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Overview of the Agricultural Input Sector in Ghana

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ABSTRACT

Knowledge of the characteristics and size of the agricultural input sector of a country is critical for policymakers to design appropriate interventions that not only foster growth in the sector, but also support the agricultural development goals of the country. In 2009, the International Food Policy Research Institute and the International Fertilizer Development Center jointly conducted a census of agricultural input dealers in Ghana to fill a critical data gap on the nature of the country's agricultural input sector. This paper presents a detailed description of the sector's structure, market practices, and supply chain. It also assesses the sector's response to recently implemented fertilizer subsidies, and findings show that, despite the government's goal of making the subsidy program supportive of the private market, the majority of fertilizer retailers were excluded from participating.

Keywords: agricultural input sector, fertilizer, agro-dealers network, vouchers, subsidies

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1. INTRODUCTION

The agricultural input sector has critical impact on the agricultural productivity of a nation as it influences farmers' access to and use of productivity enhancing inputs. For several years, information about this sector in Ghana, such as the types of products sold as well as the number of dealers and how they are dispersed across the country, has not been accurately known. The most concrete estimate about the number of retailers in the sector, which emerged from a review of the literature, comes from a Food and Agriculture Organization of the United Nations (FAO) (2005) document that described the sector as consisting of "registered wholesalers/retailers, located in most of the regional capitals" supplying "about 700 rural retailers of fertilizers spread throughout the country, with the highest concentration in the maize belt in the Brong-Ahafo region" (FAO 2005, 12). Knowledge about the sector is critical for designing policies to support its growth. Additionally, the Ghanaian government has embarked on various public-private partnerships aimed at increasing agricultural productivity, and in order for these interventions to succeed, it is crucial that the structure and marketing practices in the sector are understood.

In 2009, the International Food Policy Research Institute (IFPRI) and the International Fertilizer Development Center (IFDC) jointly conducted a census of agricultural input dealers in Ghana. The result of this collaboration is geo-referenced data on a wide range of characteristics of the agricultural-input retail network in Ghana. This paper presents a description of Ghana's agricultural input sector: the number of retailers, basic enterprise characteristics, types of products sold, sources of financing, challenges to operating an agricultural-input retail business, a detailed description of the supply chain, and some information about dealer entry and exit into the sector over time. We also present data on how the sector responded to the 2008 and 2009 fertilizer subsidy programs.

A total of 3,425 agricultural input dealers—ranging from the smallest transient retailers to agricultural input wholesalers—were identified and 2,893 were interviewed. The data show that in Ghana 80 percent of agricultural input dealers sell fertilizer, 91 percent sell crop protection chemicals, 67 percent sell agricultural tools, 59 percent sell seeds, and only 3 percent sell animal feed. There is regional variation in the number of agricultural input dealers as well as in the types of products they sell. The highest density of fertilizer retailers by both area and farmer population is found in the Ashanti region, where there are four retailers per 10,000 farmers. All fertilizer used in the country is imported, and while virtually all of it arrives by sea at the port in Accra, the supply chain revealed three distribution hubs: a dominant hub in Kumasi in the center of the country, which supplies retailers in all regions of the country, and smaller hubs in Tamale in the Northern region and Wa in the Upper West region, which both supply retailers in the northern part of the country.

The data show that the 2008 voucher program did not utilize the full fertilizer-distribution network, but rather, only 40 percent of fertilizer retailers were able to participate. The design of the voucher program required retailers to pass vouchers that they had received from farmers to one of three major fertilizer importers for reimbursement. This design relied on the assumption that a good proportion of fertilizer retailers had relationships with fertilizer importers. However, the analysis of the network shows that in 2009 only 11 percent of fertilizer retailers had direct links (through supply channels) to fertilizer importers, and it is likely that a similar percentage had direct links in 2008 as well. In 2008, 87 percent of fertilizer retailers who did not accept vouchers said it was because they had no way of redeeming them. The proportion of fertilizer retailers who were in the subsidized fertilizer network was higher in the regions where the market concentration of dealers was higher. This is further evidence of the importance of supply chain relationships to an importer; they determine whether a retailer is able to participate in the voucher program. The actual size of the subsidized fertilizer retail network was about 40 percent because retailers improvised ways to redeem the vouchers: They passed them through other retailers who had relationships with fertilizer importers. This practice may have saved the subsidized fertilizer network from being severely limited. However, it also possibly exposed retailers to exploitation as they were forced to rely on informal channels to redeem the vouchers.

The structure of the paper is as follows: Section 2 provides an overview of the importance of a private agricultural-input sector using the context of Kenya and Malawi. It summarizes the countries' approaches to agricultural input use and emphasizes the importance of a private market-led growth of the sector. Section 3 describes the basic characteristics of the agricultural-input dealers' network in Ghana. It also presents the types of products sold and explores the determinants of the sale of three productivity enhancing inputs. Section 4 examines the various obstacles to operating an agricultural inputs enterprise in Ghana. Section 5 describes the supply chain for fertilizer, a critical agricultural input. Section 6 takes a closer look at how the size of the agricultural input network has evolved overtime. Section 7 analyzes the way the sector responded to the fertilizer subsidy programs of 2008 and 2009. Section 8 offers a conclusion.

2. IMPORTANCE OF THE AGRICULTURAL INPUT SECTOR AND PRIVATE LED GROWTH

Low agricultural input use is often associated with declining soil fertility, declining yields, and low farmer incomes. Increased use of fertilizer and improved seeds are partially credited with the large increases in agricultural productivity growth in Asia during the Green Revolution. It is evident that agricultural input use must increase in Africa if the continent is to see significant productivity growth.

In Africa, input-use promotion programs have relied heavily on subsidies and have required unaffordable continuous financial support. Increasingly, consensus has emerged for the need to foster private sector–led development of agricultural input markets (Freeman and Kaguongo 2003). However, in many African countries, liberalization efforts have not necessarily resulted in the private sector taking over where the government agencies left off. Agricultural input (especially fertilizer) usage fell significantly post liberalization in many countries in Africa.

In many African countries, private investment in input distribution, especially of fertilizer, is discouraged by an unfavorable business climate characterized by continued government procurement and distribution of inputs, which undercut private markets, increase the uncertainty of input marketing, and result in high levels of rent seeking (Morris et al. 2007). Macroeconomic instability, inadequate regulatory systems, and an abundance of taxes and fees also limit the active involvement of the private sector (Morris et al. 2007). Entry into the sector is often limited by: inadequate arrangements for financing the purchase of fertilizer; poor port, rail, and road infrastructure; transaction costs; noncompetitive behavior of suppliers; and policies and institutions that restrict competition and increase marketing costs (Crawford et al. 2003).

With few exceptions, the agricultural input sectors in African countries are small and limited in geographic dispersion. Uganda had fewer than 100 input dealers in 2001; in 2003, Tanzania had only 500 input dealers (Morris et al. 2007). Many dealers were concentrated in urban or semi-urban areas, and very few were located in the rural interior near smallholders' farms. Farmers often must travel at least 20 to 30 kilometers to purchase fertilizer, seeds, and other inputs, which raises the cost of using inputs to farmers (Morris et al. 2007). Policy reforms, institutional changes, and supporting investments that can make agricultural input production and distribution more profitable and attractive are required in order to induce private sector.

Private Sector–Led Agricultural Input Use in Africa—Kenya's Success Story with Fertilizers

Since its liberalization in the late 1990s, Kenya is one of the few African countries that has made substantial progress in private sector–led fertilizer market development. Since 1990, the government has pursued a relatively stable fertilizer-marketing policy. Kenya has witnessed rapid investment in private fertilizer-distribution networks, with more than 10 importers, 500 wholesalers, and 7,000 retailers now operating in the country (Ariga, Jayne, and Nyoro 2006). A cross-section survey of private input traders in Kenya found that, on average, 62 percent of input traders sold fertilizers at the time of the survey (September to November of 1997), and about 60 percent sold improved seeds and agro-chemicals. About 90 percent of traders selling fertilizer were pure retailers while the rest carried out both wholesale and retail trade (Freeman and Kaguongo 2003). The majority of traders were relatively new entrants with 70 percent of traders entering the market between 2007 and 2010. In addition, the majority of traders relied on their own funds for start-up and enterprise operation with only 16 percent reporting that they had acquired credit for fertilizer trade (Freeman and Kaguongo 2003). In addition, 98 percent of traders reported repackaging fertilizer into smaller sizes (particularly 1 and 2 kilograms) that were preferred by smallholder farmers (Omiti et al. 1999; Freeman and Omiti 2003; Freeman and Kaguongo 2003).

A nationwide study shows that fertilizer used per cropped hectare rose by 35 percent between 1995/96 and 2003/04, and the total amount of fertilizer used has doubled between the early 1990s and

2007, raising from 250,000 tons per year in 1990 to 400,000 tons in 2007 (Ariga and Jayne 2009). Furthermore, Kenyan smallholder farms, not large-scale operations, have led the growth in fertilizer consumption; the proportion of smallholder farmers using fertilizers increased to 70 percent in 2007, up from 56 percent in 1996 (Ariga and Jayne 2009). This increase in smallholder fertilizer use is desirable as it results in broad-based productivity increases and has poverty reduction implications.

