields of smallholders, increasing our knowledge and the benefits of tailoring to local circumstances while forgetting the big picture. At least equal, but perhaps more attention needs to be given to creating opportunities for employment and livelihood security outside agriculture to create the economic incentives for longer-term investments in agriculture.

The time frame we have chosen for the analyses presented in this book – to 2050 – is fairly predictable in terms of future trends in farm size. What will happen after that is impossible to foresee. No doubt, farming will continue to be an important source of food and income for rural households, alongside other income streams. But trends in farm size suggest that rural poverty will become even more entrenched, both in absolute terms and in the proportion of households. Re-orientation of farming towards ensuring more healthy diets through diversification is perhaps more important than a singular focus on raising productivity.

Notes

- 1 Alliance for Food Sovereignty in Africa – <https://afsafrica.org/>; FAO Family Farming Network – <https://www.fao.org/family-farming/en/>.
- 2 A poverty trap is “any self-reinforcing mechanism which causes poverty to persist”.

References

- Adamopoulos, T., & Restuccia, D. (2014). The size distribution of farms and international productivity differences. *The American Economic Review*, 104(6), 1667–1697. <https://www.jstor.org/stable/42920862>
- Amin, S. (1972). Underdevelopment and dependence in Black Africa: Historical origin. *Journal of Peace Research*, 9(2), 105–119. <https://doi.org/10.1177/002234337200900201>
- Andersson, J.A. (2002). Going places, staying home: Rural-urban connections and the significance of land in Buhera District, Zimbabwe (PhD thesis). Wageningen University.
- Andersson, J.A. (2007). How much did property rights matter? Understanding food insecurity in Zimbabwe: A critique of Richardson. *African Affairs*, 106(425), 681–690.
- Annan, K.A. (2008). Forging a uniquely African green revolution. Address by Mr. Kofi A. Annan, Chairman of AGRA, 30 April 2008.
- Arrighi, G. (1970). Labour supplies in historical perspective: A study of the proletarianization of the African peasantry in Rhodesia. *Journal of Development Studies*, 6, 197–234.
- Bandiera, O., Elsayed, A., Smurra, A., & Zipfel, C. (2022). Young adults and labor markets in Africa. *Journal of Economic Perspectives*, 36(1), 81–100. <https://doi.org/10.1257/jep.36.1.81>
- Barrett, C.B., Christiaensen, L., Sheahan, M., & Shimeles, A. (2017). On the structural transformation of rural Africa. *Journal of African Economies*, 26(suppl_1), i11–i35. <https://doi.org/10.1093/jae/ejx009>
- Baudron, F., Andersson, J.A., Corbeels, M., & Giller, K.E. (2012). Failing to yield? Ploughs, conservation agriculture and the problem of agricultural intensification: An example from the Zambezi Valley, Zimbabwe. *Journal of Development Studies*, 48, 393–412.
- Carr, S.J. (2017). *Surviving on half a hectare of land: An introduction to the issues surrounding smallholder farming in Malawi*. Plant Production Systems, Wageningen University and Research <https://doi.org/10.18174/417831>.
- Collier, P., & Dercon, S. (2014). African agriculture in 50 years: Smallholders in a rapidly changing world? *World Development*, 63, 92–101. <https://doi.org/10.1016/j.worlddev.2013.10.001>
- Crowley, E.L., & Carter, S.E. (2000). Agrarian change and the changing relationships between toil and soil in Maragoli, western Kenya (1900–1994). *Human Ecology*, 28, 383–414.
- Crush, J. (2013). Linking food security, migration and development. *International Migration*, 51. <https://doi.org/10.1111/imig.12097>.
- Ellis, F. (1998). Household strategies and rural livelihood diversification. *Journal of Development Studies*, 35(1), 1–38. <https://doi.org/10.1080/00220389808422553>
- Erenstein, O., Chamberlin, J., & Sonder, K. (2021). Farms worldwide: 2020 and 2030 outlook. *Outlook on Agriculture*, 50(3), 221–229. <https://doi.org/10.1177/00307270211025539>
- FAO. (2018). *Rural livelihoods information system (RuLIS)*. Statistics Division, September. Available from <https://www.fao.org/in-action/rural-livelihoods-dataset-rulis/data-application/bulk-download/indicators/en>
- FAO. (2021). *FAOSTAT crop production [Online]*. Available from <https://www.fao.org/faostat/en/#home>.
- Franke, A.C., van den Brand, G.J., & Giller, K.E. (2014). Which farmers benefit most from sustainable intensification? An *ex-ante* impact assessment of expanding grain legume production in Malawi. *European Journal of Agronomy*, 58, 28–38.
- Frelat, R., Lopez-Ridaura, S., Giller, K.E., Herrero, M., Douxchamps, S., Djurfeldt, A.A., ... & van Wijk, M.T. (2016). Drivers of household food availability in sub-Saharan Africa based on big data from small farms. *Proceedings of the National Academy of Sciences, USA*, 113, 458–463. <https://doi.org/10.1073/pnas.1518384112>
- Giller, K.E. (2020). The food security conundrum of sub-Saharan Africa. *Global Food Security*, 26, 100431. <https://doi.org/10.1016/j.gfs.2020.100431>

