The changing face of agriculture in Tanzania: Indicators of transformation

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Abstract

Motivation: The extent to which African farming systems are undergoing transformation continues to be strongly debated.

Purpose: With a focus on Tanzania, this study assesses whether recent trends in farm behaviour, the structure of farming, and agricultural commercialization and productivity conform to stylized facts about agricultural transformation. In the process, we propose an updated typology of farms that reflects recent changes in the relative importance of different farm categories and sheds light on the heterogeneity found even among smallholder farms.

Approach and methods: To this end, we refer to farm-household survey data over the period 2008–2014.

Findings: We find that medium-scale farms and small, farm-focused, commercialized farms are claiming an increasingly prominent role in Tanzanian agriculture. Farmers are more likely to participate in markets for land and labour, to engage in some forms of agricultural intensification and to exhibit a commercial orientation. Over the study period, the real value of agricultural output grew substantially, mostly reflecting a remarkable expansion of cropland rather than increased land productivity. Labour productivity also grew, driven by a reduction in labour intensity. At the same time, Tanzania is experiencing a dramatic movement of labour out of agriculture.

Policy implications: Together, the evidence suggests that Tanzania is on the cusp of larger transformational processes in the decades to come. With this knowledge, policies can be thoughtfully shaped to support agricultural growth (particularly in land productivity) and meet farmers' diverse needs.

Keywords

agricultural transformation, factor markets, productivity, Tanzania
The process of structural transformation, whereby low-income societies with a heavy focus on agriculture transition to become high-income societies with a smaller but more productive agricultural sector, is widely found to occur alongside (or follow from) agricultural transformation. Such transformation is generally characterized by agricultural intensification (the adoption of improved seed and other modern inputs), greater participation in agricultural factor markets, a shift toward higher-income crops and animal products, a greater commercial orientation of farms, and increased integration of farm and off-farm stages of the agri-food system. Labour productivity rises both within and beyond agriculture as labour shifts away from farming toward higher-return sectors. Evidence regarding many (though not all) of these transformation processes can be examined through farm-household surveys.

Agricultural productivity growth is seen as a catalyst for broad shifts in the national employment structure, especially in heavily agrarian societies. This is because rising agricultural productivity enables greater surplus production, and with this extra income, farm-households demand goods and services, circulating money in their communities and deepening the non-farm economy. In addition to these forward linkages, more productive farms also exhibit backward linkages through agricultural employment and heightened demand for inputs (Johnston & Mellor, 1961). It follows that, in the early stages of economic development, the non-farm economy is tightly related to agriculture (Davis et al., 2017; Barrett et al., 2017a). A stronger non-farm economy, coupled with rising agricultural labour productivity, spurs a labour exit from farming (Jayne et al., 2018). Agricultural surpluses and deeper food markets further enable broad employment shifts by ensuring that non-agricultural households will have reliable access to food, even once they are detached from the land.

For these reasons, agriculture is often characterized as an “engine” that generates non-farm income opportunities (Larson et al., 2016). It is deemed to exhibit greater multiplier effects than other sectors, owing to its especially strong backward and forward linkages (Johnston & Mellor, 1961). And because so many poor people are found on farms, agricultural growth is considerably more effective at reducing poverty than growth in other sectors (Diao et al., 2010). Thus, even though structural transformation entails a large labour exit from agriculture, the pursuit of this transformation requires investment in, rather than neglect of, the agricultural sector (Davis et al., 2017). Diao et al. (2010) conclude that “there is little evidence to suggest that [African] countries can bypass a broad-based agricultural revolution to successfully launch their economic transformations.”

The conventional orientation of national governments and development partners toward agricultural investments in sub-Saharan Africa has been focused narrowly on smallholder agriculture. This emphasis rests on several arguments. First, improving small farm productivity offers the “shortest path” to poverty reduction simply because this is where poverty is concentrated (Larson et al., 2016). Second, the commonly observed inverse relationship between farm size and land productivity suggests that, at least in the face of market failures for land, labour and capital, land can be used more productively in the hands of smallholder farmers (Larson et al., 2016; Carletto et al., 2015; Ali & Deininger, 2015). Third, smallholder agriculture has a unique capacity to absorb new workers in countries with rapidly growing populations (Losch et al., 2012). Among smallholder farmers, Mellor (2014) argues for policy attention to be directed toward non-poor, commercially oriented farmers, as these have sufficient land to produce a surplus and a tendency to spend their newfound wealth on locally produced, employment-intensive goods and services in their low-income communities.

Nevertheless, some analysts argue that small farms forgo economies of scale associated with skills and technology, meaning that the success of larger-scale farms is also necessary for agricultural development. Furthermore, small farms can benefit from engagement with larger farms through knowledge diffusion, service provision (e.g., machine rental), vertical integration to achieve scale economies in processing and
marketing (Collier & Dercon, 2014), and by attracting local investments in input and output markets that can also benefit nearby smallholder farmers (Sitko et al., 2018; Wineman et al., 2019). In this way, the changing distribution of different farm types can play a role in the story of agricultural transformation.

Whether countries in sub-Saharan Africa are moving along the arc of transformation remains an open question. Analysts have alternately asserted that Africa is undergoing dramatic change in the agricultural sector (Barrett et al., 2017a; Barrett et al., 2017b; Jayne et al., 2016; Jayne et al., 2018) or that agriculture remains more or less moribund (United Republic of Tanzania, 2016). Certainly, the slow yield growth of most field crops in Africa represents a major challenge to the agricultural transformation narrative. This study examines the evidence related to agricultural transformation in Tanzania over the period 2008–2014, with a focus on farm behaviours and agricultural outcomes. We believe that trends in Tanzania are representative of changes occurring in other African countries, and therefore that the lessons gleaned from an in-depth exploration of the Tanzanian context are more widely relevant.

Our contribution to the literature is twofold. First, the perception that Tanzanian farms are dominated by small-scale, subsistence-oriented farms is increasingly outdated. In this article, we employ a typology of farms that characterizes Tanzania’s current and highly heterogeneous farm structure. Our typology highlights the rising importance of medium-scale farms and the growing prevalence of smaller, farm-focused and commercially oriented farms in Tanzania’s agricultural landscape. Second, we present the most recent evidence available for a wide spectrum of indicators of agricultural transformation, with consideration of both farm behaviours and production outcomes, and with attention to often-overlooked topics, such as the burgeoning sales market for farmland. We again find that perceptions of a staid farm sector are outdated; rather, there are indications of growth and dynamism along several axes. At the same time, national poverty rates are falling, and rural Tanzanians are de-emphasizing agriculture in their employment profiles. These changes are consistent with the notion that agricultural growth strengthens the rural non-farm economy and ultimately enables people to securely exit agriculture.

The remainder of the article is structured as follows. Section 2 outlines the history of agriculture in Tanzania. Section 3 introduces the research questions and data source. Section 4 presents evidence on broad trends in agri-food systems, while section 5 presents a typology of farm-households and considers how the relative importance of each farm type has changed. Section 6 concludes with a discussion of implications for policy-makers and researchers.