Ariga and Jayne (2009) summarize the four main factors that account for the expanded use of fertilizer by smallholder farmers in Kenya in the last 15 years: (1) a major expansion in the number of fertilizer importers, wholesalers, and retailers operating in Kenya; (2) a decline in the distance traveled by farmers to the point of fertilizer sales; (3) a substantial decline in the margins charged between the cost of fertilizer in world markets and observed fertilizer prices paid by Kenyan farmers, reflecting increased competition and efficiency in domestic fertilizer distribution; (4) reduction in marketing costs, which result in roughly constant fertilizer farmgate prices (Ariga and Jayne 2009).

As a direct result of an increasingly dense network of fertilizer retailers operating in rural areas, the mean distance of small farmers to the nearest fertilizer retailer has declined (from 8.4 to 3.4 kilometers between 1997 and 2007) (Ariga and Jayne 2009). This has greatly expanded smallholder farmers' access to fertilizer, reduced transaction costs, and increased the profitability of using fertilizer. In addition, since importing and wholesaling are now subject to intense competition, pressure to cut costs and innovate logistics has cut domestic marketing margins (Ariga, Jayne, and Nyoro 2006). Despite rising world prices, farmgate prices in Kenya have remained fairly constant over the past 15 years due to the 55 percent reduction in fertilizer marketing costs from Mombasa to Western Kenya (Ariga, Jayne, and Nyoro 2006).

Kenya's experience with fertilizer-market reforms shows that a sustained commitment to the development of viable commercial input-delivery systems can foster an impressive private sector response that can lead to productivity gains in the smallholder farming sector. In turn, poverty is alleviated (Ariga, Jayne, and Nyoro 2006).

Government-Led Agricultural Input Use: Malawi's Story

In contrast to Kenya, the Malawian government reversed the liberalization process of the early 1990s and reinstated its fertilizer subsidy policy. Malawi reintroduced universal fertilizer subsidies to smallholders in 1998, and in 2005 the subsidy program underwent a substantial expansion and was redesigned into an universal voucher-based subsidy program that allows farmers to buy 100 kilograms of fertilizer at about one-fifth of the market price, thus dramatically increasing both the scope and the fiscal cost of the subsidy (Minot and Benson 2009).

Private sector involvement in the fertilizer subsidy programs was very limited, and as a result, the Malawi agricultural-dealer market is still fragmented and underdeveloped. The distribution of the subsidized inputs has been managed largely by two state-owned enterprises, and while private importers were contracted to deliver the subsidized fertilizer to distribution points, private retailers have generally not been involved in distribution (Minot and Benson 2009). In the late 1990s, the dealers still maintained substantial market share as only about 9 to 24 percent of fertilizer sold in the country was subsidized. However, by 2005, the proportion of subsidized fertilizer had increased to about one-half of the fertilizer sold (Minot and Benson 2009). By 2007, the fertilizer subsidy program accounted for over 90 percent of the smallholder fertilizer market in Malawi, and the share of the private sector in this program was reduced to import operations only (Kachule and Chilongo 2007). A few large input-supply companies were allowed to participate in retail sales of subsidized fertilizer between 2006 and 2008, during which they accounted for 25 to 30 percent of subsidized fertilizer sales; however, in 2009 their involvement was discontinued (Dorward and Chirwa 2009). However, subsidized seeds have been largely distributed and sold through private channels (Dorward and Chirwa 2009).

In the past decade, Malawi's private sector has seen some growth in importation and distribution of fertilizer but the size of Malawi's agricultural-input dealer sector is still relatively small compared to other countries in terms of density and total number of private sector retailers and dealers. The fertilizer

sales sector consists of three connected but distinct tiers: (1) the importers' network of retail outlets (their own and independent businesses); (2) a network of permanent, small, independent dealers who may sell, at most, 50-100 metric tons per year; and (3) seasonal dealers who may sell, at most, a few metric tons per year.

The import dealers usually procure their fertilizer from first tier retailers. These outlets are usually quite large, selling hundreds of metric tons per year. In addition to selling directly to farmers, they often sell to second and third tier dealers. The total number of these retail outlets is about 225. The small, independent dealers, totaling a about 100, usually procure their fertilizers from first tier retailers. Seasonal dealers usually serve small remote villages where there are no permanent retailers or dealers operating. Their numbers are unknown, but probably between 30 to 50 (Kachule and Chilongo 2007). The government activity in fertilizer distribution has had evident deleterious effects on growth in the private agricultural-input distribution sector.

3. THE AGRICULTURAL INPUT SECTOR IN GHANA

Ghana is divided into 10 administrative regions and, at the time of the IFPRI/IFDC (2009) survey, 138 administrative districts.¹ We expect the demand for agricultural inputs to be dependent on the type of crops grown in the region, farmers' knowledge about agricultural technologies and inputs, profitability, the affordability of inputs, and the ease of accessing both input and output markets. Regional level demographics shown in Table 1 reveal broad variation in wealth, health, and educational achievements among Ghanaians per region, which could impact both the demand for agricultural inputs and the nature of the agricultural input sector per region. Therefore, throughout the paper, we typically present data at a regional level to reveal the spatial variation in the characteristics of the sector.²

Table 1. Summary demographic characteristics of the regions of Ghana

Region	Population with no education (%)	Years of schooling (median)	Household size (mean)	Child mortality (per 1,000 newborns)	Poverty head- count ratio
South					
Ashanti	13.3	7.0	5.3	28	0.27
Brong-Ahafo	26.4	3.8	5.3	41	0.44
Central	18.0	5.6	4.4	38	0.45
Eastern	15.0	6.6	4.6	30	0.39
Greater Accra	9.2	8.9	4.6	14	0.13
Volta	19.6	5.6	4.7	13	0.50
Western	15.7	7.0	4.7	14	0.33
North					
Northern	51.1	0	7.4	72	0.7
Upper East	43	0.8	7.2	33	0.72
Upper West	41.1	1	6.4	50	0.76

Sources: Demographic and Health Survey (2008) and Ghana Living Standards Survey (2005).

Number and Density of Dealers

Table 2 shows the number of agricultural input dealers per region. An input dealer is defined as any establishment that sells any type of agricultural input. The counts in Table 2, therefore, include small table-top operations, medium-sized retailers who have stores (stockists), and various specialized wholesalers of fertilizers, chemicals, and improved seeds. In the following section, we discuss the proportion of dealers in each region who sell particular inputs (fertilizers, chemicals, etc.). However, for an accurate picture, these proportions need to be viewed in the context of the total numbers of agricultural input dealers operating in the region.

¹ The district is the second tier of Ghana's deCentralized structure of government. District boundaries have been redemarcated since the time of the survey, and as of 2010, there were 170 districts.

² In some instances, the differences are most pronounced between the northern and southern parts of the country and data are presented in only these two categories.

Table 2. Number of agricultural retailers

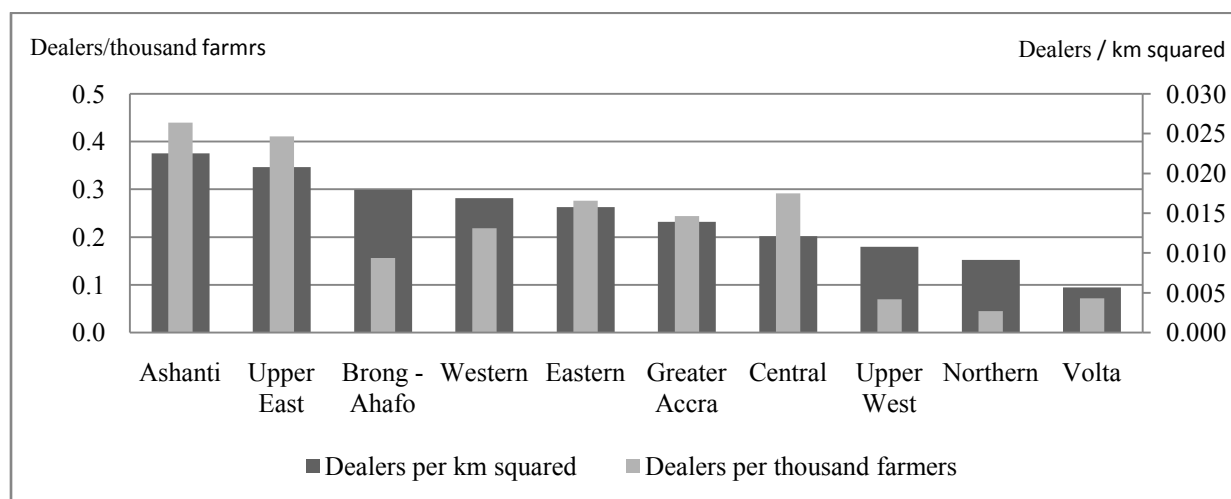
Region	Agricultural input dealers 2009
Ashanti	851
Brong-Ahafo	503
Central	176
Eastern	400
Greater Accra	98
Northern	359
Upper East	219
Upper West	97
Volta	195
Western	527
National Total	3,425

Source: IFPRI/IFDC (2009).

Figure 1 shows the density of agricultural input dealers per area and per thousand farmers and Figure 2 shows the location of each agricultural input dealer in Ghana. There is no accurate count of the number of farmers in each district in Ghana in 2009. However, we estimate this number as the product of the size of the labor force in a district and the proportion of the labor force engaged in agriculture as reported in the 2000 census (Ghana Statistical Services 2000). District area is also identified from Ghana Statistical Services data. As evident from Figure 1, dealer densities vary widely across the country. With the exception of the Upper East region, the northern part of the country has a significantly lower density (especially in terms of number per farmer) of dealers compared to the southern part of the country. The Ashanti region has the highest density of agricultural input dealers both per area and per a thousand farmers. It is important to note that for many regions relatively high area density does not necessarily imply high per-farmer density and vice versa (as evidenced by the Brong-Ahafo region).

