**CHAPTER 9**

URBANIZATION AND ITS IMPACT ON GHANA’S RURAL TRANSFORMATION

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* 1. INTRODUCTION

Ghana has rapidly urbanized in recent years and more than half the total population now lives in urban areas. However, as discussed in Chapter 2, urbanization in Ghana has not followed the typical historical pathway for the economic transformation of an agrarian country. In China, and much of Asia, urbanization typically followed a period of substantial growth in agricultural productivity (the Green Revolution) that, amongst other things, freed up labor to move into the urban sectors. At the same time, rapid growth in labor-intensive industries, especially export manufacturing, offered productive jobs to workers leaving agriculture (Timmer 1988; Mellor 1976; Rosegrant and Hazell 2000). The pattern of transformation in Ghana is quite different. Ghana has neither undergone a Green Revolution (Nin-Pratt and McBride 2014) nor an industrial revolution (Jedwab 2013), yet urbanization has nevertheless been rapid. A similar phenomenon has been observed in many other African countries (Headey, Bezemer and Hazell, 2010; McMillan and Rodrik, 2011).

As discussed in Chapter 2, cocoa, gold and oil continue to account for about 80 percent of Ghana’s exports while manufacturing growth remains stagnant (Aryeteey and Baah-Boateng 2015). Urbanization without industrialization has led to the rise of “consumption cities” dominated by employment in non-tradable services (Gollin, Jedwab and Vollrath, 2013). One consequence of this type of urbanization is that the economy is bypassing a stage of abundant low-wage agricultural labor, which in Asia was key to driving agricultural intensification (Nin-Pratt and McBride, 2014). Instead, high population-density rural areas are emerging around consumption cities where households are diversifying their livelihoods into the rural nonfarm economy rather than pursuing agricultural intensification.

Another important factor preventing a Green Revolution in Ghana has been the relative abundance of land in the main agricultural areas (Chapter 4). Given high labor costs, farmers are spurning the labor intensive and yield increasing technologies of the Green Revolution, and instead are opting to expand their cultivated area by clearing new land or shortening traditional slash-and-burn fallows, and adopting labor saving technologies (Nin-Pratt and McBride, 2014; Chapters 4 and 7).

This chapter explores how urbanization in Ghana has affected agricultural development in terms of rural employment, the farm size distribution, and use of modern inputs. In examining these relationships, we recognize that there have been distinct spatial patterns of urbanization in Ghana, and urbanization has not affected agriculture equally throughout the country. Therefore, we go beyond the usual agroecological breakdown (Chapter 4) and develop a spatial typology of rural areas based on work by Berdegue et al (2015) and others in Latin America.

The chapter is structured as follows: Section 2 provides additional background information about recent urbanization trends in Ghana, and describes our typology of rural areas. Section 3 discusses the association between urbanization and changes in the structure of rural employment. Section 4 examines the relationship between urbanization, farm size, and modern input use, and Section 5 concludes.

* 1. URBANIZATION TRENDS IN GHANA

Ghana has always been relatively urbanized compared to other African countries. This is partially due to the post-independence expansion of the cocoa sector (Jedwab, 2013), and the promotion of state-owned industries in the late 1960s and early 1970s (Ackah, Adjasi, and Turkson, 2013). However, urbanization has been especially rapid in the past two decades, as shown in Figure 9.1. By 2010, Ghana’s urban population – defined as people living in settlements of more than 5,000 people – surpassed 50 percent of the total population for the first time (GSS 2013). Urbanization has involved the growth of large cities, but more so the development of small cities and towns throughout the country. There has been substantial migration of workers from rural to urban areas, alongside substantial employment growth in the rural nonfarm economy, leading to a decline in the share of workers remaining in agriculture (Figure 9.2).

Figure 9.1: Annual growth rate in the population between census years, and urban population share in census years, 1960-2010.

Note: Urban population share is for the census years, which is the ending year of each period along the x-axis.

Source: Authors’ calculation using data from the five rounds of censuses (GSS 2013).

Figure 9.2: Annual growth rate in employment between census years and agricultural share of total employment in census years, 1960-2010

Note: Agricultural employment share is for the census years, which is the ending year of each period along the x-axis.

Source: Authors’ calculation using data from the five rounds of censuses (GSS 2013).

***9.2.1 A Spatial Typology of Rural Areas***

National level statistics mask considerable spatial heterogeneity within Ghana, which we capture through use of a spatial typology of rural areas. Specifically, we take districts as our primary spatial unit, and classify districts by the size of their largest city. Similar studies have found correlations between the size of a city and its impact on the surrounding rural areas (e.g., Berdegue et al 2015; Deichmann, Shilpi and Vakis 2008). An alternative approach would be to capture the effect of proximity to cities using a gravity model as done by Binswanger-Mkhize et al (2016), who measure urban gravity in Kenya using satellite images of the light intensity emanating from urban areas into surrounding rural villages. However, this approach requires data that is not available for Ghana.

Ghana has a well-defined south-north divide, which, amongst other things, reflects spatial differences in agroecological conditions, population density, rural infrastructure, and levels of urbanization. As a first step in our typology, we therefore differentiate between two major regions based on both the north-south divide and agroecological conditions. We distinguish between the agriculturally dominant north, comprising the regions of Brong Ahafo, Northern, Upper East and Upper West, which we call the **North**. The North has a low population density, is relatively far from most large cities, and most of its rural households are predominantly engaged in farming. The North also corresponds closely to the Savanna and Transition agroecological zones, and hence has its own well-defined farming systems (Chapter 4). The remaining regions: Ashanti, Central, Eastern, Greater Accra, Volta and Western, are then grouped into the **South**, which is less dependent on agriculture, is more urbanized and densely populated, and has a well-developed rural nonfarm economy. The South corresponds closely to the Forest and Coastal agroecological zones, which also have their own well-defined farming systems (Chapter 4).

Taking districts as our primary spatial unit using 2010 census data, each of the two regions is subdivided into four groups based on the proximity of each district to cities of different sizes. **Big city districts** are those that contain parts of Accra and Kumasi, and hence are only in the South, **2nd-tier city districts** are those with cities of between 100,000 and 500,000 people, which are located in both the North and South, **3rd-tier city districts** are those with cities containing between 40,000 and 100,000 people, and **no city-districts** are those with no settlement of over 40,000 people. This leads to a total of seven groups of districts in Ghana, three in the North and four in the South. These are mapped in Figure 9.3.