2 | AGRICULTURE IN TANZANIA

A brief overview of the history of agriculture in Tanzania will help to place this analysis in context. Tanzania in the 1950s was characterized by a robust system of peasant agriculture (Bryceson, 1988). However, in the two decades after Tanzania gained independence in 1961, agricultural production was alternately stagnant and unstable. The agri-food system was at that time characterized by state-controlled input and output markets and pan-territorial crop prices that brought low prices for farmers. In 1973, the ujamaa villagization programme gathered peasants into nucleated settlements, often to practice collective farming (Bryceson, 1988; Lofchie, 1978), and this programme (unpopular among farmers) is regarded as an internal cause of agricultural decline in the early 1970s (Lofchie, 1978). High oil prices in the 1970s also contributed to this agricultural malaise by raising transportation costs and making it more difficult to produce crops for export, prompting a shift toward domestically consumed crops and growing the country’s trade deficit (Bryceson, 1988, 2019). Bryceson (2019) characterizes this era as one of “depeasantization” (a shift away from commodity production toward either subsistence production or non-agricultural work) and “deagrarianization” (the movement of labour out of agriculture).
In the 1980s, structural adjustment policies were introduced to transition from a socialist to a market economy and reduce barriers to domestic and international trade (Cooksey, 2011, 2012). The National Milling Corporation, which previously acted as a monopoly in the purchase and distribution of food grains, was replaced by private traders, and fertilizer markets were likewise opened to private suppliers (Cooksey, 2011). Meertens (2000) argues that this process was too rapid, with the private sector unable to meet farmers’ needs in the short term. Though domestic food markets are considered to be largely liberalized, some find that export crop markets are not, and in fact, that anti-liberalization sentiments remain strong in Tanzania. In the early 20th century, efforts to “bring the state back in” to agricultural policy spanned policies of taxation and lending, the re-empowerment of export crop boards, and the positioning of the state as a vehicle of foreign aid-funded projects (Cooksey, 2011).

Today, agriculture remains important in Tanzania, employing a large majority of the labour force and accounting for about one-quarter of gross domestic product (Benson et al., 2017; Cooksey, 2012). The food price crisis of 2007–2008 has inspired greater interest in agriculture on the part of both donor agencies and the private sector. Nevertheless, the narrative in Tanzania tends to be one of stagnation, in which much of agriculture remains small-scale, undercapitalized and labour intensive (Cooksey, 2012).

It is evident that agricultural policy in Tanzania has long been characterized by tension between faith in the market system and in the state, and this endures to this day. The government’s major agricultural policy of the 20th century is the Agricultural Sector Development Programme, which has occurred in two phases (ASDP-I, from 2006 to 2013, and ASDP-II, from 2018 to 2025). Despite this being framed as a private sector-focused initiative, Cooksey (2012) describes ASDP-I as primarily a state-centric development strategy with a secondary role for markets and private sector actors. The Kilimo Kwanza framework for agricultural development was introduced in 2008 with an emphasis on private sector-driven development in support of commercial farming, and the Southern Agricultural Growth Corridor of Tanzania (SAGCOT), which was officially launched in 2010, aims to attract private investments in agriculture and public investments in infrastructure to specific geographic clusters (United Republic of Tanzania, 2016). The National Agricultural Input Voucher Scheme (NAIVS), consisting of input vouchers for inorganic fertilizer and improved maize and rice seed, was introduced in 2009 and eventually targeted approximately two million farmers (Cooksey, 2012). This was scaled back around 2014 and has been replaced with a Fertilizer Bulk Procurement System (FBPS) aimed at regulating fertilizer prices (Kasumuni, 2018).

The evaluation of these various policies is mixed. For example, a joint study by the Ministry of Agriculture, Food Security, and Cooperatives (MAFC), Research on Poverty Alleviation (REPOA), and the World Bank finds that NAIVS was successful in raising agricultural productivity (United Republic of Tanzania, 2016), while Cooksey (2012) tells a story of elite capture, with some diversion of subsidized fertilizer and vouchers provided to relatively wealthy farmers. In this article, we do not attempt to attribute trends around agricultural transformation to different policies, acknowledging that discerning causality at the level of the agricultural sector is very challenging.

3 | RESEARCH QUESTIONS AND DATA SOURCES

This study aims to discern what indications of agricultural or structural transformation are evident in Tanzania, based on available household survey data during the 2008–2014 study period. While a comprehensive assessment of agricultural transformation would entail examination of trends in agribusiness investment in input markets and downstream stages of agri-food systems, including processing, wholesaling and retailing, such data are largely unavailable. The need for additional data is discussed in section 6.
sectors, we focus mostly on the experiences of agricultural households and their interaction with input and output markets. We specifically examine whether agricultural factor markets are growing increasingly active in recent years; whether farms are more likely to engage in agricultural intensification or market their agricultural output; whether there is evidence of area expansion and/or land or labour productivity growth; and whether farms are more likely to diversify or specialize.

We also consider the landscape of farm types to discern whether the prevalence and relative importance of each type of farm has changed. Thus, farm-households are categorized as being small, medium or large in scale, based on their farm size (land area cultivated, with special attention given to the land area devoted to higher-value fruits and vegetables) and livestock holdings. This loosely incorporates the farm classification criteria used by the National Bureau of Statistics (Tanzania National Bureau of Statistics, 2012). In the spirit of Dorward et al. (2009) and Hazell et al. (2017), small-scale farm-households are further disaggregated by whether they specialize in off-farm activities (deriving at least 75% of household income from off-farm sources), and whether their farms are commercially oriented (marketing at least 50% of agricultural production). These thresholds were selected to disaggregate small-scale farms into groups that are notably distinct from one another (see Figure 1).

This report draws on four waves of the Tanzania National Panel Survey—NPS, also known as the Living Standards Measurement Study – Integrated Surveys on Agriculture (LSMS-ISA) (Tanzania National Bureau of Statistics, 2010, 2012, 2014, 2017). This nationally representative survey was implemented by the Tanzania National Bureau of Statistics in 2008–2009, 2010–2011, 2012–2013 and 2014–2015 (hereafter referred to as survey years 2008, 2010, 2012 and 2014). The data set captures detailed information on household landholdings and agricultural production over the previous year, as well as demographics and income-generating activities. As a household data set, the NPS necessarily does not capture agricultural activities undertaken by parastatals or corporations, which likely comprise the largest farms in the country. However, it provides a detailed view of the population of farm-households who comprise a large majority of all households in the country.

Several key terms are used throughout this paper:

- A **cropping household** has engaged in any cropping activities in the past year, either cultivating some land or collecting some harvest.
- A **livestock household** has either sold or slaughtered some livestock or produced some livestock products in the past year.
- An **agricultural household** has engaged in either cropping or livestock activities in the past year.