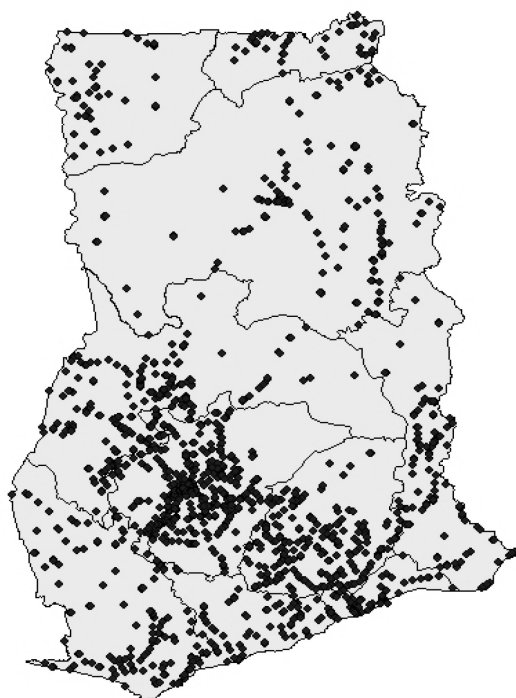
Dealer density is likely an important determinant of the ease with which farmers can reach an agricultural input dealer. The correlation coefficient between the regional poverty head-count ratios and the number of dealers per thousand farmers is -0.30 and -0.38 , respectively, indicating that farmers in poorer regions have less physical access to agricultural inputs.

Figure 1. Agricultural-input dealer densities by region



Source: IFPRI/IFDC (2009) and Ghana Statistical Services (2000). Note: Regions ranked by dealer density.

Figure 2. Locations of agricultural input dealers in Ghana



Source: IFPRI/IFDC (2009).

Types of Agricultural Input Dealers

Table 3 provides an indication of the nature of the type of dealers that make up the agricultural input network in each region. We identified three broad groups of dealers: tabletop dealers, general stockists, and specialized wholesalers. Tabletop dealerships are, in general, small enterprises run by one person. They typically have a very small inventory, often only enough to fit on top of a single table on which the items are displayed for sale. Stockists operate medium-sized enterprises that have a fixed store location and frequently sell multiple types of agricultural inputs. Specialized wholesalers manage larger enterprises that typically focus on the sale of one type of agricultural input to other retailers.

Table 3. Percentage of agricultural input dealers by type of establishment

Region	Stockist	Wholesaler	Tabletop Dealer	Sole Ownership
Ashanti	79%	9%	11%	1%
Brong – Ahafo	87%	6%	5%	2%
Central	94%	3%	3%	1%
Eastern	81%	5%	10%	4%
Greater Accra	87%	11%	2%	0%
Northern	42%	35%	18%	5%
Upper East	22%	31%	47%	0%
Upper West	58%	32%	11%	0%
Volta	84%	7%	4%	5%
Western	86%	2%	9%	3%
National Average	74%	12%	12%	2%

Source: IFPRI/IFDC (2009).

In the southern part of the country, 84 percent of the agricultural input sellers self-identify as general stockists selling multiple types of agricultural inputs. In the northern part, the types of dealers in operation are equally divided among stockists, wholesalers, and tabletop dealers. Only 6 percent of agro-dealers in the southern part of the country reported being a wholesaler, while 33 percent of agro-dealers in the northern part self-identify as wholesalers.

While the types of agricultural input dealers differ among regions, the ownership structure of enterprises is fairly uniform across the country. The majority of the agricultural input enterprises in Ghana are family owned, sole ownerships, established and operated from owners' own funds. Only 3 percent of agro-dealers in Ghana are private limited-liability partnerships.

Demographic Characteristics of Owner/Managers of Agricultural Input Businesses

In all Ghana, agricultural input dealerships are primarily male owned and owner managed. As seen in Table 4, owner/managers in the northern regions have less education than their peers in the south the number of owners there with no education is significantly higher than the national average of 12 percent and the percentage with middle school education is less than the country's 38 percent average. Brong-Ahafo and Ashanti agricultural-input enterprise owners show the most years of education.

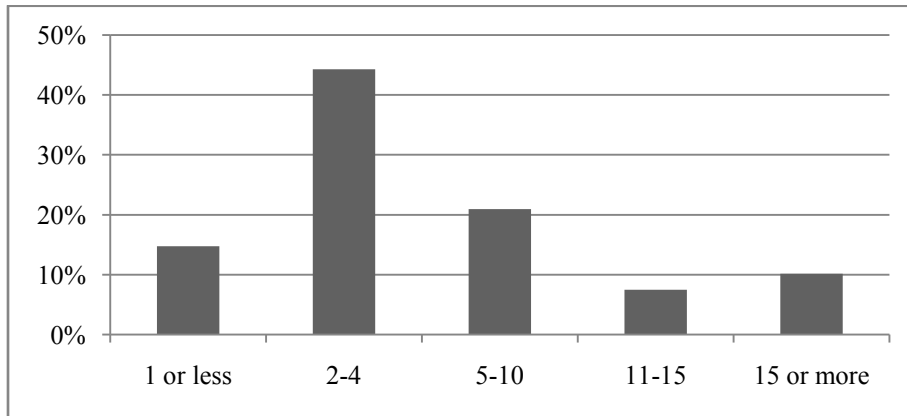
Table 4. Demographic characteristics of agricultural input dealers

	Male owners (%)	Average age of owner (years)	Owners with no education (%)	Owners with middle school or junior high school education (%)
Ashanti	82	42	4	47
Brong-Ahafo	84	41	5	49
Central	84	43	3	36
Eastern	85	42	1	42
Greater Accra	81	44	0	23
Volta	78	45	1	31
Western	78	41	4	41
Northern	92	38	47	18
Upper East	54	37	46	15
Upper West	92	41	25	28
National Average	81	41	12	38

Source: IFPRI/IFDC (2009).

The agricultural input enterprises are on average 5.3 years old. Fifteen percent of dealers could be considered new entrants as they have been in operation for 1 or less years, but 18 percent are more than 10 years old (Figure 3) Seed and fertilizer wholesalers have been, on average, the longest operating, for 10.8 and 6.8 years, respectively, while chemical wholesalers and tabletop dealers are, on average, the newest businesses with less than 4.0 years in operation.

Figure 3. Percentage distribution of agricultural input dealers by age of business (years)

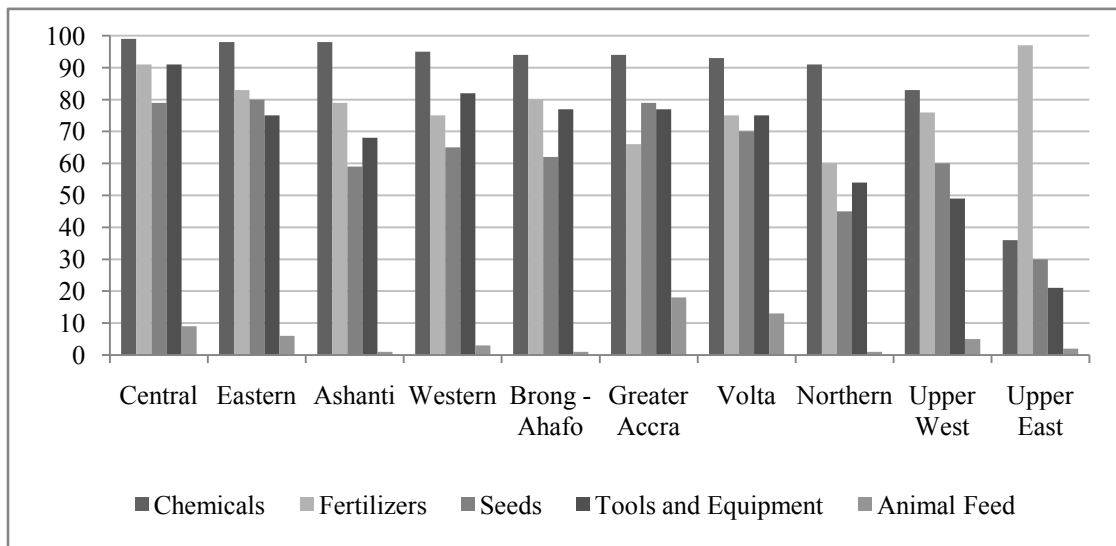


Source: IFPRI/IFDC (2009).

Types of Products Sold

The percentages of agricultural input dealers who sell each type of product are shown in Figure 4.

Figure 4. Percentages of agricultural input dealers who sell specific products



Source: IFPRI/IFDC (2009).

Note: Regions are ranked by percentage of agro-dealers selling chemicals and fertilizers.