Although the South covers a much smaller land area than the North, the 2010 census shows that 73% of the total population and 63% of the rural population live in the South. Moreover, the majority of the total population lives in districts with cities of at least 40,000 people in both regions; 40% of the rural population also lives in such districts.

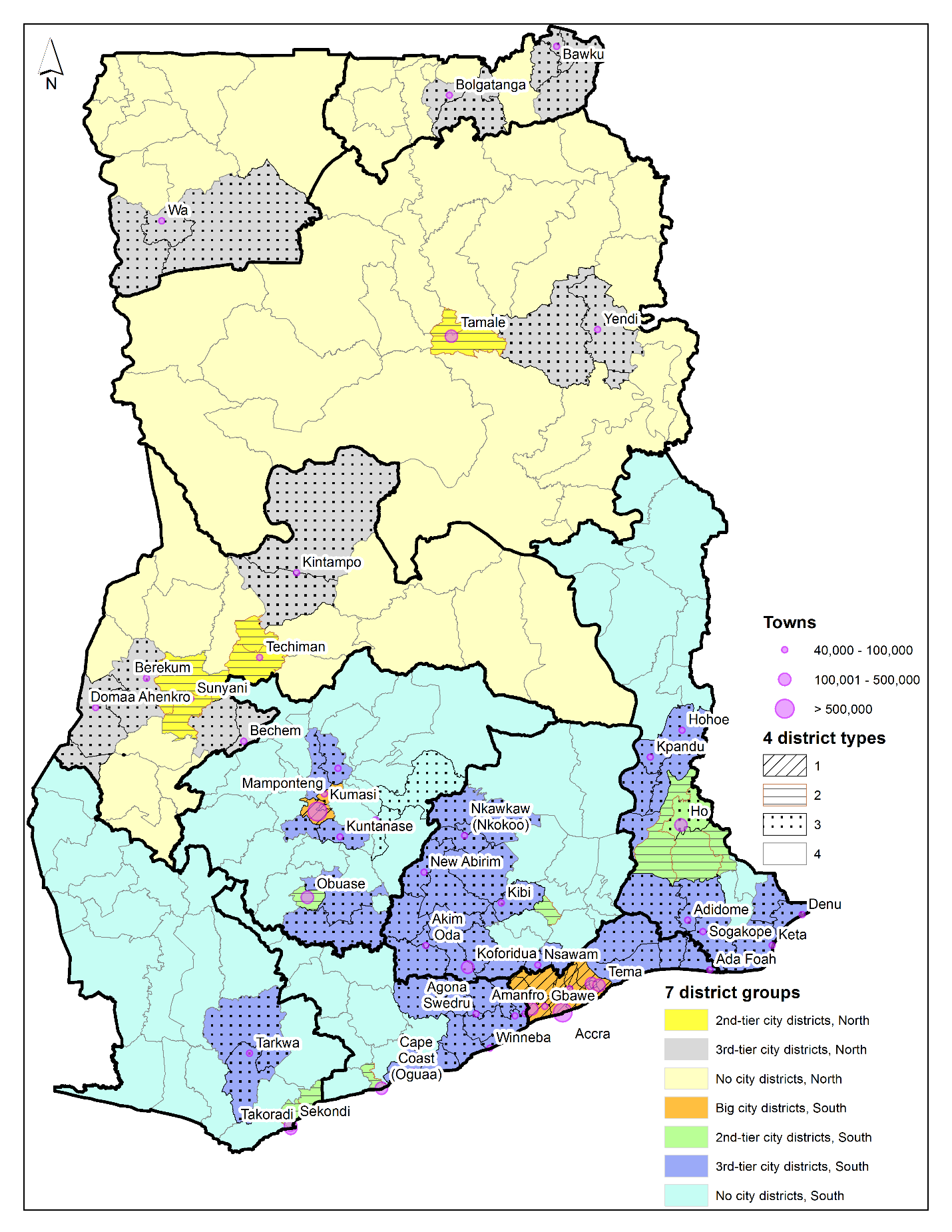
Classifying districts based on their level of urbanization reflects farmers’ access to different sized market centers with different population densities (Table 9.1). As such, more recent interpretations of the induced innovation theory (Pingali et al.1987; Binswanger and McIntire 1987; McIntire et al. 1992), which emphasize the role of market access as well as population pressure (resulting in decreased access to land) in driving agricultural intensification, suggest that farmers in more urbanized areas will be more likely to adopt agricultural intensification practices and technologies.

Table 9.1: Population densities by district group, 2000 and 2010 (people/km2)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 2000 |  |  |  | 2010 |  |  |
| District Group | Total | Rural | Urban |  | Total | Rural | Urban |  |
| North: | | | |  |  |  |  |  |
| 2nd tier city districts | 210 | 72 | 138 |  | 257 | 73 | 184 |  |
| 3rd tier city districts | 57 | 40 | 17 |  | 69 | 45 | 24 |  |
| No city districts | 28 | 23 | 5 |  | 37 | 28 | 9 |  |
| North total | 38 | 27 | 10 |  | 48 | 33 | 16 |  |
| South: | | | |  |  |  |  |  |
| Big city districts | 2,410 | 127 | 2,283 |  | 3,577 | 129 | 3,448 |  |
| 2nd tier city districts | 753 | 133 | 620 |  | 1,023 | 119 | 904 |  |
| 3rd tier city districts | 136 | 89 | 48 |  | 177 | 100 | 77 |  |
| No city districts | 71 | 56 | 15 |  | 84 | 62 | 22 |  |
| South total | 135 | 68 | 68 |  | 178 | 75 | 102 |  |

Source: Authors’ calculation using Population and Housing Census 2000 and 2010.