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FIGURE 1  Farm categories

| A. On-farm focus, not commercialized |
|--------------------------------------|
|  • ≥25% household income from the farm |
|  • <50% value of farm production marketed |

| B. On-farm focus, commercialized |
|---------------------------------|
|  • ≥25% household income from the farm |
|  • >50% value of farm production marketed |

| C. Off-farm focus, not commercialized |
|--------------------------------------|
|  • <25% household income from the farm |
|  • <50% value of farm production marketed |

| D. Off-farm focus, commercialized |
|---------------------------------|
|  • <25% household income from the farm |
|  • >50% value of farm production marketed |

| E. Medium |
|-----------|
|  • 5-20 ha cultivated, or |
|  • 0.5-2 ha cultivated with fruits/vegetables, or |
|  • 35-105 Tropical Livestock Units |

| F. Large |
|----------|
|  • ≥20 ha cultivated, or |
|  • 2.2 ha cultivated with fruits/vegetables, or |
|  • ≥105 Tropical Livestock Units |

Electronic copy available at: https://ssrn.com/abstract=3721364
Urban households that engage in agriculture are therefore included in the population of agricultural households, while the odd household that owns land, but does not cultivate, is excluded.

Land size estimates are central to the construction of many agricultural indicators. In this study, we use the Global Positioning Systems (GPS) area measures that are available for approximately three-quarters of cultivated plots, and the sizes of unmeasured plots are imputed. This report also draws from the household income estimates produced from the NPS by the Evans School Policy Analysis & Research Group (EPAR, n.d.). Population weights are used in all analyses, and monetary values are adjusted for inflation and reported in 2015 Tanzanian shillings.

The study period, 2008–2014, overlaps with the global food price crisis of 2007–2008, and also falls within the implementation period of the first phase of the Tanzania Agricultural Sector Development Program (ASDP-I) (United Republic of Tanzania, 2016). This may influence our analysis because both conditions led to greater investments in the agricultural sector than had occurred previously. The extent to which any trends detected can be expected to continue beyond the study period may therefore rest on the extent to which such investments are maintained, a point which will be discussed in more detail in section 6.

Some of our results could also be influenced by annual growing conditions that vary from year to year. We have confirmed that rainfall levels did not shift in a linear manner over the study years. Specific results that could be influenced by especially favourable or unfavourable growing conditions are acknowledged in section 4.

4 | EVIDENCE OF AGRI-FOOD SYSTEMS TRANSFORMATION

This section highlights several themes that emerge from our examination of recent time trends in indicators of agricultural or structural transformation.

4.1 | Tanzania is experiencing a dramatic reduction in the share of the population residing in rural areas and a shift in labour away from agriculture

Though Tanzania remains a predominantly agrarian country, the share of households that were rural fell from 74% to 66% between 2008 and 2014 (Table 1). This was accompanied by a similar decline in the percent of households engaged in any agricultural activities (from 82% to 73%), and even a decline in the percent of rural households engaged in agriculture (from 97% to 91%). This transition

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2Specifically, plot size estimates are divided into “units,” such as one-quarter acre, one-half acre or five acres. For unmeasured plots, the size of each unit is captured using the GPS measures of other plots, applying the median value from the smallest local geographic unit for which 10 measurements were taken. Per-crop areas are estimated with reference to the proportion of the plot cultivated with a given seasonal crop or, for permanent crops, with references to per-plant area estimates (United Republic of Tanzania, 2012). Where the sum of per-crop areas on a plot exceeds the plot size (as may happen when crops are intercropped), crop areas are scaled down proportionally to the plot area.

3The Evans School Policy Analysis & Research Group (EPAR), based at the Daniel J. Evans School of Public Policy and Governance at the University of Washington, has constructed a wide range of variables with this data set and makes the Stata code publicly available on their website (EPAR, n.d.).

4The adjustments made to inflate monetary values to 2015 Tanzanian shillings are as follows: 2008 = 1.6775053, 2010 = 1.4021384; 2012 = 1.1207163; 2014 = 1 (World Bank Group, n.d.). Most data from the 2014 survey wave were collected in 2015.
in the rural economy suggests that non-farm opportunities are increasingly available. This pivot away from farming is also reflected in individual-level occupational choices, with both men and women less likely (by 5% and 6%, respectively) to identify agriculture as their main occupation (Table 2). In its place, people tended to cite self-employment or non-agricultural wage work.

Not surprisingly, household income portfolios are also increasingly leaning away from agriculture (Figure 2), with the average percentage of income derived from crop production falling from 36% to 29%, and the average percentage derived from livestock sliding from 11% to 8%. Note that this employment shift does not automatically indicate rising prosperity if people leave agriculture in response to distress (i.e., a stagnant or declining farm sector) rather than in anticipation of opportunity. However, these transitions away from agriculture and out of rural areas have occurred alongside indications of improved welfare, with the average value of consumption per adult equivalent rising over time (with a statistically significant positive trend (P=0.000)), and the household poverty rate falling ever so slightly from 26% in 2008 to 24% by 2014 (with a statistically significant negative trend (P=0.000)).

Table 1 shows the number of households living in rural areas or engaged in agriculture, and Table 2 details the main occupation of individuals by gender and age category.

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**Table 1** Households living in rural areas or engaged in agriculture (percentages)

| Year | Among all households | Among rural households |
|------|----------------------|-----------------------|
|      | Number rural | % Rural | % Agricultural | % Agricultural |
| 2008 | 5,338,115 | 74 | 82 | 97 |
| 2010 | 6,148,095 | 69 | 77 | 93 |
| 2012 | 6,404,694 | 68 | 74 | 91 |
| 2014 | 6,739,502 | 66 | 73 | 91 |

**Table 2** Main occupation of individuals, by gender and age category (percentages)

| Men | Ages 20+ | Ages 20-34 | Ages 35+ |
|-----|----------|------------|---------|
| 2008 | 2014     | 2008      | 2014    | 2008 | 2014 |
| Agriculture/livestock | 76 | 71 | 71 | 65 | 80 | 76 |
| Non-agricultural wage worker | 6 | 8 | 6 | 8 | 6 | 9 |
| Self-employed | 7 | 9 | 7 | 8 | 6 | 9 |
| Other (Fishing/mining, family work, student/too young, jobless, disabled) | 11 | 12 | 17 | 19 | 7 | 6 |

| Women | 2008 | 2014 | 2008 | 2014 | 2008 | 2014 |
|-------|------|------|------|------|------|------|
| Agriculture/livestock | 84 | 78 | 83 | 75 | 85 | 81 |
| Non-agricultural wage worker | 2 | 3 | 2 | 6 | 2 | 2 |
| Self-employed | 4 | 7 | 4 | 6 | 4 | 8 |
| Other | 10 | 12 | 11 | 13 | 9 | 9 |

*Survey (household) weights are adjusted by household size to represent the universe of individuals.