- Giller, K.E., Baudron, F., Matema, S., Milgroom, J., Murungweni, C., Guerbois, C., & Twine, W. (2013). Population and livelihoods on the edge. In J.A. Andersson, M. de Garine-Wichatitsky, D.H.M. Cumming, V. Dzingirai, & K.E. Giller (Eds.), *Transfrontier conservation areas: People living on the edge* (pp. 62–88). Routledge.
- Giller, K.E., Delaune, T., Silva, J.V., Descheemaeker, K., van de Ven, G., Schut, A.G.T., ... & Van Ittersum, M.K. (2021a). The future of farming: Who will produce our food? *Food Security*, *13*, 1073–1099.
- Giller, K.E., Delaune, T., Silva, J.V., Descheemaeker, K., van de Ven, G., Schut, A.G.T., ... & Andersson, J.A. (2021b). Small farms and development in sub-Saharan Africa: Farming for food, for income or for lack of better options? *Food Security*, *13*, 1431–1454. <https://doi.org/10.1007/s12571-021-01209-0>
- Giller, K.E., Tittonell, P., Rufino, M.C., van Wijk, M.T., Zingore, S., Mapfumo, P., ... & Vanlauwe, B. (2011). Communicating complexity: Integrated assessment of trade-offs concerning soil fertility management within African farming systems to support innovation and development. *Agricultural Systems*, *104*, 191–203. <https://doi.org/10.1016/j.agry.2010.07.002>
- Goldstone, J.A., & May, J.F. (2023). The global economy's future depends on Africa: As others slow, a youthful continent can drive growth. *Foreign Affairs*. <https://www.foreignaffairs.com/africa/global-economys-future-depends-africa>
- Harris, D., & Orr, A. (2013). Is rainfed agriculture really a pathway from poverty? *Agricultural Systems*, *123*, 84–96.
- Hazell, P., Poulton, C., Wiggins, S., & Dorward, A. (2010). The future of small farms: Trajectories and policy priorities. *World Development*, *38*, 1349–1361. <https://doi.org/10.1016/j.worlddev.2009.06.012>
- Hengsdijk, H., Franke, A.C., van Wijk, M.T., & Giller, K.E. (2014). How small is beautiful? Food self-sufficiency and land gap analysis of smallholders in humid and semi-arid sub Saharan Africa. Plant Research International, Wageningen UR, 68.
- Jayne, T.S., Chamberlin, J., Traub, L., Sitko, N., Muyanga, M., Yeboah, F.K., ... & Kachule, R. (2016). Africa's changing farm size distribution patterns: The rise of medium-scale farms. *Agricultural Economics*, *47*(S1), 197–214. <https://doi.org/10.1111/agec.12308>
- Julien, J.C., Bravo-Ureta, B.E., & Rada, N.E. (2019). Assessing farm performance by size in Malawi, Tanzania, and Uganda. *Food Policy*, *84*, 153–164. <https://doi.org/10.1016/j.foodpol.2018.03.016>
- Kuznets, S. (1966). *Modern economic growth: Rate, structure, and spread*. Yale University Press, 1966.
- Kuznets, S. (1973). Modern economic growth: Findings and reflections. *The American Economic Review*, *63*(3), 247–258.
- Lewis, W.A. (1954). Economic development with unlimited supplies of labor. *The Manchester School*, *22*, 139–191.
- Liu, Y., Barrett, C.B., Pham, T., & Violette, W. (2020). The intertemporal evolution of agriculture and labor over a rapid structural transformation: Lessons from Vietnam. *Food Policy*, *94*, 101913–101914. <https://doi.org/10.1016/j.foodpol.2020.101913>
- Lowder, S.K., Sánchez, M.V., & Bertini, R. (2021). Which farms feed the world and has farmland become more concentrated? *World Development*, *142*, 105455. <https://doi.org/10.1016/j.worlddev.2021.105455>
- Marinus, W., Thuijsman, E.S., van Wijk, M.T., Descheemaeker, K., van de Ven, G.W.J., Vanlauwe, B., & Giller, K.E. (2022). What farm size sustains a living? Exploring future options to attain a living income from smallholder farming in the East African Highlands. *Frontiers in Sustainable Food Systems*, *5*, 759105. <https://doi.org/10.3389/fsufs.2021.759105>
- McMillan, M., & Headey, D. (2014). Introduction - Understanding structural transformation in Africa. *World Development*, *63*(C), 1–10. <https://doi.org/10.1016/j.worlddev.2014.02.007>
- Mellisse, B.T., Descheemaeker, K., Giller, K.E., Abebe, T., & van de Ven, G.W.J. (2018). Are traditional home gardens in southern Ethiopia heading for extinction? Implications for productivity, plant species richness and food security. *Agriculture, Ecosystems and Environment*, *252*, 1–13. <https://doi.org/10.1016/j.agee.2017.09.026>
- Mellisse, B.T., van de Ven, G.W.J., Giller, K.E., & Descheemaeker, K. (2017). Home garden system dynamics in southern Ethiopia. *Agroforestry Systems*. <https://doi.org/10.1007/s10457-017-0106-5>