Figure 9.3: Ghana map showing the different types of districts

Source: The map was created by Mekamu Kedir Jemal (IFPRI) who combines 2010 Census data with other spatial data including cities and road networks. Spatial data of cities, towns and road network are from University of Ghana- Remote Sensing & Geographic Info Systems website (Accessed on March 25, 2016 and retrieved from <http://www.ug.edu.gh/rsgislab/rs-gis-geonode-app.html>)

* 1. CHANGING PATTERNS OF EMPLOYMENT AND RURAL ECONOMIC ACTIVITY

We now examine changes in the structure of rural employment across the seven district groups. Unlike other studies, we focus on employment at the household rather than individual level in order to distinguish between changing employment patterns that involve entire households shifting sectors, and farm household diversification that involves employment in multiple sectors including agriculture. We classify rural households into three types based on members’ reported primary occupations in the census data: (1) agricultural households that have members whose primary employment is in agriculture and that have no family members primarily engaged in non-agriculture – called **‘agriculture only’** households; (2) nonagricultural households that have members whose primary employment is in non-agriculture and having no members whose primary employment is in agriculture - called **‘non-agriculture only’** households; and (3) households that have members with primary employment in both agriculture and non-agriculture – called **‘mixed’** households. We ignore a small percentage of rural households that do not report any primary employment. Table 9.2 reports the shares of rural households for each of the three types of households.

Table 9.2: Distribution of rural households by agricultural, nonagricultural and mixed occupations across district groups (each type of district’s total rural households = 100)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | North | | | South | | |
| District group | Agri. only | Non-agri. only | Mixed | Agri. only | Non-agri. only | Mixed |
| *Census 2000* |  |  |  |  |  |  |
| Big city districts |  |  |  | 27.7 | 50.3 | 12.3 |
| 2nd tier city districts | 53.8 | 18.2 | 20.3 | 38.3 | 32.4 | 14.9 |
| 3rd tier city districts | 58.2 | 11.2 | 19.1 | 50.1 | 21.1 | 18.8 |
| Non-city districts | 62.6 | 8.2 | 19.0 | 61.5 | 13.9 | 17.9 |
| Regional total | 60.9 | 9.7 | 19.1 | 55.3 | 18.4 | 18.0 |
| *Census 2010* |  |  |  |  |  |  |
| Big city districts |  |  |  | 9.0 | 74.1 | 6.6 |
| 2nd tier city districts | 37.7 | 34.9 | 20.4 | 14.9 | 59.7 | 10.2 |
| 3rd tier city districts | 63.7 | 14.5 | 17.8 | 39.4 | 34.1 | 17.4 |
| Non-city districts | 67.5 | 10.5 | 18.6 | 53.4 | 23.0 | 17.0 |
| Regional total | 64.7 | 13.0 | 18.5 | 45.6 | 29.7 | 16.7 |
| *Difference in 2000-10* |  |  |  |  |  |  |
| Big city districts |  |  |  | -18.7 | 23.8 | -5.8 |
| 2nd tier city districts | -16.1 | 16.6 | 0.0 | -23.4 | 27.4 | -4.7 |
| 3rd tier city districts | 5.5 | 3.2 | -1.3 | -10.7 | 12.9 | -1.4 |
| Non-city districts | 4.9 | 2.3 | -0.4 | -8.0 | 9.1 | -0.9 |
| Regional total | 3.8 | 3.3 | -0.6 | -9.6 | 11.3 | -1.3 |

Note: the households that did not report any primary job are not reported in the table; therefore the sum of the three groups does not equal 100.

Source: 2000 and 2010 Census data (GSS 2003; 2013)

The excel file is in Daily\2015\GSSP\youth\Jed\Districtypes-CensusGLSS\_Sep22-2016\_Rawurban.xlsx, sheet “calculation” row 37

In both the South and North, rural households’ exit from agriculture has been highly correlated with proximity to cities. The share of ‘non-agriculture only’ rural households increased in all district groups in Ghana between 2000 and 2010, though more rapidly in the South and especially in the big city and 2nd tier city district groups. This was mirrored by an almost equivalent pattern of decline in the shares of ‘agriculture only’ rural households in the South and the district group with 2nd tier cities in the North. However, in the other district groups that either have small cities or no cities in the North, share of agriculture only households increased in this period. Thus, there has been a sizeable movement of household from agriculture to the rural non-farm economy in the South and districts with secondary cities in the North. Despite this exit, the share of rural ‘agriculture only’ households remains high in district groups without big and secondary cities in both the North and South, averaging 46 percent even in the South in 2010. Only in the areas with relatively larger cities did ‘non-agriculture only’ households dominate in the rural areas in 2010.

There has been a modest but surprising decline in the shares of agriculture/non-agriculture mixed rural households in both North and South (Table 9.2). Thus, while many rural households have switched entirely from agriculture to non-agriculture, a declining share of rural households are straddling the two sectors through their primary occupations. However, the census data do not capture secondary or part time occupations, so it is possible that many rural households have maintained a mixed strategy more than that shown in Table 9.2, but on a part time basis.

Some insights about this can be gained from the GLSS data. Figure 9.4 reports the share of ‘non-agriculture only’ rural households that reported having cultivated farmland, which in 2012/13 was about 60 percent in the North but less than 30 percent in the South. The size of the land area held by such households is small, mostly less than 2 hectares. However, it does seem that many households whose members’ primary occupations lie outside agriculture are still engaged in farming as a secondary or part time occupation.

Additionally, some rural households classified as ‘agriculture only’ also report having nonfarm household enterprises, though these are likely to be seasonal or part time activities. This phenomenon was more prevalent in the relatively less urbanized districts, though its importance fell between 2005/06 and 2012/13 (GSS 2008; 2014- not pictured in Figure 9.4).

Figure 9.4: Shares of no-land households and households with cultivated land less than 2ha by types of district groups

Source: Authors’ calculations using data from GLSS5 for 2005) and GLSS6 for 2012 (GSS 2007 and 2014)

The excel file is in Daily\2015\GSSP\youth\land&input\landinputcosts(Oct10-2016)\_new types reg.xlsx, sheet “GLSS type compare”, row AU15

The census data also provides detailed insights into the types of primary employment, and we focus on ‘non-agriculture only’ households in Table 9.3 for such information. By far the largest share of nonagricultural employment in the rural areas is in informal activities, and this is true for all district groups in both census years. Informal trade is more prevalent than informal manufacturing, and more so in 2010 than in 2000. Between the North and South informal manufacturing is also more prevalent in less urbanized areas in the North, as much of it involves small-scale food processing for the local market. The growing importance of informal trade suggests increasing integration of rural areas with urban areas and the broader economy (Haggblade, Hazell and Brown, 1989).