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5 A household’s poverty status is determined with reference to the national poverty line (World Bank, 2015) and the household consumption index per adult equivalent per day, which is weighted with a Fisher food price index specific to geographic stratum and quarter to reflect the cost of living in different settings.
These rates are consistent with those estimated for Tanzania from other data sources (United Republic of Tanzania, 2013). As will be discussed in section 4.5, this labour shift toward non-agricultural employment has coincided with sustained agricultural growth, suggesting that the two trends are linked through the extensive forward and backward linkages between farming and the rest of the economy.

We also find changes occurring within agricultural households in the form of a decreased reliance on food produced on the farm (Table 3). Specifically, the percentage of food value that was acquired through purchase rose from 51% to 60% over six years, mirroring a similar change occurring at the population level. As noted in the introduction, this growing reliance on food markets is a trend commonly associated with agricultural transformation as farms become increasingly specialized, drawing dietary diversity from the market instead of the farm, and as markets are better able to provide a consistent supply for the non-farm population (Benson et al., 2017; Tschirley et al., 2015).

### 4.2 A rising proportion of Tanzanian farm-households are engaging in agricultural land and labour markets

It is a common assumption that agricultural factor markets in rural Africa are thin on the ground or even non-existent, and so, the extent of factor market activity evident in Tanzania is somewhat surprising. In 2014, 50% of all farms hired in at least one day of farm labour, and 38% possessed some farmland that was acquired through purchase (Table 4). Furthermore, there is some evidence that farmers are increasingly likely to utilize these markets, with the percent of farms hiring in labour rising from 45% in 2008 to 50% by 2014. On average, farms hired in 18 labour days in 2014. The average

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**TABLE 3** Trends in food purchases (percentages)

| Year | % of food that is purchased |
|------|----------------------------|
|      | All households | Agricultural households |
| 2008 | 60 | 51 |
| 2010 | 65 | 56 |
| 2012 | 67 | 57 |
| 2014 | 70 | 60 |

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**FIGURE 2** Household income shares (mean values)
The percent of total farm labour that was hired in rose significantly (to 11%), and the average wage for a day of labour also increased significantly. Rising wages are yet another marker of agricultural transformation as labour productivity rises and/or agricultural labour grows scarcer as it exits the farm sector (Jayne et al., 2018; Diao et al., 2016).6

There are further indications that the land market is growing more active, as the percentage of farmers renting land rose from 12% to 16% by 2014 (Table 4). While information on land purchases was

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**Table 4** Trends in agricultural intensification and engagement with factor/input markets (mean values)

|                                      | 2008  | 2010  | 2012  | 2014  | Coefficient on year | P-value |
|--------------------------------------|-------|-------|-------|-------|--------------------|---------|
| **Cropping households (HHs)**       |       |       |       |       |                    |         |
| 1= HH uses only family labour and   | 0.33  | 0.35  | 0.32  | 0.24  | -0.02              | 0.00    |
| non-rented land                     |       |       |       |       |                    |         |
| 1= HH rents land                    | 0.12  | 0.08  | 0.09  | 0.16  | 0.01               | 0.00    |
| 1= HH possesses purchased land      |       |       |       | 0.38  |                    |         |
| (2014)                               |       |       |       |       |                    |         |
| 1= HH hires agricultural labour     | 0.45  | 0.40  | 0.45  | 0.50  | 0.01               | 0.00    |
| 1= HH uses a tractor                | 0.03  | 0.03  | 0.05  | 0.07  | 0.01               | 0.00    |
| 1= HH possesses purchased land      |       |       |       | 0.34  | 0.03               | 0.00    |
| (2014)                               |       |       |       |       |                    |         |
| 1= HH purchased improved seed       | 0.17  | 0.14  | 0.22  | 0.28  | 0.02               | 0.00    |
| 1= HH uses fertilizer               | 0.12  | 0.16  | 0.14  | 0.16  | 0.004              | 0.03    |
| 1= HH uses pesticide                | 0.13  | 0.11  | 0.12  | 0.13  | 0.000              | 0.87    |
| 1= HH accesses agricultural inputs  | 0.01  | 0.02  | 0.02  | 0.02  | 0.001              | 0.25    |
| (seed, fertilizer, chemicals) on    |       |       |       |       |                    |         |
| credit                              |       |       |       |       |                    |         |
| Labour days hired in                | 16    | 15    | 16    | 18    | 0.39               | 0.10    |
| Proportion of labour that is hired in| 0.09  | 0.09  | 0.10  | 0.11  | 0.004              | 0.00    |
| Wage paid per workday (real 2015     | 3,454 | 3,468 | 3,971 | 4,010 | 108                | 0.01    |
| shillings)6                         |       |       |       |       |                    |         |
| Obs.                                 | 2,216 | 2,583 | 3,220 | 2,064 |                   |         |
| **Livestock households**            |       |       |       |       |                    |         |
| 1= HH possesses an improved/exotic  | 0.14  | 0.19  | 0.15  | 0.11  | -0.01              | 0.00    |
| livestock                           |       |       |       |       |                    |         |
| Obs.                                 | 1,560 | 1,698 | 1,951 | 1,231 |                   |         |

6Labour-day adjusted weights are applied to represent the average wage per agricultural labour-day in a given year.

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6Note that both labour inputs and wages may reflect favourable growing conditions in a given season, which could drive up demand for agricultural labour. Across agricultural households, we find that 2014 (reflecting the 2013-2014 main season) was a particularly good year. While the average percentage deviation in main season rainfall from the 1981-2015 average was +1.04%, +2.27%, and -2.52% in the 2008, 2010 and 2012 survey years, this value was +8.50% in 2014 (Climate Hazards Group InfraRed Precipitation with Stations, n.d.; Funk et al., 2014). Thus, for some variables that are influenced by agricultural outcomes, including labour inputs, land productivity and levels of commercialization, readers should bear in mind that data for 2014 may be more favourable than would have been the case in an average year. This underscores the need for sustained data collection over more years.
not available in earlier survey waves, the 2014 NPS reveals that 15% of farms had purchased some land within the previous five years, and 17% of all farms accessed land only through purchase. Farmland values also rose in Tanzania by approximately 5% per year between 2008 and 2014, though limited attention has been given to understanding the functioning of the informal land sales market (Wineman & Jayne, 2018). Rising land prices are another tell-tale sign of agricultural transformation as agriculture becomes more profitable (Jayne et al., 2018).