Ninety-one percent of agricultural input dealers reported selling crop protection chemicals. This percentage is consistent in all regions except in the Upper East where only 36 percent of dealers reported selling chemicals. Ninety percent of dealers reported selling herbicides, and 84 percent sell insecticides herbicides and weedicides (Table A1 in the appendix). Insecticide sales are less prevalent in the northern part of the country with only 60 percent of Northern, 34 percent of Upper East, and 75 percent of Upper West dealers selling them compared to high selling southern regions such as the Central (97 percent) and Eastern (96 percent) regions. The majority of agricultural dealers that sell chemicals sell directly to smallholder farmers and to a varying degree to large-scale commercial farmers. Ashanti, Greater Accra, and the Northern region are the only three regions where agro-dealers supply a substantial share of their

products to commercial large-scale farmers. However, the chemicals sold are used on a variety of crops across regions: 82 percent of agro-dealers reported that the purchased chemicals are being used on tomatoes, garden eggs and peppers and 88 percent of them reported usage on maize. These numbers are uniformly high throughout the country with the exception of the Northern region where use of chemicals on vegetables is substantially lower than the rest of the country; crop protection chemicals sold in this region are used primarily on millet, sorghum, and rice. In the Ashanti, Central, and Western regions, the crop protection chemicals sold are used on cocoa and cassava. Brong-Ahafo dealers reported chemicals sold for use on various fruits.

Eighty-four percent of agricultural input dealers in Ghana reported selling fertilizers in 2009, putting the number of fertilizer sales locations at about 2,880. The Upper East region has the highest percentage of dealers who reported selling fertilizer (99 percent). The Northern region had the lowest proportion of its dealers selling fertilizers (66 percent). However, in terms of the density of fertilizer dealers, with the exception of the Upper East, the northern part of the country shows a lower density (both in terms of dealer per farmer and dealer per area) of fertilizer dealers compared to the southern part of the country (Figure 1). The highest density of fertilizer dealers (both in terms of population and area) is in the Ashanti region. As shown in appendix Table A2, NPK solution is the most frequently sold fertilizer with 82 percent of dealers reporting selling it, followed by sulphate of ammonia (79 percent). Urea sales are less prevalent throughout the country. The exceptions are in the Upper East and Greater Accra where the percentages of dealers selling urea were 91 and 68 percent respectively, which are well above the country average of 45 percent. The majority of agricultural dealers that sell fertilizers sell directly to smallholder farmers and only Ashanti, Greater Accra, and the Northern region reported a high percentage of customers being large-scale commercial farmers.

The fertilizers sold are used on a variety of crops in a pattern across the regions very similar to that seen for the use of protective chemicals. Across all regions, a high proportion of fertilizer retailers reported that their customers are maize farmers; about 90 percent of fertilizer retailers reported selling to maize farmers in each region (Table A2 in the appendix). Of the fertilizers sold, cocoa, cassava, tomatoes, garden eggs and peppers also receive significant amounts in the southern regions, while rice, millet, sorghum, and vegetables are the major fertilizer recipients in the northern part of the country (Table A2 in the appendix).

Sixty-six percent of agricultural dealers in Ghana sell at least one kind of improved seeds (Table A3 in appendix). The percentage of agro-dealers selling improved seeds is substantially higher in the Central, Eastern, and Greater Accra regions than the rest of the country. A very low percentage of agricultural input dealers in the Upper East and Northern region reported improved seeds sales. The majority of improved seeds sold are of maize and various vegetables including tomatoes, peppers, garden eggs, and onions.

Only a very small percentage (3 percent nationally) of agro-dealers sell animal feed. Even in the regions with the highest percentages, Greater Accra and Volta, the percentage of agro-dealers selling animal feed is less than 20 percent. The animal feed sold is predominantly for feeding poultry, sheep, and goats. Sixty-seven percent of agro-dealers sell agricultural tools. Knap sacks and cutlasses are the most frequently sold tools with 52 and 41 percent of dealers selling them. In addition, many of the other tools sold, such as gloves, sprayers, and masks, are complementary products to fertilizer and chemicals usage.

Dealer Characteristics and Correlations to Types of Inputs Sold

We sought some insights on which factors enable the sale of productivity enhancing inputs such as fertilizers, chemicals, and improved seeds. We focus on these inputs because they can be considered an extra instead of a necessary input in production. We limit our sample to stockists and tabletop dealers. Due to endogeneity bias and the possible problem with reverse causality, our discussion of results is solely exploratory and centers on discussing correlations among explanatory variables and the implications of the coefficient signs.

To capture the influence of the expected determinants of the dealers' decisions to sell a particular agricultural input, PROBIT and OLS regressions were used to estimate the model in equation 1:

$$y_i = \alpha_0 + \alpha_1 \text{OWNER}_{it} + \alpha_2 \text{BUSINESS}_{it} + \alpha_3 \text{DEMAND}_{it} + \alpha_4 \text{COMP}_{it} + \alpha_5 \text{Z}_{it} + u_i \quad (1)$$

In equation 1, the dependent variable y_i is a dummy variable that depicts whether particular agricultural input is sold by the agricultural input dealer; OWNER_{it} contains different measures of the business owners' characteristics; BUSINESS_{it} captures various characteristics of the business itself; different measures of demand are captured by the variable DEMAND_{it} ; COMP_{it} is a proxy for the amount of competition faced by the agricultural dealers; and Z_{it} is a vector of region dummies.

In general, we would expect higher education levels and the fact that an owner/manager received training to have a positive influence on the owner's decision to sell fertilizers, chemicals, and improved seeds. We expect that older enterprises will have more established supply networks and thus be more likely to access the inputs of interest. We expect ownership of a bank account to positively influence the ability of an enterprise to finance its operations both through the implication that the owner engages in savings and in the possibility that existing bank relations can enhance an owner's ability to apply for credit. We use a districts' farmer population, area of maize cultivated, and poverty head-count ratios as proxies for the demand for agricultural inputs.³ We expect district farming populations to be highly positively correlated with the number of customers for agricultural inputs. Lastly, we expect higher poverty head counts to dampen demand for agricultural inputs and negatively influence agricultural dealers' decisions to sell any of the inputs of interest. Agricultural-input dealer density in the district is used as a proxy for competition, and we expect it to have a negative impact on the dealers' input sales decisions because a high number of dealers in the area selling the same input may decrease a dealer's incentive to stock any given input. The region dummies capture several region-specific factors, the most important of which is the agroecology of the region.

Estimated coefficients in equation 1 are shown in Table 5. The coefficients on owner/manager training are significant and positive for all three inputs. Education levels also increase the probability of the sale of chemicals and improved seeds. This finding is consistent with our expectation as more highly educated dealers with proper training are likely more informed about the types of products available and may be better positioned to sell them. For fertilizers and improved seeds, the correlation for enterprise age is positive and significant, as expected. However, it is negative and significant for the sales of chemicals. If we use age of enterprise as a proxy for the time it takes to establish relationships with input suppliers, this would imply that the chemical supplier network is more easily accessible. The bank account ownership coefficient is positive and significant for both fertilizers and chemicals. Because of the low percentage of agro-dealers that reported receiving credit (7 percent), the bank account should be viewed as a measure of savings and wealth rather than a measure of access to finances. A stockist is more likely to sell each of the three inputs of interest than a tabletop dealer.

There is a positive correlation between number of farmers in a district and the probability that dealers located there will sell fertilizer. Poverty head-count ratios negatively impact the probability that a dealer sells crop protection chemicals or improved seeds. The results show also that dealers are less likely to stock a given input if there is a significant amount of competition, as measured by a high dealer density.

³ Eighty-seven percent of agricultural dealers reported that maize is one of the crops for which fertilizers are purchased (88 percent for chemicals, and 53 percent for improved seeds)

Table 5. Determinants of agricultural input sales

	OLS fertilizer sales	PROBIT fertilizer sales	OLS chemical sales	PROBIT chemical sales	OLS seeds sales	PROBIT seeds sales
Age	-0.002*** (0.0008)	-0.002*** (0.0007)	0.0007 (0.0003)	-0.0002 (0.0002)	-0.0002 (0.0009)	-0.0003 (0.001)
Male	-0.024 (0.02)	-0.018 (0.02)	0.042*** (0.01)	0.013** (0.006)	-0.013 (0.02)	-0.013 (0.03)
Primary/secondary education	0.006 (0.03)	0.03 (0.04)	0.063*** (0.02)	0.002 (0.004)	0.121*** (0.04)	0.139*** (0.04)
Tertiary education	-0.014 (0.04)	0.005 (0.04)	0.063*** (0.02)	0.005 (0.005)	0.189*** (0.04)	0.199*** (0.04)
Received training	0.079*** (0.02)	0.08*** (0.02)	0.013 (0.009)	0.008* (0.004)	0.138*** (0.02)	0.147*** (0.03)
Has banking account	0.041* (0.02)	0.044** (0.02)	0.023** (0.01)	0.008 (0.005)	0.043 (0.03)	0.046 (0.03)
Enterprise age	0.004*** (0.001)	0.004** (0.002)	-0.002*** (0.0007)	-0.0005** (0.0002)	0.004** (0.002)	0.004** (0.002)
Stockist	0.250*** (0.03)	0.246*** (0.03)	0.140*** (0.02)	0.0635*** (0.02)	0.299*** (0.03)	0.317*** (0.04)
Number of farmers	1.12e-10*** (0.00)	1.10e-10*** (0.00)	-0.00 (0.00)	0.00 (0.00)	-0.00 (0.00)	-0.00 (5.03e-11)
Poverty head count	-0.071 (0.09)	-0.131 (0.11)	-0.240*** (0.05)	-0.047** (0.02)	-0.236** (0.11)	-0.312** (0.14)
Area of maize in Ha	2.02e-07 (1.24e-06)	1.97e-07 (1.31e-06)	-2.89e-07 (3.70e-07)	4.35e-08 (3.15e-07)	-2.15e-06 (1.64e-06)	-2.47e-06 (1.75e-06)
Dealer density(per km ²)	-0.186 (0.15)	-0.320* (0.17)	-0.302*** (0.06)	-0.083*** (0.03)	-0.326* (0.18)	-0.427** (0.20)
R-squared	0.835		0.971		0.707	

Source: IFPRI/IFDC (2009).