Table 9.3: Types of primary employment amongst ‘non-agriculture only’ households, by type district, 2000 and 2010

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | % of rural nonagricultural households with family members engaging in: | | | | | |
|  | Formal only | Inf. mfg only | Inf. trade only | Inf. mfg & trade | Inf. others | Formal & informal combined |
|  |  |  | 2000 |  |  |  |
| North |  |  |  |  |  |  |
| 2nd tier city districts | 30.1 | 10.5 | 21.6 | 4.3 | 9.7 | 23.7 |
| 3rd tier city districts | 16.1 | 27.5 | 14.0 | 5.0 | 18.0 | 19.3 |
| No city districts | 21.7 | 25.6 | 18.7 | 2.7 | 15.6 | 15.7 |
| North total | 21.0 | 24.4 | 17.6 | 3.6 | 15.6 | 17.8 |
| South |  |  |  |  |  |  |
| Big city districts | 27.7 | 6.3 | 15.5 | 2.9 | 13.0 | 34.5 |
| 2nd tier city districts | 24.8 | 10.1 | 22.7 | 3.3 | 12.0 | 27.1 |
| 3rd tier city districts | 19.4 | 16.2 | 23.6 | 4.9 | 13.7 | 22.1 |
| No city districts | 23.6 | 16.8 | 22.1 | 4.1 | 12.5 | 20.9 |
| South total | 22.1 | 15.3 | 22.2 | 4.3 | 13.1 | 22.9 |
| National total | 21.9 | 16.9 | 21.4 | 4.2 | 13.5 | 22.0 |
|  |  |  | 2010 |  |  |  |
| North |  |  |  |  |  |  |
| 2nd tier city districts | 29.2 | 5.4 | 20.8 | 4.9 | 9.7 | 30.0 |
| 3rd tier city districts | 24.0 | 14.7 | 21.2 | 4.1 | 14.5 | 21.5 |
| No city districts | 22.9 | 19.0 | 22.0 | 4.2 | 11.4 | 20.4 |
| North total | 24.3 | 15.6 | 21.6 | 4.3 | 12.0 | 22.3 |
| South |  |  |  |  |  |  |
| Big city districts | 24.0 | 6.0 | 19.5 | 3.0 | 10.9 | 36.6 |
| 2nd tier city districts | 25.4 | 8.8 | 20.0 | 3.8 | 10.1 | 31.9 |
| 3rd tier city districts | 20.5 | 14.5 | 24.1 | 4.2 | 12.0 | 24.5 |
| No city districts | 23.6 | 13.3 | 25.3 | 3.8 | 11.6 | 22.4 |
| South total | 22.3 | 13.2 | 24.1 | 3.9 | 11.7 | 24.8 |
| National total | 22.6 | 13.5 | 23.7 | 4.0 | 11.7 | 24.4 |

Source: Authors’ calculation using data of Census 2000 and 2010 (GSS 2003; 2013)

The excel file is in Daily\2015\GSSP\youth\Jed\Districtypes-CensusGLSS\_Sep22-2016\_rawurban.xlsx, sheet “calculation, row374”

* 1. URBANIZATION AND AGRICULTURAL INTENSIFICATION

***9.4.1 Farm size distribution***

Along with changes in occupation patterns, there have also been changes in the distribution of land amongst rural households (Tables 9.4a and 9.4b). There has been an overall decline in the share of rural households with farmland, which has been greater in the South than North (from 80% to 71% in the South and 91% to 89% in the North). The decline was most marked in Southern big city districts (from 42% to 12%). However, despite these changes, the majority of rural households still held cultivated land in 2012/13 in all types of districts except big city districts (Table 9.4b).

Nationally, the share of small farms with less than 2 ha declined from 53.3% in 2005/06 to 49.3% in 2012/13. This was offset by some increase in the shares of medium-sized farms (2-5 ha and 5-20 ha), while the share of farms larger than 20 ha remained at about 1 percent. Similar patterns of change occurred on average in both the North and South regions. However, there was a reverse trend in the most urbanized districts of the South, where the shares of small farms increased from 77% to 90% in big city districts and from 52.6% to 61.8% in 2nd tier districts, while larger farms with more than 5ha cultivated land virtually disappeared in the big city districts. Apparently, the trend is for farming in the most urbanized districts to be undertaken by small-scale units. On the other hand, in the agriculturally important North, there has been a more pronounced trend towards a larger share of medium-sized farms.

Table 9.4a: Shares of rural households by farm size and district group, 2005/06

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| District Group | Percent landless house-holds | Percent landed households by farm size | | | | Percent landed house-holds |
| <2 ha | 2-5 ha | 5-20 ha | > 20 ha |
| *North* |  |  |  |  |  |  |
| 2nd tier city districts | 27.0 | 55.5 | 39.0 | 5.6 | - | 73.0 |
| 3rd tier city districts | 7.9 | 49.6 | 28.9 | 17.8 | 3.8 | 92.1 |
| No city districts | 8.1 | 40.7 | 42.0 | 14.3 | 3.1 | 91.9 |
| Total North | 9.0 | 43.9 | 38.0 | 16.2 | 3.2 | 91.0 |
| *South* |  |  |  |  |  |  |
| Big city districts | 57.9 | 77.2 | 16.2 | 3.1 | 3.5 | 42.1 |
| 2nd tier city districts | 29.4 | 52.6 | 34.6 | 12.7 | - | 70.6 |
| 3rd tier city districts | 22.6 | 65.9 | 25.8 | 7.6 | 0.7 | 77.4 |
| No city districts | 16.5 | 52.0 | 31.1 | 15.1 | 1.2 | 83.5 |
| Total South | 20.2 | 58.0 | 28.8 | 11.8 | 1.3 | 79.8 |
| National total | 16.8 | 53.3 | 31.8 | 12.9 | 1.9 | 83.2 |

Note: Land is defined as cultivated farmland

Source: Authors’ calculation using data of GLSS6 (GSS 2015)

The excel file is in Daily\2015\GSSP\youth\land&input\landinputcosts(Oct10-2016)\_new types reg.xlsx, sheet “5.4a”