4.3 Farms are increasingly likely to engage in some (though not all) forms of agricultural intensification

Productivity growth, particularly on small farms, is derived from agricultural intensification, and this often involves the increased application of modern inputs, such as improved seeds or agrochemicals, and the use of machinery (Barrett et al., 2017b; Diao et al., 2016). By 2014, the percentage of cropping farms that applied only family labour and used only non-rented land (with no other inputs) had declined from 33% to 24% (Table 4). Thus, farms are increasingly likely to engage with some markets or apply some mechanization in their farm operations. Mechanization is typically adopted as farmers expand their farm size, face rising labour constraints, or when machines become available on a rental basis (Diao et al., 2016; Jayne et al., 2018), and some of these conditions are certainly evident in Tanzania. As shown in Table 4, agricultural wage rates had risen by 2014, which could push farms to become more capital intensive. Indeed, over this same time period, farmers became more likely to use mechanization, with 7% of all farms using a tractor for land preparation by 2014. Although it is beyond the scope of this article to identify the causes of these trends, we note that the Government of Tanzania has sought to intensively promote tractor use, distributing machinery through District Agricultural Development Programmes and offering credit through the Agricultural Inputs Trust Fund (Diao et al., 2016).

By 2014, 40% of all cropping farms used some improved seed (including recycled seed), and 28% purchased new, improved seed. These numbers are clearly rising over time. There is some indication that use of inorganic fertilizer rose over this period, although just 16% of farms applied any fertilizer by 2014. Note that fertilizer use rates are likely to be influenced by the availability of fertilizer subsidies through the National Agricultural Input Voucher Scheme (NAIVS), which has been scaled back in recent years (United Republic of Tanzania, 2016; Benson et al., 2017). Hence, fertilizer usage may also decline in the future if adoption rates are not sustained at un-subsidized prices.

Other indicators of agricultural intensification do not show any positive trends (Table 4). In 2014, 13% of all farms applied some pesticide, and just 2% report accessing any agricultural inputs on credit. The infrequency of applying agricultural credit toward input purchases is indicative of underdeveloped rural financial markets (Barrett et al., 2017a; Mellor, 2014). Among livestock households, there is, if anything, a negative trend in the likelihood of possessing an improved or exotic type of livestock, and this is true for both cow and chicken farmers. It therefore seems that patterns of intensification diverge between cropping and livestock activities, with cropping practices displaying more dynamism.

4.4 Farms exhibit an increasingly commercial orientation in terms of crop production, but not necessarily livestock production

As noted, another aspect of agricultural transformation is the production of agricultural surplus and an increase in marketing behaviours to meet the needs of a growing domestic (both urban and rural) market. Though there is little evidence that crop farmers in Tanzania are more likely, over time, to
sell any of their crop output, farms are clearly marketing a greater percentage of the crop value they produce (Table 5). Specifically, the average percentage of crop output that was sold rose from 36% to 41% over six years, and among farmers that sold anything, this rate rose from 49% to 55%.

The story around livestock commercialization (the sale of live or slaughtered animals or livestock products) seems to exhibit less dynamism, with no time trends evident in terms of the likelihood of sale or the proportion of livestock value produced that was sold. 64% of all livestock farms sell any livestock products, and these farms market an average of 31% of the value produced. However, it is worth noting a curious drop in livestock marketing behaviours between 2008 and 2010; positive trends do emerge when the first survey wave is excluded from this analysis.

Improved access to markets is a key component of agricultural transformation. Some even argue that such transformation is most dependent, not on efforts to directly encourage productivity growth, but rather on tighter linkages between the farm sector and the growing urban consumer market (Gollin & Goyal, 2017). Improved market access will, it is argued, spur farms to independently pursue more productive practices. In 2014, cropping farms in Tanzania were located an average of 2.6 km from the nearest road and 10 km from the nearest agricultural market, and these average distances did not diminish significantly over the study period (Table 6). However, there are

**Table 5** Trends in commercialization of farm output (mean values)

|                          | Cropping HHs | Livestock HHs | Agricultural HHs |
|--------------------------|--------------|---------------|-----------------|
|                          | 2008 | 2010 | 2012 | 2014 | 2008 | 2010 | 2012 | 2014 | 2008 | 2010 | 2012 | 2014 |
| **Coefficient on year**  |      |      |      |      |      |      |      |      |      |      |      |      |      |
| **P-value**              |      |      |      |      |      |      |      |      |      |      |      |      |      |
| 1= HH sells some crops   | 0.73 | 0.74 | 0.74 | 0.74 | 0.64 | 0.60 | 0.61 | 0.64 | 0.81 | 0.79 | 0.79 | 0.78 | 0.80  |
| Proportion of crop value | 0.36 | 0.38 | 0.39 | 0.41 | 0.31 | 0.28 | 0.30 | 0.31 | 0.37 | 0.38 | 0.39 | 0.40 | 0.45  |
| sold (mean value)        |      |      |      |      |      |      |      |      |      |      |      |      |      |
| Obs.                     | 2,186 | 2,529 | 3,134 | 2,034 | 1,560 | 1,698 | 1,951 | 1,231 | 2,324 | 2,719 | 3,425 | 2,166 |      |
| **Proportion of livestock value sold (mean value)** |      |      |      |      |      |      |      |      |      |      |      |      |      |
|                         | 0.45 | 0.47 | 0.48 | 0.51 | 0.45 | 0.47 | 0.48 | 0.51 | 0.45 | 0.47 | 0.48 | 0.51 | 0.45  |
| Obs.                     |      |      |      |      |      |      |      |      |      |      |      |      |      |

*aThis is necessarily a lower-bound estimate, as it reflects only the interval between harvest and the time of survey, which is sometimes less than a year.

*bAnalysis of marketing behaviour excludes cropping households with zero harvest.

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other indications of improving market access. Cropping farms that sell some crops are increasingly likely to sell right at the farm gate, with this rate rising from 57% to 67% between 2008 and 2014. This seems to suggest greater penetration of traders into rural villages, providing improved market access conditions for farmers. At the same time, among those farmers who travelled to make a sale, there was even a significant increase in the average distance travelled from 8 km to 14 km. Crop sellers that travel over 10 km to the point of sale tend to be more commercially oriented than those travelling smaller distances (selling, on average, 61% of their production, as compared with 54%) and to market a greater value of production (selling an average of 1.1 million shillings’ worth of crops, as compared with 0.76 million shillings for other sellers). These long-distance crop sellers may bring their relatively large hauls directly to wholesalers or processors, rather than selling to smaller-scale rural assembly traders. Taken together, this suggests that a measure of distance to the point of sale does not capture the full story of market access; rather, the more dynamic and market-oriented farms are increasingly willing to travel far and invest money to reach those markets.