Note: Standard errors in parentheses, *** for p<0.01, ** for p<0.05, * for p<0.1. ; region dummies included in all analysis.

4. OPERATION OF AGRICULTURAL INPUT ENTERPRISES

Sources of Financing

On average, 76 percent of agricultural input dealers reported having a bank account. The Central region has the highest percentage of dealers with a bank account (93 percent) and the Northern region has the lowest with only 51 percent of agro-dealers reporting having one (Table A4 in appendix). However as seen in Table 6, only 7 percent of enterprises reported obtaining any of their start-up capital through bank loans or bank financing for their current operations. Alternative sources of financing, such as cooperatives and microfinance institutions, play almost no role in financing; less than 2 percent of enterprises rely on these sources for start-up and enterprise operation (Table A4 in the appendix). This suggests that access to loans for agricultural input enterprises is very low. Ninety percent of enterprises reported that their start-up financing came from the personal resources of the owner/manager and another 9 percent reported receiving loans from family members. Eighty-one percent of agricultural input dealers rely on profit from business operations to finance the running of the enterprise.

Table 6. Sources of financing for agricultural input dealerships

	Source of start-up capital			Source of capital for financing of current operations		
	Personal resources (%)	Family (%)	Banks (%)	Profits from current business (%)	Personal resources (%)	Banks (%)
Ashanti	93	8	5	60	87	7
Brong-Ahafo	91	10	6	97	86	7
Central	86	4	13	93	45	10
Eastern	86	6	12	73	73	11
Greater Accra	87	10	8	97	66	13
Northern	95	7	2	96	93	4
Upper East	92	12	6	83	80	3
Upper West	76	21	4	78	75	7
Volta	89	10	16	92	73	15
Western	87	9	7	93	78	7
National Average	90	9	7	81	80	7

Source: IFPRI/IFDC (2009).

The cost of establishing a new business in 2009 differed among the regions. The median amount of start-up capital needed to establish an agricultural input dealership in Ghana in 2009 was 500 cedis.⁴ In the Northern and Upper East regions, the lowest median start-up cost in 2007 was 200 cedis. Start-up costs were highest in the Greater Accra region with a median of 3,850 cedis.

As seen in Table 7, the 2009 start-up costs varied by business type. As expected, tabletop dealers had the lowest start-up cost with a median of 200 cedis, while seed and fertilizer wholesalers are the most expensive to establish with 1,000 and 900 cedis needed, respectively, to meet start-up costs. The reported median start-up costs of general stockist businesses in 2009 were 800 cedis. Only for the stockist business was the cost of start-up fairly consistent across the northern and southern parts of the country. For all the other business types, the median cost of establishing an agricultural input business was much higher in the southern part of the country, with the most pronounced regional differences among seed wholesalers (seed wholesale businesses in the southern part cost almost eight times as much to start as those in the north). The start-up costs for a tabletop dealer in the southern part of the country was more four times the

⁴ 1 Ghana Cedi was approximately US\$0.70 in 2009.

cost in the northern regions. The large difference among the start-up costs between the northern and southern parts of the country stems partially from the overall higher prices in the south. In addition, the differences in start-up costs also reflect the size variation among identical types of business between the two parts of the country.

Table 7. Start-up capital amounts by location and type of business

	Median amount of start-up capital by business type in Ghana (cedis)					
	All dealers	Stockist	Fertilizer wholesaler	Chemical wholesaler	Seed wholesaler	Tabletop dealer
North	300	600	700	200	200	60
South	500	700	1,000	400	1,500	250
National	500	700	800	322	1,000	200

Source: IFPRI/IFDC (2009).

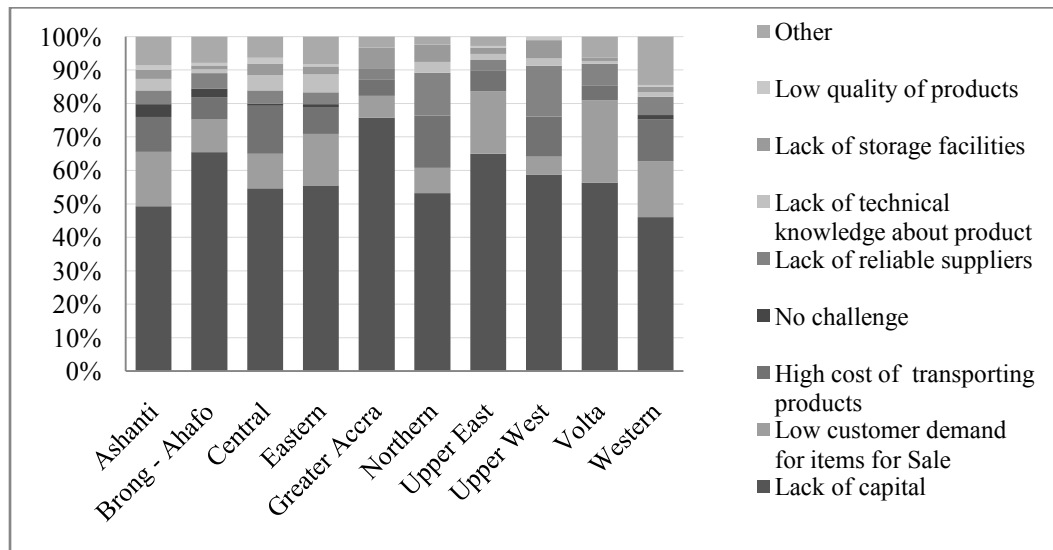
Thirty-four percent of agro-dealers reported that they are able to purchase some kind of items on credit from their most important supplier. Fertilizers and pesticides were the most likely items to be sold on credit; very few suppliers extend credit to their customers for purchases of improved seeds, animal feeds, and tools. Twenty-three percent of fertilizer retailers are able to purchase it on credit from their most important supplier. About 8 percent of improved-seed retailers and 7 percent of agricultural tool retailers are able to purchase these products on credit from their most important supplier. There is regional variation in the proportion of dealers who are able to purchase any input credit from their most important supplier (Table A5 in appendix): 61 percent in the Upper East, 56 percent the Upper West, and 15, 18 and 22 percent in the Central, Western, and Ashanti regions, respectively, and 42 percent in Brong-Ahafo.

Sixty-three percent of agricultural input dealers reported selling at least one type of product on credit to their customers. Forty-three percent of retailers sell fertilizers on credit while about 50 percent of dealers sell agricultural chemicals, such as weedicides and pesticides, on credit. The proportion of dealers willing to sell to customer on credit varies significantly by region. In Greater Accra only 37 percent dealers sell on credit, while in Upper West 77 percent of dealers provide credit to their customers.

Challenges to Business Operations

The majority of agricultural input dealers perceive lack of capital (79 percent) and high cost of transporting products (48 percent) as challenges to operating an agricultural-input retail business. Given that virtually all the businesses were started with personal finances, this finding is not surprising. When asked to rank challenges by severity (Figure 5), lack of available capital was uniformly ranked by a vast majority in all regions as the most important challenge to running a business. For the majority of southern regions, lack of customer demand is the number two most frequently cited obstacle. For the Northern and Upper West regions, lack of reliable suppliers ranks as the second biggest challenge (Table A6 in the appendix).

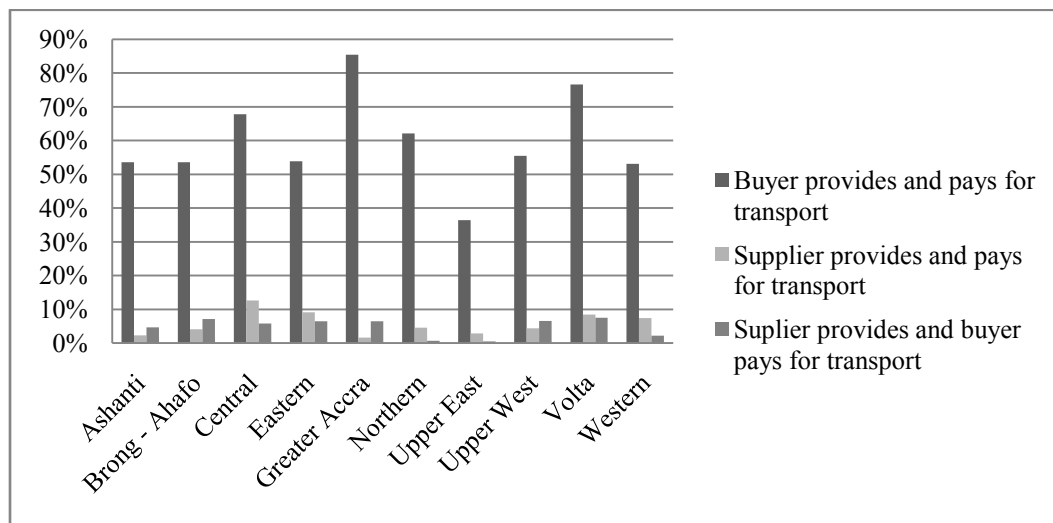
Figure 5. Top challenge to business operation



Source: IFPRI/IFDC (2009).