Table 9.4b: Shares of rural households by farm size and district group, 2012/13

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| District Group | Percent landless house-holds | Percent landed households by farm size | | | | Percent landed house-holds |
| <2 ha | 2-5 ha | 5-20 ha | > 20 ha |
| *North* |  |  |  |  |  |  |
| 2nd tier city districts | 22.8 | 40.5 | 37.7 | 20.6 | 1.2 | 77.2 |
| 3rd tier city districts | 7.7 | 49.3 | 35.3 | 13.1 | 2.3 | 92.3 |
| No city districts | 10.2 | 32.5 | 44.4 | 21.7 | 1.4 | 89.8 |
| Total North | 10.3 | 37.3 | 41.7 | 19.4 | 1.7 | 89.7 |
| *South* |  |  |  |  |  |  |
| Big city districts | 87.8 | 90.3 | 9.7 | - | - | 12.2 |
| 2nd tier city districts | 42.7 | 61.8 | 24.5 | 12.9 | 0.8 | 57.3 |
| 3rd tier city districts | 35.0 | 61.6 | 29.2 | 8.4 | 0.8 | 65.0 |
| No city districts | 22.3 | 52.2 | 34.5 | 13.1 | 0.2 | 77.7 |
| Total South | 28.8 | 55.8 | 32.3 | 11.4 | 0.4 | 71.2 |
| National total | 23.2 | 49.3 | 35.6 | 14.2 | 0.9 | 76.8 |

Note: Land is defined as cultivated farmland

Source: Authors’ calculation using data of GLSS6 (GSS 2015)

The excel file is in Daily\2015\GSSP\youth\land&input\landinputcosts(Oct10-2016)\_new types reg.xlsx, sheet “5.4b”

However, these changes in the distribution of rural households by farm size seem not to have affected the average farm sizes of small, medium and large farms (Figure 9.5). The average farm size for the small farms with less than 2 ha is about 0.91 and 0.95 ha in 2005 (GLSS5) and 2012 (GLSS6), respectively at the national level, and 3.02 ha and 3.05 ha for the farm size group of 2-5ha in these two rounds of the surveys, while farms of 5-20 ha in size have become marginally smaller on average. These trends are similar for both types of regions.

Figure 9.5. Average farm size (ha) by farm size group, rural households, 2005/06 and 2012/13

Note: Farm size is defined according to cultivated farmland and only rural households with cultivated farmland are counted.

Source: Authors’ calculation using GLSS5 and GLSS6 (GSS 2008; 2014)

The excel file is in Daily\2015\GSSP\youth\land&input\landinputcosts(Sepcot10-2016)-new types reg.xlsx, sheet “fig5.5” row F31

***9.4.2 Farming Practices***

Urbanization has had important impacts on rural livelihoods, increasing the share of rural households engaged in the nonfarm economy. It has also contributed to an increase in the share of small, part-time farms in urbanized areas, and a shift towards more medium sized farms in the agriculturally important areas of the north. The induced innovation hypothesis predicts that urbanization and associated increases in population density and market access should lead to more intensive farming practices, both in terms of land use patterns and the choice of technologies. We examine these relationships in this section.

Fertilizer use, particularly inorganic fertilizer, has increased significantly in Ghana from 3.7 kg NPK/ha arable land in 2002 to 35.8 kg/ha in 2013 (see Chapter 4). Still, only 45 percent of farmers were using either organic or inorganic fertilizer in 2012/13 (GLSS6), and the share of farmers using fertilizer was nearly twice as high in the North than in the South (Table 9.5), mainly reflecting the poor soil fertility in the North. Table 9.5 also shows an inverse relationship between the degree of urbanization of a district and the share of farmers using fertilizer in both the North and South, i.e., the lower the level of urbanization for a district group, the higher percentage of farmers that use fertilizer. Thus, rather than any pattern of induced fertilizer adoption from urbanization, these data suggest that the main drivers of increased fertilizer use may have been a) the need to maintain soil fertility and crop yields in the North as fallow periods were shortened (see Chapters 4 and 7), and b) possibly the introduction of a fertilizer subsidy policy in 2007/08.

Table 9.5: Share of rural farm households using organic and inorganic fertilizer, 2012/13

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Type district | | <2 ha | 2-5 ha | 5-20 ha | > 20 ha | Total |
| North | 2nd-tier city districts | 38.7 | 59.1 | 70.3 | 82.0 | 53.4 |
| 3rd-tier city districts | 55.5 | 67.2 | 63.9 | 84.5 | 61.4 |
| No city districts | 48.3 | 69.0 | 73.1 | 93.5 | 63.5 |
| Total North | 50.3 | 68.2 | 71.3 | 89.8 | 62.4 |
| South | Big city districts | 3.6 |  |  |  | 3.3 |
| 2nd-tier city districts | 15.7 | 36.4 | 50.4 | 0.0 | 25.1 |
| 3rd-tier city districts | 23.3 | 42.3 | 58.6 | 48.7 | 32.0 |
| No city districts | 28.6 | 47.6 | 56.1 | 29.2 | 38.8 |
| Total South | 26.2 | 45.7 | 56.6 | 40.4 | 36.1 |
| National | Total | 32.7 | 55.0 | 63.7 | 73.7 | 45.4 |

Source: Authors calculations using GLSS6

(In file:\IFPRI1995\GSSP\Youth\Jed\New defined two regions\_Sep2016\chapter5tables(XD-Oct9), sheet “new” row H14).

Herbicide and insecticide use in Ghana has also increased sharply in recent years, from less than 2 percent of all farm households in 1998 to about 55 percent in 2013 (Grabowski and Jayne, 2016). Nationally, about 70 percent of farm households used herbicides or/and insecticides in 2012/13, and with the big city district group in the South as an exception (possibly due to few observations covered by the survey), the use of herbicides/insecticides is more evenly distributed across the two regions than is fertilizer use (Table 9.6). In both regions, small farms are less likely to use herbicides or insecticides than medium-sized or large farms (with exceptions for the farm size larger than 20ha in the South, again possibly due to few observations in the survey). However, there is no consistent pattern of increased use herbicides with levels of urbanization within the two regions, suggesting that urbanization is not inducing greater use.