4.5 The agricultural sector has grown in size. In terms of crop production, this mostly reflects a remarkable area expansion, although labour productivity has also improved

Both crop and livestock production have dramatically increased in their economic size (in real values) from 2008 to 2014 (Figure 3). The value of total annual crop production was 4,234 billion Tanzanian shillings in 2008 (in real 2015 values), and this rose consistently to 6,415 billion shillings by 2014, representing an average annual increase of 8.6%. Another monotonic trend is also seen in the scale of livestock production, growing from 1,502 to 2,642 billion shillings.7

In terms of crop production, this growth could represent either an expansion of the cultivated area or an increase in agricultural productivity. In fact, evidence of both patterns can be found. The land area

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7 These positive trends in agricultural production value are evident when using either real (inflation-adjusted) monetary values, or when agricultural production is valued with respect to the median price for a kg of maize in a given year.
under crop cultivation in Tanzania has been rising consistently over the study period (Figure 3). In the main growing season, the area under crops grew from 8.3 million ha in 2008 to 13.0 million ha in 2014, representing a 9% annual growth rate. A similar rate of area expansion (9%) is seen with respect to the area cultivated when aggregating over areas cultivated in both the main and short growing seasons. The sharp uptick in land cultivated in 2014 may distort our conclusions. However, the Agricultural Sample Census Survey (ASCS) of 2007–2008 and the Annual Agricultural Sample Survey (AASS) of 2016–2017, both conducted by the Tanzania National Bureau of Statistics, confirm a very similar pattern. Between the 2007–2008 to 2016–2017 agricultural years, these data sets produce an annual average percentage increase in area cultivated of 6% per year in the main season, or 8% per year over both seasons (Tanzania National Bureau of Statistics, 2012, 2018). As expected, this area expansion generally occurred through a contraction of the amount of land left fallow or uncultivated, which underscores the limited potential for further expansion. Figure 3 shows that the percentage of land categorized as agricultural (cultivated plus fallow) that was actually cultivated rose from 60% in 2008 to 79% in 2014.

There is little indication that land productivity is rising. Specifically, with a focus on the main cropping season (when the area cultivated can be estimated with more precision than at the year level), we find that land productivity rose at an average rate of approximately 0.4% per year (Table 7). Given the increased rates of adoption of improved seed and, to some extent, inorganic fertilizer, this muted finding

![Figure 3](https://ssrn.com/abstract=3721364)
of limited land productivity growth is a bit confounding. It is possible that the new land being increasingly brought under cultivation is of lower quality than the land initially cultivated. However, a consideration of labour productivity provides some additional clarity. Note that labour productivity (value of crop production per day of farm labour) is derived from the ratio of land productivity (value of crop production per area unit of land) to labour intensity (days of farm labour per area unit of land). Labour productivity can increase when either land productivity rises or labour intensity falls (holding all else constant). In Tanzania, we find evidence that labour productivity is indeed increasing, with the value of crop production per labour-day increasing from 3,962 shillings to 4,741 shillings by 2014 (with a similar pattern observed at the year level). This improvement in labour productivity is derived from a consistent decline in labour intensity, with the number of labour days applied to one hectare of cropped land falling from 98 to 83. It therefore seems that adoption of modern inputs and mechanization allows partial land productivity to remain more or less constant, even as labour intensity is reduced.

4.6 | There has been an increasing orientation toward field crops and livestock products, and farms are increasingly likely to specialize

As the population becomes more urbanized, and incomes rise even in rural areas, agricultural output is expected to accommodate changing trends in consumer demand, shifting toward protein-rich animal products and fruits and vegetables (Barrett et al., 2017a; Tschirley et al., 2015). However, this pattern is only partly evident in Tanzania (Figure 4). From 2008 to 2014, the area allocated to cereal crops in Tanzania increased from 5.1 million ha to 7.9 million ha. According to the 2016–2017 Annual Agricultural Sample Survey (AASS), this value continued to rise to 8.6 million ha in 2017 (United Republic of Tanzania, 2018). Some of this field crop production is used as feed grains for livestock, though it is likely that much is absorbed in domestic consumer markets. Another considerable area increase is evident for legumes and oilseeds, with the latter trend driven by growth in soy production. At the same time, there is no sizeable increase in the area allocated to fruits and vegetables, a trend that might have been expected to meet rising demand of urban consumers. A similar area estimate for fruits and vegetables is derived from the 2007–2008 AASS, indicating that the NPS figures are probably accurate. There is also no increase in the total land dedicated to traditional cash crops, including coffee, tea, tobacco and palm trees.

Across farms, the average percentage of gross on-farm income derived from field crop production was 64% in 2014 (Table 8). For livestock production, this value was 22%, with fruits/vegetables and cash crops responsible for an average of 7% and 6% of gross on-farm income. Over time, we do not

| TABLE 7 | Trends in land and labour productivity (country-level, main season) |
|------------------|------------------|------------------|------------------|------------------|
| **Value crop production** (billions shillings, real 2015 values)* | 2008 | 2010 | 2012 | 2014 |
| Area cropped (thousands ha) | 8,308 | 9,457 | 10,512 | 12,998 |
| Land productivity: Value crop production/ha cropped (millions shillings) | 0.39 | 0.41 | 0.43 | 0.40 |
| Total labour days on farms (millions) | 811 | 894 | 947 | 1,083 |
| Labour productivity: Value crop production/labour-day (shillings) | 3,962 | 4,353 | 4,756 | 4,741 |
| Labour intensity (days/ha) | 97.56 | 94.50 | 90.13 | 83.33 |
find growth in the share of farm income derived from fruit/vegetable production or cash crop production, though field crops and livestock see a slight (but not statistically significant) increase in their share of farm income. Another notable trend is related to on-farm specialization. In the process of agricultural transformation, individual farms tend to increasingly focus their efforts in one area, running their farm operations more like a modern business (Jayne et al., 2018). This shift is linked to a growing reliance on the market for food acquisitions, a pattern that was observed in Table 3. Here, we see that farms in Tanzania are increasingly likely to specialize in (i.e., to derive at least 75% of farm income from) one of the four categories of farm income, with the percent of specializers rising consistently from 62% to 65% over the study period.

5 | EVIDENCE OF CHANGING FARM STRUCTURE

In this section, farms are categorized as being either small, medium or large in scale (Figure 1). For clarity, these farm categories will sometimes be referred to by their letter (e.g., group A farms). Key lessons that emerge from applying this typology are presented below.

5.1 | The distribution of farms and their relative importance are shifting among different farm categories, with medium-scale farms and small, farm-focused, commercialized farms claiming an increasingly prominent role

Over the 2008–2014 period, Tanzania saw a steady decline in the proportion of farms categorized as primarily subsistence-oriented, farm-focused and small-scale (group A) (Figure 5). Specifically, these comprised 43% of all farms in 2008 and 31% in 2014. Both group B and C farms rose in their prevalence by 3% to 5%. In total, the percent of Tanzanian farms categorized as small-scale declined from 91% to 88%, while the percent of medium-scale farms increased from 8% to 10.5%. This rise of medium-scale farms in Tanzania is also noted by Cooksey (2012).