Agricultural input dealers in the Upper West region (78 percent), in particular, cite the high cost of transportation as a challenge to business operations. Nationally, arrangements in which the buyer pays for transport and the supplier provides means of transportation are also rare with only 8 percent of agricultural input dealers relying on this arrangement with their main supplier (Figure 6).

Figure 6. Transportation arrangements with most important supplier



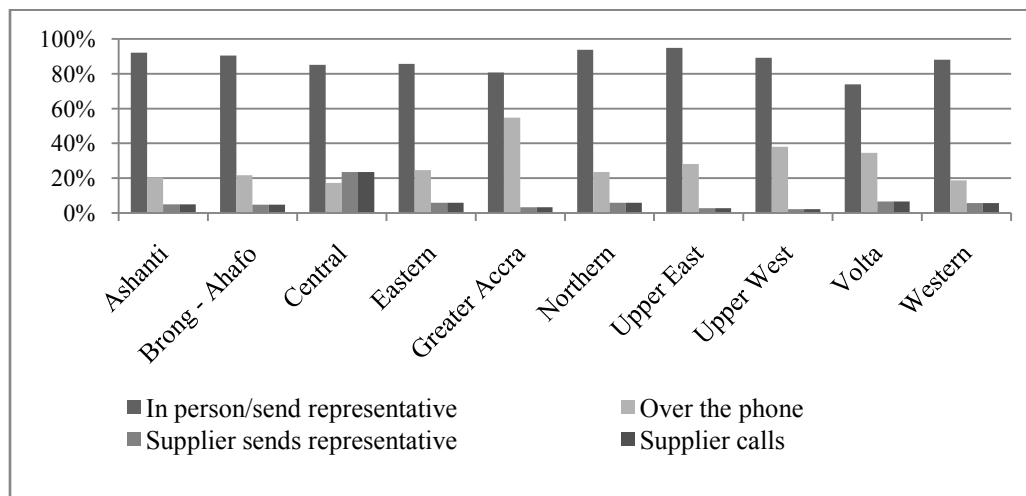
Source: IFPRI/IFDC (2009).

Seventeen percent of agricultural input dealers perceive lack of reliable suppliers to be an obstacle to business operations (Figure 5). The problem is particularly pronounced in the northern part of the country, with 39 percent of Northern, 29 percent of Upper East, and 43 percent of Upper West suppliers complaining about supplier availability and reliability. This is also reflected in the average number of suppliers in these regions. In the northern regions, the average dealer has between 1.5 to 1.8 suppliers, which is a significantly lower number than operate in the southern regions. In Greater Accra, dealers have on average 4.4 suppliers and those in the Central region have 3.2 suppliers. The southern

region with the lowest average number of suppliers is Brong-Ahafo with 2.0 suppliers, which is still more than the 1.5 average in the Upper East. Twenty-seven percent of Greater Accra dealers list finding good suppliers as a challenge despite having the highest average number of suppliers from the region (Figure 5).

One important factor to note is that the majority of supply chain transactions are made in person: Eighty-nine percent of agricultural dealers reported dealing with their most important supplier in person when making new orders, and 59 percent reported making orders from their second most important supplier in person. Only 6 percent of agro-dealers have a supplier’s representative visit in their store. This lack of in-store contact may place considerable limitations on supplier availability in regions distant from the main supply hubs located Ashanti. See Figure 7.

Figure 7. Order-making arrangements from most important supplier by region



Source: IFPRI/IFDC (2009).

Agro-dealers with lower rates of complaint about supplier reliability and availability show a substantially more regionally diversified supplier portfolio and decreased reliance on other dealers located directly in their regions.

Sixteen percent of agricultural input dealers perceive lack of technical knowledge as a significant challenge to the running of their enterprise. This percentage is even higher in the Northern and Upper West regions where 27 percent and 26 percent of agro-dealers perceive it to be an obstacle (Figure 5). This is not a surprising finding when we look at the fact that 36 percent of agro-dealers reported never receiving any formal training. This percentage hides significant regional variations. Owners in the Northern and Upper East regions also show significantly less access to training than the remaining regions. Only 18 percent of owners of agricultural input enterprises in the Upper East have received training in the last two years and a staggering 75 percent of agro-dealers never received any formal training. In the Northern region, 55 percent of agro-dealers have never received any type of training. The content of the training received also varies regionally (Table 8 and Table A7 in appendix). On average, only 56 percent of all agro-dealers received some form of training in the last two years. Ninety-four percent of agricultural dealers with some training reported learning about proper application and recommended dosages for fertilizers and chemicals. Eighty-two percent of trained agro-dealers receive training in demonstrating proper usage and a demonstration of proper storage and safe handling of products while in the store. However, only 57 percent of agro-dealers received training in general business management.

Table 8. Percentage of agro-dealers by training timing and content

Region	Dealers that received formal training (%)		Content of training received (%)			
	Less than 2 years ago	Never received formal training	Proper application and recommended dose	Product use and safe handling	Resolve farmers' complaints	Safe handling and storage of products
Ashanti	64	31	94	79	59	79
Brong-Ahafo	69	28	94	91	77	91
Central	80	12	98	92	65	84
Eastern	55	36	94	82	47	78
Greater Accra	63	18	86	65	45	84
Volta	62	30	86	60	38	79
Western	51	39	93	92	65	82
Northern	34	55	96	77	70	76
Upper East	18	75	96	91	53	85
Upper West	63	32	94	86	38	70
National Average	56	36	94	83	60	82

Source: IFPRI/IFDC (2009).

Of agricultural input dealers who sell chemicals or fertilizer 68 percent have received training. The lack of training can have potentially dangerous consequence because 23 percent of agricultural dealers split bags of chemical and 73 percent split bags of fertilizer (Table A7 in appendix). Furthermore, 92 percent of agricultural input dealers reported advising customers on types of products to use and on proper application techniques, despite many of them never receiving training in these activities themselves. As seen in Table 9, the Ministry of Food and Agriculture (MoFA) is the most important training provider, with 41 percent of agro-dealers reporting that they received training from them. With the exception of the Volta region, MoFA uniformly provided training to the largest percentage of agricultural-input dealers across all regions. The Ghana Agricultural Input Dealers Association (GAIDA) and the Environmental Protection Agency (EPA) provided training to 29 and 27 percent, respectively, of agro-dealers. GAIDA was the most important training provider in Volta, and the second most important provider in the majority of the regions with the exception of Ashanti and the Central and Western regions, where the EPA provided training to a slightly higher percentage of agro-dealers. The Central region has the largest percentage of agro-dealers receiving training from all the different agencies, while the Upper East and Northern regions lag significantly behind the rest of Ghana in the variety of sources of training.

Table 9. Percentage of agro-dealers who received training from given organization

	IFDC	GAIDA	MOFA	MIDA	EPA	SEEDPAG	APFOG	Other
Ashanti	16	28	44	7	30	3	1	19
Brong-Ahafo	18	39	54	5	36	3	1	15
Central	47	54	63	24	57	3	2	22
Eastern	14	28	38	13	28	6	4	14
Greater Accra	23	37	42	7	27	10	1	3
Northern	8	12	25	1	6	1	0	15
Upper East	8	17	19	4	16	5	0	4
Upper West	26	43	45	2	15	5	0	9
Volta	21	46	36	3	29	2	0	12
Western	11	18	37	2	21	1	0	21
Total	16	29	41	7	27	3	1	16

Source: IFPRI/IFDC (2009).

Notes: IFDC (International Fertilizer Development Center), GAIDA (Ghana Agricultural Input Dealers Association), MOFA (Ministry of Food and Agriculture), MIDA (Millennium Development Authority), EPA (Environmental Protection Agency), SEEDPAG (Seed Producers Association of Ghana), APFOG (Apex Farmers Organization of Ghana).

5. FERTILIZER SUPPLY CHAIN

Virtually all fertilizers in the country are imported and arrive in ports at the approximate positions marked by the red star in Figure 8. The figure shows the top three fertilizer wholesalers in the south and the top three fertilizer wholesalers in the north with each supplier linked by a line to a retailer it supplies. While the fertilizer arrives at the port in Accra, the analysis has shown that it is distributed mainly from Kumasi in the center of the country. Fifty-five percent of agricultural input dealers reported that their first most important supplier is located in the Ashanti region; 57 percent reported that their second most important supplier is in the Ashanti region. Other important hubs are Accra in the Greater Accra region, Tamale in the Northern region, Wa in the Upper Western region, and Techiman in Brong-Ahafo.

Figure 8. Fertilizer distribution network in Ghana



Source: IFPRI/IFDC (2009).

As seen in Table 10, agricultural inputs dealers in all regions have to travel significant distances to access their suppliers. The Greater Accra, Ashanti, and Upper East are the only three regions in which agro-dealers reported median travel distances of less than 50 kilometers, which is consistent with the location of distribution hubs in these regions. In the Upper East, the median is at 30 kilometers, but there is a significant range of distances that dealers have to travel to reach a supplier, as reflected in the 120 kilometer mean. The median distance between an agricultural input dealer and its supplier is highest in the Upper West, Volta, and Western regions; the highest is the 152 kilometer observed in the Western region.