Table 9.6: Share of rural farm households using herbicides or insecticides, 2012/13

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Type district | | <2 ha | 2-5 ha | 5-20 ha | > 20 ha | Total |
| North | 2nd-tier city districts | 85.6 | 93.8 | 78.5 | 100.0 | 87.4 |
| 3rd-tier city districts | 43.1 | 73.3 | 88.1 | 96.1 | 60.9 |
| No city districts | 59.0 | 81.4 | 92.4 | 93.8 | 76.7 |
| Total North | 55.0 | 80.2 | 90.9 | 94.8 | 73.1 |
| South | Big city districts | 7.3 |  |  |  | 6.6 |
| 2nd-tier city districts | 56.3 | 62.9 | 94.1 |  | 62.4 |
| 3rd-tier city districts | 59.1 | 79.1 | 84.1 | 69.5 | 67.1 |
| No city districts | 63.4 | 78.9 | 80.8 | 50.9 | 71.0 |
| Total South | 61.5 | 78.7 | 82.0 | 60.7 | 69.4 |
| National |  | 59.6 | 79.3 | 86.3 | 83.3 | 70.6 |

Source: Authors calculations using GLSS6 data

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Mechanization. The share of farmers using mechanization (mostly tractors) doubled from 17 percent in 2005/06 to 33 percent in 2012/13. About 40 percent of farm households used mechanization in 2012/13 in the North, compared to less than 30 percent in the South (Table 9.7), possibly due to the natural restriction from tree stumps in the forest zone. The share of farm households using machinery also increases with farm size in both regions, and more so in the agriculturally important North. As with other modern inputs, there is no consistent pattern of use across levels of urbanization within each of the two regions, again suggesting that urbanization is not inducing greater use of mechanization. The factors driving mechanization are explored more fully in Chapter 8.

Table 9.7: Share of rural households using mechanization, 2012/13

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | <2 ha | 2-5 ha | 5-20 ha | > 20 ha | Total |
| North | 2nd-tier city districts | 42.3 | 54.2 | 62.3 | 100.0 | 51.6 |
| 3rd-tier city districts | 20.5 | 43.6 | 51.9 | 96.1 | 34.5 |
| No city districts | 26.5 | 40.1 | 59.4 | 66.6 | 40.3 |
| Total North | 25.3 | 41.6 | 58.2 | 78.6 | 39.3 |
| South | Big city districts | 28.8 |  |  |  | 26.0 |
| 2nd-tier city districts | 17.1 | 0.0 | 0.0 | 0.0 | 10.6 |
| 3rd-tier city districts | 23.1 | 36.9 | 50.4 | 69.5 | 29.8 |
| No city districts | 19.2 | 35.1 | 50.5 | 51.4 | 28.9 |
| Total South | 20.7 | 35.1 | 49.3 | 60.9 | 28.8 |
| National |  | 22.0 | 37.8 | 53.6 | 72.8 | 32.6 |

Source: Authors calculations using GLSS6

(In file:\IFPRI1995\GSSP\Youth\Jed\New defined two regions\_Sep2016\chapter5tables(XD-Oct9), sheet “new”).

* + 1. ***Regression analysis of the links between urbanization and modern input adoption***

So far we have looked at bivariate relationships between urbanization and use of inputs. Further insights can be obtained by using regression techniques to unravel more complex multivariate relationships. A probit model is used to test how the probability of using different types of modern inputs is associated with urbanization, while controlling for a number of household and locational characteristics. The latter included farm size group, type of household head (youth; gender, level of education), the degree of urbanization of the districts in which the households live (using our district typology), and a set of infrastructural variables such as access to markets, public transportation or electricity at the rural community level. In the regression, we only include the rural households of which agriculture is the primary occupations for all or some family members, since for most households defined as ‘non-agriculture only’ in Section 9.3, any agricultural activity appears to be part-time.

In the probit estimation, we have pooled data together from the two rounds of surveys – GLSS5 and GLSS6, and hence we also include a year dummy for 2012/2013 (GLSS6), as well as the interactive effects of year and youth and year and gender in the regression. Still, there are too many missing variables in the regressions to test any causal relationships (e.g. we are unable to control for wages or missing household effects), but they do reveal some interesting patterns of association. We only report the marginal effects of the probit estimation in Tables 9.8.

Urbanization, as captured through our typology, has some significant but complex links with agricultural intensification. Rural households in all the three district groups in the agriculturally important North have a higher predicted probability of using fertilizers than household in the South, which as we mentioned above, may be driven by poorer soil fertility in the North. However, contrary to the bivariate relationship of Table 9.5, in which we could not find a consistent pattern of increased use fertilizer with levels of urbanization within each of the two regions, the probit estimation shows that in the North, the higher the urbanization level – measured by the size of cities in different district groups, the higher the predicted probability of using fertilizer. For example, compared with households in the South’s districts without cities, the predicted probability of using fertilizer increases by 25 percent in the North’s districts with secondary cities, while the marginal effects are smaller in Northern districts with 3rd tier cities or without cities, at 18.7 percent and 13.9 percent, respectively.

The probit estimates show a similar relationship between farm size and use of fertilizer as we observe in Table 9.5, i.e., the smaller the farm size is for a rural household, the less likely for it to use fertilizer. For example, the predicted probability of using fertilizer is 27.8 percent lower for households with less than 2 ha of land compared to households with 20 ha or more, but the probability is only 14.0 percent and 8.4 percent lower for those with land 2-5ha and 5-20ha, respectively. The regression also shows a significant increase in the predicted probability of using fertilizer in 2012/13 relative to 2005/06, suggesting that fertilizer subsidy introduced since 2007/08 could be leading to more fertilizer use among all types of farm households.

In terms of education, the probit analysis shows that for the farm households whose heads are more educated, particularly for those completing secondary education, the probability of use fertilizer increases compared with the less educated ones. On the other hand, the dummy variable for youth headed households only significantly affects the probability of fertilizer use through its interaction with the year dummy; this suggests that youth headed households only started having a higher probability of using fertilizer in recent years.

The probit results for the use of herbicides/insecticides, hiring labor and use of mechanization are not always consistent with the results for fertilizer adoption, except for the relationships between farm size or education level of household heads and use of such inputs. That is, in general, the smaller the farm size, the less likely for farm households to use herbicides/insecticides, to hire labor and to use machinery. Similarly to fertilizer use, the more educated the household heads are, the higher the probability of such households using other modern inputs, hired labor or mechanization.

In terms of the relationship between input use and farm size, the results of the probit analysis are consistent with findings from the village narratives in Chapter 7 that farmers in the savanna and transition zones are cropping larger areas and using mechanization to reduce labor requirements, and fertilizer to offset soil fertility losses on land with shortened fallow periods.