Although the percentage of medium-scale farms grew by just 3% during this time period, these farms increased their share of the country’s total farmland (and cultivated area) from 23% to 35%–37% (Figure 5). In fact, medium-scale farms are the only farm category that grew their share of cultivated land by a considerable margin. At the same time, farm-oriented and primarily subsistence small-scale farms (group A) shrank in their share of Tanzanian farmland, falling from 28% of all land planted in...
the 2008 main season to 21% in 2014. Within this farm category, this pattern mirrors a similar reduction in the share of total value of agricultural products produced (falling from 33% to 26%), as well as the share of the value of marketed agricultural products (falling from 15% to 11%). Tracking their rising prevalence, group B farms (which are small-scale, farm-focused and commercially oriented) grew in their share of total agricultural products produced by 2%. In contrast, medium-scale farms stand out in terms of their growing importance, seeing an increase in the share of total value of agricultural products produced from 18% to 30%, and an even larger increase in the share of the value of marketed agricultural products from 20% to 33%. Given that these farms comprise just 10.5% of all farms by 2014, their outsized contribution to agricultural production is noteworthy. Though Larson et al. (2016) justify a sustained policy focus on smallholder farms by arguing that the pace of farm restructuring would be slow, it is clear that medium-scale farms are rapidly claiming a prominent place in Tanzanian agriculture.

5.2 Application of this farm typology sheds light on which farm categories are most likely to exhibit forward and backward linkages

These six farm categories exhibit diverging characteristics (Table 9, Figure 6). Small farms with an off-farm focus (groups C and D) are more likely to be held by urban households (comprising 30%–36% of their holders). However, even among rural households, these farms tend to be located in more densely populated areas, and to be smaller than small farms with an on-farm income focus (groups A and B). Group C and D households (small-scale with an off-farm focus) derive an average of just 8–9% of their income from the farm, and the total value of farm production is far lower, on average, than other farm categories. These households are likely to be in the process of “stepping out” of agriculture (Dorward et al., 2009), and this suggests that, although they are many in number, they should not necessarily be pooled with farm-focused households in an analysis of small-scale farms. Note that, even among rural farmers, the poverty rate of groups C and D (at 30% and 24%) is lower than other farm categories.

Not surprisingly, the farm category with the highest rate of poverty is group A: farm-focused, small-scale households that are relatively non-commercialized. Group B farms, which are closest...
to what Mellor (2014) considers to be commercialized smallholders, produce twice the gross value of crop production than group A farms, on average. With regard to medium- and large-scale farms (groups E and F), Jayne et al. (2016) express concern that they are likely to be held by urban investors, and therefore, any forward growth linkages they exhibit will not benefit lower-income, rural communities. However, contrary to our expectations, medium- and large-scale farms tend to be held by farmers who reside in less densely populated areas. They are not more likely to be held by urban
households, and just 12%–13% of these farms can be described as having non-resident owners (located ≥ 10 km from home). In many cases, they seem likely to have been local farmers who “graduated” to a larger-scale status.

Medium-scale farms play a large role in agricultural employment (Table 10). While 37% and 48% of group A and B farms, respectively, hire in labour, this value is 61% for medium-scale farms, and they hire in an average of 49 labour days per year. Altogether, group B farms (small-scale, farm-focused and commercially oriented) hire in 25% of the total agricultural labour employed by farm-households in Tanzania, and medium-scale farms hire in 31%. It therefore seems that group B farms and medium-scale farms have strong backward linkages and are likely to generate multipliers in the local economy.

Adoption rates of improved seeds vary across farm categories, at 34% for group A farms, 41% for group B farms and 45% for medium-scale farms (Table 10). Measures of agricultural productivity also vary across farm categories, with small-scale farms (particularly those in group B) exhibiting the greatest average land productivity in the main season. Consistent with evidence elsewhere of an inverse relationship between land size and productivity (Larson et al., 2014), medium- and large-scale farms exhibit lower average land productivity than farm-focused small farms. By definition, small-scale, commercialized farms (groups B and D) market more of their farm production than groups A and C. However, rates of commercialization are rising significantly among group A farms. This suggests that, over time, more farms will shift into the group B farm category, a pattern already evident in Figure 5.

TABLE 9  Characteristics of farms and agricultural households, by farm category (mean values, pooled years)
6 | DISCUSSION AND CONCLUSIONS

This article is motivated by questions around the extent to which sub-Saharan Africa is experiencing tangible and sustained agricultural transformation. By using comparable nationally representative

**FIGURE 6** Household income shares (6a) and income levels (6b), by farm category (mean values)
surveys of farm-households over a six-year period, we track changes in various indicators of transformation. The picture that emerges is that Tanzanian agriculture is indeed evolving consistently with stylized facts about agricultural transformation. The trends documented here are sometimes dramatic (as with the rising prominence of medium-scale farms) and sometimes subtle (as with a shift in the farm share of crop value sold). Each indicator examined in isolation would not, on its own, herald profound structural change. However, these pieces of evidence together suggest that Tanzania is on the cusp of larger transformational processes in the decades to come.

Tanzania’s agricultural output grew by 58% in real terms between 2008 and 2014. This is almost entirely driven by a striking expansion of cropped area, a pattern that probably reflects more favourable conditions for farmers—especially among medium-scale farms. Although there is limited movement in partial land productivity, labour productivity has risen as the labour intensity of agriculture has declined. Among other changes documented in this study, farms are increasingly likely to utilize mechanization and sow improved seed varieties; to hire agricultural labour and rent in land; to specialize in one type of farm product; and to sell an increasing share of their crop production on the market (and more often by selling right at the farm gate). Along with these changes, Tanzanians are

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**TABLE 10** Farm characteristics and agricultural behaviours across farm categories (mean values, pooled years)

| Cropping households | Small | Medium | Large |
|---------------------|-------|--------|-------|
|                     | On-farm focus | Off-farm focus |
|                     | Not com. | Com. | Not com. | Com. | Medium | Large |
| 1= HH uses only family labour and non-rented land | 0.38 | 0.24 | 0.35 | 0.25 | 0.14 | 0.10 |
| 1= HH rents in land | 0.10 | 0.13 | 0.13 | 0.18 | 0.07 | 0.03 |
| 1= HH possesses purchased land (2014) | 0.33 | 0.38 | 0.37 | 0.32 | 0.60 | 0.55 |
| 1= HH hires agricultural labour | 0.37 | 0.48 | 0.44 | 0.56 | 0.61 | 0.65 |
| Labour days hired in | 9 | 18 | 10 | 17 | 49 | 64 |
| 1= HH uses a tractor | 0.04 | 0.05 | 0.05 | 0.07 | 0.07 | 0.07 |
| 1= HH uses improved seed | 0.34 | 0.41 | 0.32 | 0.36 | 0.45 | 0.62 |
| 1= HH uses fertilizer | 0.09 | 0.22 | 0.13 | 0.18 | 0.15 | 0.20 |
| 1= HH uses pesticide | 0.08 | 0.21 | 0.06 | 0.17 | 0.19 | 0.21 |
| Land productivity (value crop production/ha cultivated, main season – millions shillings) | 0.44 | 0.68 | 0.34 | 0.53 | 0.31 | 0.12 |

| Labour productivity (value crop production/labour-day, main season – shillings) | 3,560 | 5,521 | 2,587 | 4,560 | 5,513 | 5,613 |
| Obs. | 3,619 | 2,259 | 2,231 | 850 | 1,011 | 113 |

**Agricultural households**

|                     | 1= HH sells some crops or livestock products |
|---------------------|------------------------------------------|
|                     | Not com. | Com. | Not com. | Com. | Medium | Large |
| 1= HH sells some crops or livestock products | 0.79 | 1.00 | 0.47 | 1.00 | 0.95 | 0.98 |

| Proportion of farm products value sold | 0.20 | 0.76 | 0.12 | 0.76 | 0.53 | 0.53 |
| Obs. | 3,700 | 2,286 | 2,563 | 821 | 1,017 | 117 |
shifting their work time from farming to off-farm activities; the urban population share is growing; and poverty rates have fallen. These various changes are consistent with the notion that agricultural growth plays a vital role in structural change (Johnston & Mellor, 1961; Barrett et al., 2017b; Jayne et al., 2018), strengthening the (rural) non-farm economy through backward and forward linkages, and enabling people to securely exit agriculture.