Six companies control almost 50 percent of the wholesale supply of goods carried by agricultural input dealers, and a single company supplies fertilizer to 20 percent of fertilizer retailers in Ghana.

Table 10. Average and median distances to the supplier

Region	Average distance closest supplier (km)	Median distance to closest supplier (km)
Ashanti	42	41
Brong-Ahafo	84	76
Central	92	87
Eastern	80	86
Greater Accra	34	21
Northern	120	97
Upper East	120	30
Upper West	197	108
Volta	130	127
Western	143	152
National Average	92	70

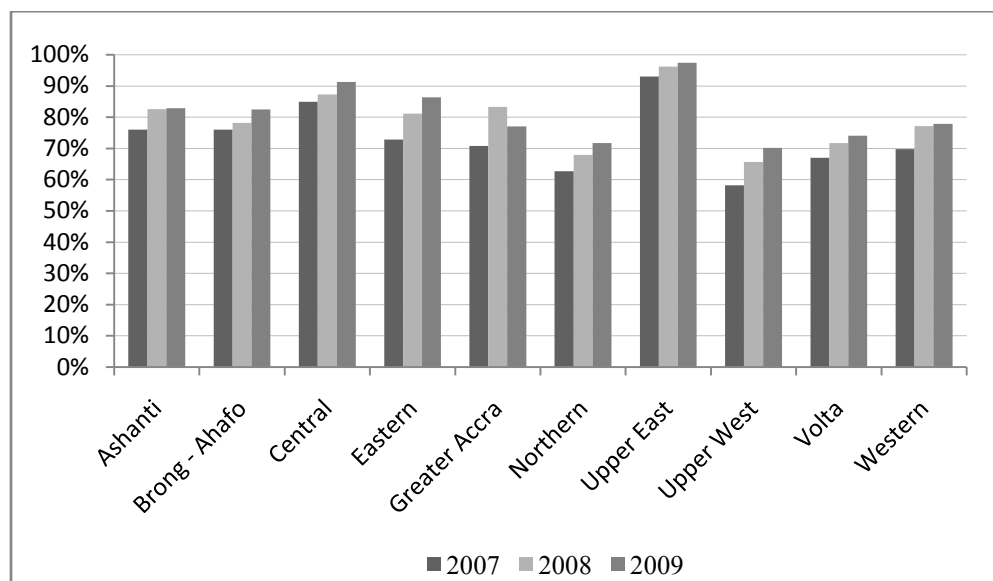
Source: IFPRI/IFDC (2009).

6. ENTRY AND EXIT IN THE AGRICULTURAL INPUT SECTOR

Because the 2009 IFPRI/IFDC agricultural-input dealer survey was the first of its kind, we do not have information about companies that existed in the sector in previous years and stopped operating before 2009. However, based on survey responses regarding dealer activities in 2007 and 2008, we can comment on the prevalence of fertilizer sales over the three year period (2007 to 2009) among enterprises that were operating in all three years. We are also able to look at differences in the types of products sold by the newly established agricultural dealers (2008/09 establishment year) and the longer standing enterprises to evaluate the ease of entry into individual product markets.

Out of the agricultural input enterprises that existed in 2007, 2008, and 2009, 74 percent sold fertilizers in 2007, 80 percent sold fertilizer in 2008, and 82 percent sold fertilizer in 2009. As seen in Figure 9, despite the uniform upward trend in the proportion of dealers selling fertilizer in all regions, there are significant differences in the percentage of agro-dealers selling fertilizers as well as different growth rates in fertilizer agro-dealers across regions. The Eastern and Upper West regions experienced highest growth in the number of agro-dealers selling fertilizers between 2007 and 2009 (14 and 12 percent). The increase in proportion of dealers selling fertilizer was lowest in the Upper East region (4 percent increase), but the percentage of agro-dealers selling fertilizers in the Upper East was initially very high (93 percent).

Figure 9. Participation in fertilizer sales over time of enterprises, 2007–2009



Source: Authors' calculations from IFPRI/IFDC (2009) survey.

The top three reasons for those not selling fertilizers between 2007 and 2009 did not change, but their importance was rebalanced. In 2007, 57 percent of agro-dealers who did not sell fertilizers reported they could not afford to stock them, but in 2008 and 2009 the percentage of the agro-dealers who cited this problem dropped to 24 and 22 percent, respectively. While in 2007, 6 percent of agro-dealers reported being unable to obtain fertilizers to sell, this percentage rose sharply to 38 percent in 2008 and 2009.

The national trends hide significant regional variations in the reasons why agro-dealers did not sell fertilizer. In 2007, with the exception of agro-dealers in the Greater Accra region, lack of affordability was reported as the key reason for not stocking fertilizer. In 2008 and 2009, the reasons given by agro-dealers across the country diverged significantly (Table 11). In 2008, when the new fertilizer-subsidy

voucher program was first implemented, inability to obtain fertilizer to sell became a major issue in the majority of regions; in the Northern, Upper West, and Central regions, 70, 75, and 45 percent of agro-dealers who did not stock fertilizers reported inability to obtain any as the main reason for not stocking them.

Table 11. Reasons that dealer did not sell fertilizer

Main reasons for not selling fertilizers in 2008						
Regions	Could not afford to stock fertilizer (%)	Could not obtain fertilizer to sell (%)	Fertilizer not profitable to sell (%)	Did not have storage space (%)	Not eligible to redeem vouchers (%)	Eligible but vouchers difficult to redeem (%)
Ashanti	23	52	2	2	0	0
Brong-Ahafo	20	13	1	1	6	1
Central	8	45	0	3	0	0
Eastern	3	12	2	0	6	2
Greater Accra	12	29	12	18	29	0
Northern	34	70	5	6	1	0
Upper East	68	9	3	3	0	3
Upper West	19	47	0	9	6	3
Volta	36	13	0	0	0	0
Western	17	25	1	2	0	2
National Average	22	36	2	3	3	1
Main reasons for not selling fertilizers in 2009						
Regions	Could not afford to stock fertilizer (%)	Could not obtain fertilizer to sell (%)	Fertilizer not profitable to sell (%)	Did not have storage space (%)	Not eligible to redeem vouchers (%)	Eligible but vouchers difficult to redeem (%)
Ashanti	23	51	2	3	0	1
Brong-Ahafo	28	19	2	1	13	0
Central	0	40	7	0	0	0
Eastern	0	20	2	0	9	9
Greater Accra	24	24	18	18	41	0
Northern	26	77	4	8	3	0
Upper East	40	0	20	0	0	20
Upper West	23	32	0	14	9	5
Volta	39	22	0	0	0	0
Western	14	30	1	1	1	0
National Average	21	43	3	4	5	1

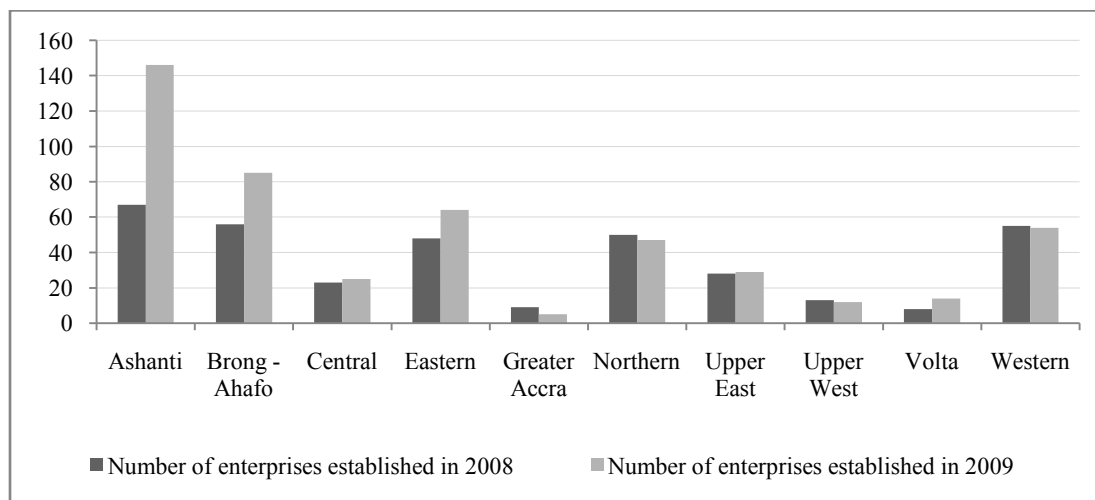
Source: IFPRI/IFDC (2009).

In 2009, the problem with obtaining fertilizers decreased slightly in the Upper West, Greater Accra, and Central regions. This problem, however, had grown slightly worse in the Ashanti, Northern, and Eastern regions. In addition, ineligibility to redeem vouchers prevented 41 percent of agro-dealers from selling fertilizers in Greater Accra and accounts for non-sales behavior in 13 and 9 percent of dealers in Brong-Ahafo and the Eastern region, respectively.