While predicted probabilities of fertilizer, herbicide/insecticide and mechanization use are higher in 2012/13, they are lower for hired labor use. From 2005/06 to 2012/13, the predicted probability of using herbicides/insecticides and mechanization increases by 34.6 percent and 14.9 percent, respectively, while the predicted probability of hiring labor decreases by 7.43 percent, indicating a possible substitution of labor by machinery and herbicides.

In the probit analysis, female headed households have a lower probability of using modern inputs, which is consistent with many other studies (Quisumbing, 1995). However but the marginal effect is positive for hiring labor among female headed households, possibly due to the labor constraints such households face. The sign of the marginal effect for the youth dummy is not consistent and often insignificant in the regressions. This result is somewhat surprising, since younger farmers might be expected to be more open to new technologies and knowledge than older adults.

The marginal effect of urbanization on the use of other inputs is not always consistent with that for fertilizer use. Compared with no city districts in the South, only in the districts with 2nd tier cities in the North or with big cities in the South, the marginal effect of using other inputs is mostly positive and significant. The sign of marginal effect tends to be negative, if significant, for the other types of district groups in both North and South.

Among the three variables related to market access or public infrastructure, the marginal effect of input use is positive only for the access to public transportation variable. The probability for any modern input use or labor hiring increases by 4.18 – 10.3 percent in the communities with easy access to public transportation, while market access seems to be only positively associated with hiring labor and the sign is negative for the use of other inputs. Market access is measured by whether a rural community has a daily or periodic market. It is also possible that better access to public transportation allows farmers to get access to market through traders who can come to villages directly.

Table 9.8. Probit model regressions for input use, pooled data of GLSS5 and GLSS6

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
| Independent variable | Fertilizer | Herbicides/Insecticides | Hiring labor | Mechanization |
| *Farm size* |  |  |  |  |
| Less than 2 ha | -0.278\*\*\* | -0.147\*\*\* | -0.223\*\*\* | -0.286\*\*\* |
|  | (0.0461) | (0.0449) | (0.0501) | (0.0389) |
| 2 - 5 ha | -0.140\*\*\* | -0.0236 | -0.116\*\* | -0.187\*\*\* |
|  | (0.0463) | (0.0447) | (0.0503) | (0.0388) |
| 5 - 20 ha | -0.0842\* | 0.0709 | -0.00961 | -0.0869\*\* |
|  | (0.0475) | (0.0462) | (0.0519) | (0.0399) |
| Base is > 20 ha |  |  |  |  |
| Types of district groups |  |  |  |  |
| 2nd tier city districts, North | 0.250\*\*\* | 0.174\*\*\* | 0.177\*\*\* | 0.0803\*\* |
|  | (0.0452) | (0.0522) | (0.0508) | (0.0383) |
| 3rd tier city districts, North | 0.187\*\*\* | -0.172\*\*\* | -0.0150 | -0.000881 |
|  | (0.0184) | (0.0181) | (0.0205) | (0.0172) |
| No city districts, North | 0.139\*\*\* | -0.0827\*\*\* | 0.0103 | -0.00338 |
|  | (0.0138) | (0.0137) | (0.0154) | (0.0128) |
| Big city districts, South | 0.0217 | -0.0730 | 0.180\* | 0.175\*\* |
|  | (0.107) | (0.109) | (0.103) | (0.0857) |
| 2nd tier city districts, South | -0.00633 | -0.159\*\*\* | 0.0604 | -0.0807 |
|  | (0.0621) | (0.0587) | (0.0669) | (0.0630) |
| 3rd tier city districts, South | -0.0693\*\*\* | -0.0404\*\*\* | -0.0254 | -0.00712 |
|  | (0.0156) | (0.0150) | (0.0166) | (0.0140) |
| Base is no city districts, South |  |  |  |  |

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

Notes: Farm size is based on cultivated area. Rural households defined as agricultural only or agricultural and nonagricultural mixed households in GLSS5 are included in the regressions.

Source: Authors own estimation using GLSS5 and GLSS6 data.

Table 9.8: Probit model regressions for input use, pooled data of GLSS5 and GLSS6 (cont.)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) |
| Independent variable | Fertilizer | Herbicides/Insecticides | Hiring labor | Mechanization |
| Year dummy for 2013 | 0.156\*\*\* | 0.346\*\*\* | -0.0743\*\*\* | 0.149\*\*\* |
|  | (0.0108) | (0.00876) | (0.0124) | (0.00993) |
| Youth headed household | 0.00104 | 0.0234\* | -0.0433\*\*\* | 0.00602 |
|  | (0.0134) | (0.0134) | (0.0147) | (0.0123) |
| Female headed household | -0.0695\*\*\* | -0.0842\*\*\* | 0.0612\*\*\* | -0.0385\*\*\* |
|  | (0.0159) | (0.0155) | (0.0168) | (0.0144) |
| Year dummy \* Youth | 0.0596\*\* | -0.0663\*\* | -0.0200 | 0.0295 |
|  | (0.0266) | (0.0269) | (0.02904) | (0.0245) |
| Year dummy \* Female | -0.00362 | -0.0440 | -0.0184 | -0.0773\*\* |
|  | 0.02845 | (0.0286) | (0.0303) | (0.0261) |
| *Education level* |  |  |  |  |
| Primary completed | 0.0265\*\* | 0.0647\*\*\* | 0.0609\*\*\* | 0.0601\*\*\* |
|  | (0.0134) | (0.0131) | (0.0144) | (0.0121) |
| Secondary completed | 0.0828\*\*\* | 0.0961\*\*\* | 0.0833\*\*\* | 0.0863\*\*\* |
|  | (0.0267) | (0.0276) | (0.0303) | (0.0241) |
| University and above | 0.0130 | 0.352\*\* | 0.184 | 0.136 |
|  | (0.0894) | (0.148) | (0.142) | (0.143) |
| Base is no education |  |  |  |  |
| Access to markets | -0.0335\*\* | -0.0276\* | 0.0314\* | -0.0278\*\* |
|  | (0.0145) | (0.0143) | (0.0161) | (0.0126) |
| Access to public transportation | 0.0418\*\*\* | 0.103\*\*\* | 0.0769\*\*\* | 0.0904\*\*\* |
|  | (0.0125) | (0.0124) | (0.0138) | (0.0116) |
| Access to electricity | -0.00848 | -0.0381\*\*\* | 0.0284\*\* | -0.00746 |
|  | (0.0124) | (0.0122) | (0.0134) | (0.0116) |
| Observations | 13,388 | 13,340 | 13,340 | 13,340 |

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01

Notes: Agricultural only or agricultural and nonagricultural mixed rural households in GLSS5 are included in the regressions.