- Morris, M., Binswanger-Mkhize, H.P., & Byerlee, D. (2009). *Awakening Africa's sleeping giant: Prospects for commercial agriculture in the Guinea Savannah zone and beyond*. The World Bank. <https://doi.org/10.1596/978-0-8213-7941-7>
- Mutungi, C., Manda, J., Feleke, S., Abass, A., Bekunda, M., Hoeschle-Zeledon, I., & Fischer, G. (2023). Adoption and impacts of improved post-harvest technologies on food security and welfare of maize-farming households in Tanzania: A comparative assessment. *Food Security*, 15(4), 1007–1023.
- Nye, P.H., & Greenland, D.J. (1960). *The soil under shifting cultivation*. Commonwealth Agricultural Bureaux.
- Ollenburger, M., Crane, T., Descheemaeker, K., & Giller, K.E. (2019). Are farmers searching for an African Green Revolution? Exploring the solution space for agricultural intensification in southern Mali. *Experimental Agriculture*, 55, 288–310. <https://doi.org/10.1017/S0014479718000169>
- Ollenburger, M.H., Descheemaeker, K., Crane, T.A., Sanogo, O.M., & Giller, K.E. (2016). Waking the sleeping giant: Agricultural intensification, extensification or stagnation in Mali's Guinea Savannah. *Agricultural Systems*, 148, 58–70. <https://doi.org/10.1016/j.agsy.2016.07.003>
- Paice, E. (2021). *Youthquake: Why African Demography Should Matter to the World*. Head of Zeus.
- Palmer, R.H., & Parsons, N. (1977). *The roots of rural poverty in Central and Southern Africa* (Vol. 11977). Univ of California Press.
- Phimister, I. (1993). Rethinking the reserves: Southern Rhodesia's land husbandry act reviewed. *Journal of Southern African Studies*, 19, 225–239.
- Ronner, E., Sumberg, J., Glover, D., Descheemaeker, K.K.E., Almekinders, C.J.M., Haussmann, B.I.G., ... & Giller, K.E. (2021). Basket of options: Unpacking the concept. *Outlook on Agriculture*, 50(2), 116–124. <https://doi.org/10.1177/00307270211019427>
- Samberg, L.H., Gerber, J.S., Ramankutty, N., Herrero, M., & West, P.C. (2016). Subnational distribution of average farm size and smallholder contributions to global food production. *Environmental Research Letters*, 11(12), 1–11. <https://doi.org/10.1088/1748-9326/11/12/124010>
- Schumacher, E.F. (1973). *Small is beautiful: A study of economics as if people mattered*. Blond & Briggs Ltd.
- Sheahan, M., & Barrett, C.B. (2017). Ten striking facts about agricultural input use in sub-Saharan Africa. *Journal of Food Policy*, 67, 12–25. <https://doi.org/10.1016/j.foodpol.2016.09.010>
- Sumberg, J., Fox, L., Flynn, J., Mader, P., & Oosterom, M. (2021). Africa's "youth employment" crisis is actually a "missing jobs" crisis. *Development Policy Review*, 39(4), 621–643. <https://doi.org/10.1111/dpr.12528>
- Suri, T., & Udry, C. (2022). Agricultural technology in Africa. *Journal of Economic Perspectives*, 36(1), 33–56. <https://doi.org/10.1257/jep.36.1.33>
- Tittonell, P., & Giller, K.E. (2013). When yield gaps are poverty traps: The paradigm of ecological intensification in African smallholder agriculture. *Field Crops Research*, 143, 76–90. <https://doi.org/10.1016/j.fcr.2012.10.007>
- Tittonell, P., Vanlauwe, B., Leffelaar, P.A., Rowe, E.C., & Giller, K.E. (2005). Exploring diversity in soil fertility management of smallholder farms in western Kenya - I. Heterogeneity at region and farm scale. *Agriculture, Ecosystems and Environment*, 110, 149–165. <https://doi.org/10.1016/j.agee.2005.04.001>
- van Vliet, J.A., Slingerland, M.A., Waarts, Y.R., & Giller, K.E. (2021). A living income for cocoa producers in Côte d'Ivoire and Ghana? *Frontiers in Sustainable Food Systems*, 5, 350. <https://doi.org/10.3389/fsufs.2021.732831>
- World Bank. (2020). *Microdata library, living standards measurements study*. Available from <https://microdata.worldbank.org/index.php/catalog/lsm>
- Zeza, A., Carletto, C., Davis, B., & Winters, P. (2011). Assessing the impact of migration on food and nutrition security. *Food Policy*, 36(1), 1–6. <https://doi.org/10.1016/j.foodpol.2010.11.005>
- Zingore, S., Murwira, H.K., Delve, R.J., & Giller, K.E. (2007). Influence of nutrient management strategies on variability of soil fertility, crop yields and nutrient balances on smallholder farms in Zimbabwe. *Agriculture, Ecosystems and Environment*, 119, 112–126. <https://doi.org/10.1016/j.agee.2006.06.019>