This article also employs a typology that categorizes Tanzania's farm population according to the scale of farming, relative reliance on farm and non-farm activities, and degree of farm commercialization. In so doing, we highlight the extent to which the contemporary picture departs from long-standing views of African agriculture as dominated by small-scale, subsistence-oriented farms that are poorly connected to input and output markets. This exercise reveals that medium-scale farms are responsible for an increasing share of the total land area cultivated and total agricultural production. Relative to their prevalence among the farm population, medium-scale farms also play an outsized role in terms of employing agricultural labourers. Group A farms (small, farm-focused, and not commercialized) are declining in prevalence as such farms either “step up” (transitioning to group B farms) or “step out” (transitioning to group C farms) (Dorward et al., 2009).

The application of this farm typology sheds light on patterns of agricultural production and can inform agricultural policy, particularly the debate over whether resources should be directed toward subsistence-oriented small farms, commercialized smallholders, or medium- or large-scale farms. As noted by Hazell and Rahman (2014), because so many poor people reside on small farms, support for subsistence farmers seems necessary to reduce food insecurity. At the same time, as populations become increasingly urbanized with a greater proportion of the poor residing in cities, investments in commercially oriented farms are necessary to produce surpluses for urban consumers. Medium-scale farms may furthermore confer important benefits to nearby smallholder farmers. Because they tend to produce relatively large surpluses, buy more purchased inputs and demand more extensive agricultural-related services, medium-scale farms may attract considerable agribusiness investments to cater to them, which improves market access conditions for other farmers in the area (Sitko et al., 2018; Wineman et al., 2019).

Several tentative policy implications can be drawn from this analysis. As agricultural growth is recognized as a catalyst for structural transformation and inclusive economic growth, the realization that agriculture is now changing—and even flourishing for some farm categories—underscores the vital importance of continued support for farm production growth, and especially productivity growth. While strong growth in the real value of agricultural output is a positive story, it is a concern that much of this production growth seems to stem from area expansion rather than yield growth. Note that farm-land already covers 42% of Tanzania’s total land area. Holding constant the land devoted to wildlife habitat or other environmental amenities, there may be limited scope for continued area expansion (Gollin & Goyal, 2017), suggesting that future agricultural growth will eventually need to come from improvements in land productivity. Another lesson gleaned from our analysis is that there is little observable dynamism in livestock production, with the adoption rate of improved breeds remaining level or even declining. This suggests that more attention is needed to stimulate intensification in the livestock sector.

As noted earlier, the 2008–2014 study period overlapped (and mostly followed) the global food price crisis of 2007–2008, an event that inspired considerable attention to, and private investment in, the agricultural sector. It also fell within the implementation period of ASDP-I, which became operational in 2006 and sought to channel public and private investments into the agricultural sector. This context may have contributed to the dynamism documented in this article, although it is beyond the scope of this analysis to discern causality. Nevertheless, we suggest that financial support ought to be sustained if policy-makers aim for continued agricultural growth.
In light of the heterogeneity among farms and the rapidly shifting distribution of farm categories in the population, we propose that policy attention should be directed to meeting farmers’ diverse needs. For example, medium-scale farms and commercialized small-scale farms may exhibit unmet demand for mechanization or agricultural credit to be used for farm expansion. Their needs are very different from those of group A farmers who are closer to subsistence production. While agricultural initiatives aimed at spurring economic growth may be optimally targeted at medium-scale farms (with the promising potential for cost recovery through tax collection), group A households may benefit from assistance in the form of a safety net. Thus, aid and agricultural investments can be thoughtfully targeted among the diverse farming population in order to achieve their distinct objectives.

While this analysis has illuminated a number of noteworthy developments, it is necessarily limited by our reliance on household-level survey data. In fact, the story of agricultural transformation in Tanzania is likely to continue further downstream within agricultural value chains and urban food markets. Sitko et al. (2018) observe an increasing presence of large-scale traders in East Africa who interact with larger-scale producers or are able to realize economies of scale in trade. In the process of transformation, value chains are also likely to become both geographically lengthened and disintermediated (whereby middlemen disappear as large-scale processors source directly from farmers) (Reardon et al., 2014). However, information on agricultural value chains in Tanzania is scant, and we know of no systematic longitudinal study of value chains that could provide nationally or even regionally representative estimates of the rate of growth in agricultural wholesaling, retailing and processing investments over time.

There is also a need for more data on medium- and large-scale farms in Tanzania in order to better understand the paths taken to become such a farmer, as well as the spillover effects on neighbouring farmers if, for example, medium-scale farms are able to attract agricultural services (e.g. credit provision, input providers) to their communities (Wineman et al., 2019). Because population-based household surveys are not the optimal vehicle to collect information on larger farms, a census approach for larger farms can be used, as was done in the Agriculture Sample Census Survey of 2007–2008.

Owing to space constraints, this analysis of agricultural transformation in Tanzania did not incorporate geographic considerations. However, Tanzania is a large country, and we expect some trends to vary across different agro-ecologies with differing agricultural potential and crop suitability. Van Donge (1994) further emphasizes the importance of local processes in responding to agricultural policies. The NAIVS fertilizer programme, which was operational during our study period, was focused on 10–20 specific regions (especially in the Southern Highlands), and we would therefore also expect to see some geographically distinct trends around input adoption. Another framework through which geographic considerations may drive the pace of agricultural transformation is presented by Jayne et al. (2019), in which factor intensities and the adoption of farming practices are guided by intersecting axes that capture the local levels of population density and economic dynamism (i.e., connections to growing towns and cities). Future research could therefore explore geographically explicit patterns that may further guide the Government of Tanzania in allocating resources over space.

Finally, further research is urgently needed to better understand the drivers of transformation highlighted in this article, and to discern the influence of different policies and aid-funded projects/programmes in contributing to transformation. As noted in the introduction, a set of agricultural programmes have been implemented in Tanzania, including ASDP-I and government engagement in fertilizer procurement and distribution. Rigorous analysis of policy effectiveness is necessary to better inform policy-makers and donors on how transformation can best be supported.
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