Source: Authors own estimation using GLSS5 and GLSS6 data.

* 1. CONCLUSIONS

Ghana has rapidly urbanized in recent decades, through the development of many secondary and small cities as well as through growth of large cities, particularly in the South of the country. Urbanization has diversified rural livelihood opportunities, leading to significant growth in the share of rural households engaged primarily in the nonfarm economy. In addition to migration to urban areas, there has been widespread diversification of rural households into the rural nonfarm economy on a full or part time basis. The result has been a substantial decline in the share of households who depend primarily on agriculture. Urbanization has also contributed to an increase in the share of small, part-time farms in the more urbanized areas, and a shift towards more medium sized farms in the agriculturally important areas of the North.

The induced innovation hypothesis predicts that urbanization and associated increases in population density and market access should lead to more intensive farming practices, both in terms of the land use patterns and the choice of technologies. Although there has been substantial uptake of fertilizers, herbicides, and mechanization in recent years, we find only limited support for the hypothesis that this has been driven by urbanization, and this support is mainly in the North and in some districts with big cities in the South. More generally, fertilizer appears to be used mainly for offsetting declining soil fertility rather than intensification. Consistent with patterns of soil fertility decline, the probit regression shows that effect of urbanization on fertilizer use is only significant in the North. This is also consistent with findings in Chapter 7.

The regression analysis is also consistent with the narratives of Chapter 7 in terms of the relationship between farm size and use of modern inputs. Chapter 7 describes how farmers in the savanna and transition zones are cropping larger areas and using mechanization to reduce labor requirements in the face of increasing wages. In the probit regressions here, the probability of fertilizer use and using other inputs and mechanization and hiring labor increases significantly with farm size.

Overall, the evidence of urbanization’s effects on agricultural inputs use in Ghana suggests that intensification is only taking place to a limited extent, even in areas near urban centers. Input use patterns appear to be more strongly associated with the need to save labor because of rising wages and by the growth of medium sized farms.

**References**

Ackah, C., Adjasi, C., & Turkson, F. 2014. Scoping Study on the Evolution of Industry in Ghana*.* Washington: Learning to Compete Working Paper No. 18 Africa Growth Initiative (AGI) at Brookings.

Aryeetey, E. and Baah-Boateng, W. 2015. Understanding Ghana's growth success story and job creation challenges*.* WIDER Working Paper 2015/140.

Berdegue, J., Carriazo, F., Jara, B., Modrego, F., & Soloaga, I. 2015. Cities, territories and inclusive growth; Unraveling urban-rural linkages in Chile, Colombia and Mexico. *World Development* , 73: 56-71.

Binswanger, Hans P., and McIntire, John. 1987. Behavioral and material determinants of production relations in land abundant tropical agriculture. *Economic Development and Cultural Change*, 36: 1: 73-99, October.

Binswanger-Mkhize, H., Johnson, T., Samboko, P., & You, L. 2016. *The impact of urban growth on agricultural and rural nonfarm growth in Kenya.* International Fund for Agricultural Development .

Boserup, E. 1965. *The Conditions of Agricultural Growth.* New York: Aldine Publishing Company.

Deichmann, U., Shilpi, F. and Vakis, R. 2008. Urban proximity, agricultural potential and rural non-farm employment: Evidence from Bangladesh. *World Development*, 37 (3): 645-660.

Ghana Statistical Service. 2003. Population and Housing Census 2000. Census data. Accra, Ghana.

Ghana Statistical Service. 2008. Ghana Living Standards Survey Round 5 (GLSS 5). Survey Data. Accra, Ghana.

Ghana Statistical Service. 2013. Population and Housing Census 2010. Accra, Ghana.

Ghana Statistical Service. 2014. Ghana Living Standards Survey Round 6 (GLSS 6). Survey data. Accra, Ghana.

Gollin, D., Jedwab, R., & Vollrath, D. 2013. Urbanization with and without industrialization. Unpublished Paper. <http://dept.econ.yorku.ca/seminars/>.

Haggblade, S., Hazell, P., & Brown, J. 1989. Farm-nonfarm linkages in rural Sub-Saharan Africa. *World Development* , 17 (8): 1173-1201.

Headey, D.; Bezemer, D. and Hazell, P. 2010. Agricultural employment trends in Asia and Africa: Too fast or too slow. *The World Bank Research Observer,* 25: 57-89.

McIntire, John, Bourzat, Daniel and Pingali, Prabhu. 1992. Crop Livestock Interaction in sub-Saharan Africa. World Bank.

McMillan, M., and Rodrik, D. 2011. Globalization, structural change and productivity growth. Washington: IFPRI Discussion Paper 01160. International Food Policy Research Institute.

Mellor, J.W. 1976. *The new economics of growth: A strategy for India and the developing world.*Cornell University Press: Ithaca, N.Y.

Nin-Pratt, A., and L. McBride. 2014. Agricultural Intensification in Ghana: Evaluating the optimist’s case for a Green Revolution. *Food Policy,* 28 (2014): 153-167.

Pingali, Prabhu, Bigot, Yves and Binswanger, Hans P. *Agricultural mechanization and the evolution of farming systems in sub-Saharan Africa*. Johns Hopkins University Press: Baltimore, MD.

Quisumbing, Agnes. 1995. Gender Differences in Agricultural Productivity: A Survey of Empirical Evidence. FCND Discussion Paper No. 5. Washington, D.C., IFPRI.

Rosegrant, M.W. and Hazell, P.B.R. 2000. *Transforming the rural Asia economy: The unfinished revolution.* Oxford University Press: Hong Kong.

Ruthenberg, Hans. 1980. *Farming Systems in the Tropics*. Oxford University Press, (3rd edition).

Timmer, C. Peter, 1988. “The Agricultural Transformation,” in Chenery, H. and T.N. Srinivason (eds.) *Handbook of Development Economics*, Volume 1, Amsterdam: North-Holland, 275-331.

Timmer, C. Peter, 2005. Agriculture and pro-poor growth: An Asian perspective. Available at SSRN 1114155.