While we do not have baseline information on the number of agro-dealers in 2007 and 2008, we do have information about the number of new entrants to the sector in 2008 and 2009 that were still in existence in 2009 (Figure 10). In 2008, 357 agro-dealerships were established and remained in operation in Ghana in 2009, which is an 18 percent increase from the 1,978 enterprises that existed in 2007 (and

were still in operation in 2009). In 2009, 481 new agricultural-input enterprises were established that were still in existence at the time of the 2009 census. It is important to note that because we do not have information on the number of enterprises that exited the market in 2007 and 2008, we can only make comparisons with enterprises that were still in existence in 2009.

Figure 10. Number of agricultural input enterprises (of those existing in 2009) established in 2008 or 2009



Source: IFPRI/IFDC (2009).

As seen in Figure 10, the number of new entrants differed significantly across regions and across the two years 2008 and 2009. Ashanti saw the highest number of new agro-dealers entering the market in the two year period with 213 entrants, followed by Brong-Ahafo with 141 entrants and the Western region with 109 new entrants. The lowest number of entrants was in Greater Accra, which only had 14 new agro-dealers entering the agricultural input market in 2008 and 2009.

A comparison of the products sold by new entrants and those sold by older enterprises proved interesting. The proportion of new entrants selling chemicals is just as high as that among established enterprises (about 90 percent). This suggests that selling chemicals requires conditions that are easily met. This trend is very consistent even at the regional level, with the exception of the Upper West where a lower percentage of new entrants (73 percent) reported selling chemicals than those from pre-2008 enterprises (86 percent). Among both recent entrants and older enterprises, the proportion selling animal feed is low, which shows that older enterprises do not have advantages or motivations different from newer enterprises. A lower percentage of entrants sell improved seeds compared to older enterprises (51 vs. 64 percent). This trend is consistent across regions, with the exception of Greater Accra and the Upper West where the same proportions of new entrants and established dealers sell improved seeds.

In the sale of fertilizer, new entrants are markedly different from established enterprises. In 2009, across the nation 82 percent of pre-2008 enterprises sell fertilizer but only 72 percent of new entrants reported selling fertilizers. This suggests that entry into fertilizer retail requires some conditions that are more easily met by established enterprises. However, there is a large regional variation in the percentages of new enterprises stocking fertilizers. In some areas, including the Central and Upper West regions, new entrants were more likely to sell fertilizers than were agro-dealers established before 2008. For several regions, including Volta and the Upper East, the same percentage of new entrants sold fertilizer as did enterprises established before 2008. The Greater Accra and Northern regions show the largest disparities between the sale of fertilizer by new entrants and the old agro-dealerships. In the Northern region only 36 percent of new entrants sell fertilizers compared to 72 percent of older agricultural input dealers.

7. FERTILIZER SUBSIDY PROGRAMS OF 2008 AND 2009

Background and Context

After years of heavy state subsidies, the Ghanaian government discontinued its involvement and started the liberalization of the fertilizer sector in the early 1990s. Consequently, for the last two decades the Ghanaian fertilizer sector has been completely liberalized and the government was not involved in any major way in procuring, distributing, and retailing of fertilizer. All inorganic fertilizer in the country has been imported ready for use by private importers. Four private companies have imported 100 percent of the fertilizers on the market. These importers, in order of market size, are Yara Ghana Ltd. (a subsidiary of Yara International ASA) and its partner fertilizer company that specializes in products for fertilizing cocoa, Wienco Ghana Ltd.; Golden Stork (a subsidiary of SCPA Sivex International); Dizengoff Ghana Ltd. (a subsidiary of Balton CP Ltd.); and Chemico Ltd. Chemico Ltd. is the only large importer that does not have an international parent company.

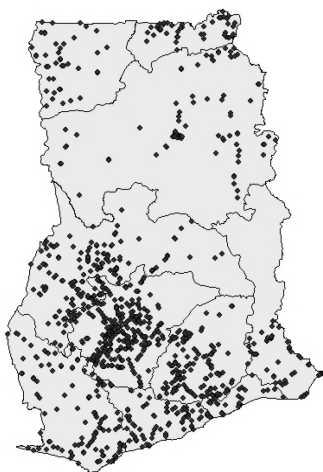
In 2008 and 2009, the government of Ghana instituted \$15 million worth of subsidies on NPK 15:15:15, NPK 23:10:05, sulfate of ammonia, and urea nationwide (Banful 2009). Farmers received the subsidy in the form of fertilizer-specific and region-specific vouchers distributed by agricultural extension agents. Ordinarily, fertilizer prices were set by fertilizer retailers, but as part of the subsidy programs, the government and the private fertilizer importers negotiated the price per 50-kilogram bag in each district capital. A voucher could be used toward the purchase of the relevant fertilizer from any retailer in the region of issue who was willing to accept it. The retailer then passes on the redeemed vouchers to an importer (in practice, one with whom they were contracted). The importer, in turn, was to transmit an invoice for the value of received vouchers to the Ministry of Food and Agriculture and receive payment within a week (Banful 2010).

Voucher Acceptances Rates

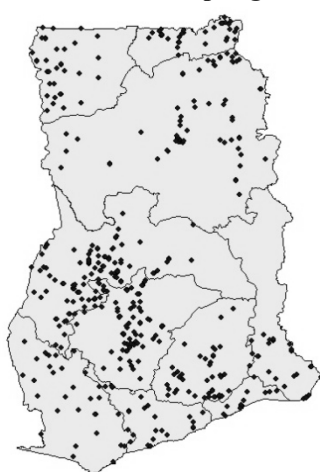
The percentage of fertilizer dealers accepting vouchers in 2008 and 2009 varied significantly across regions, but the country average was 37 percent in 2008 and 39 percent in 2009. Figure 11 shows the comparison between the distribution of fertilizer dealers in Ghana in 2009 and the distribution of fertilizer dealers accepting vouchers in 2009. Clearly, the number of dealers decreases substantially when looking only at voucher accepting sellers of fertilizer.

Figure 11. Comparison of the distribution of fertilizer dealers in 2009 and fertilizer dealers accepting vouchers in 2009 in Ghana

Fertilizer dealers in 2009



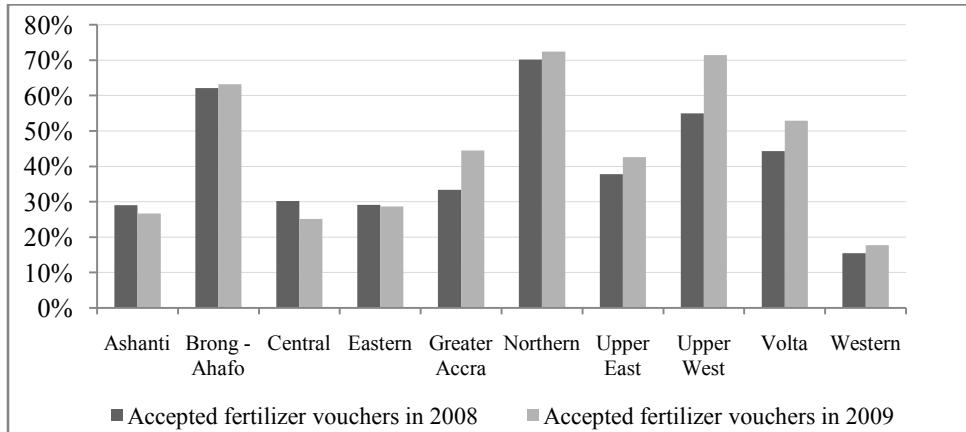
Fertilizer dealers accepting vouchers in 2009



Source: IFPRI/IFDC (2009).

Brong- Ahafo and Northern region had the highest percentage of fertilizer dealers accepting vouchers in both years, while the Western, Central, and Eastern regions had the lowest. In all regions, with the exception of the Central and Ashanti regions, the percentage of fertilizer dealers accepting vouchers rose from 2008 to 2009 (Figure 12). In the Central region, the already low percentage of 30 percent in 2008 dropped to 25 percent in 2009.

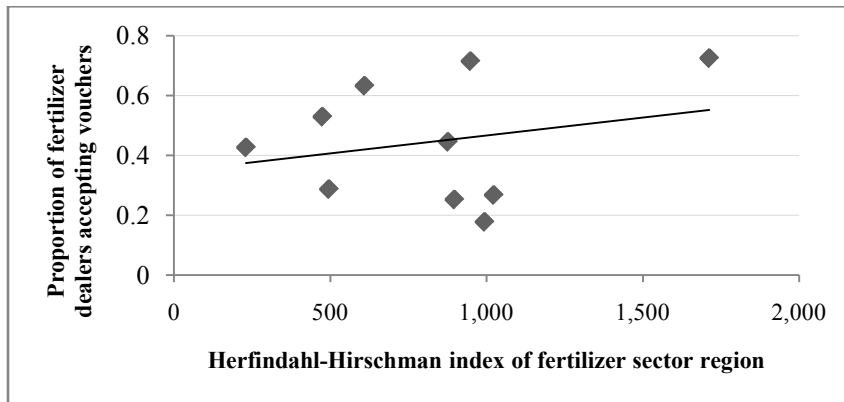
Figure 12. Percentage of fertilizer dealers who accepted vouchers in 2008 and 2009



Source: IFPRI/IFDC (2009).

Regions with higher supply chain concentrations of fertilizer retailers generally had a higher proportion of the fertilizer retailers accepting vouchers (Figure 13). This is evidence of the importance of supply links to an importer for successful redemption of a voucher.

Figure 13. Supply chain concentration in each region and proportion of dealers accepting fertilizer vouchers

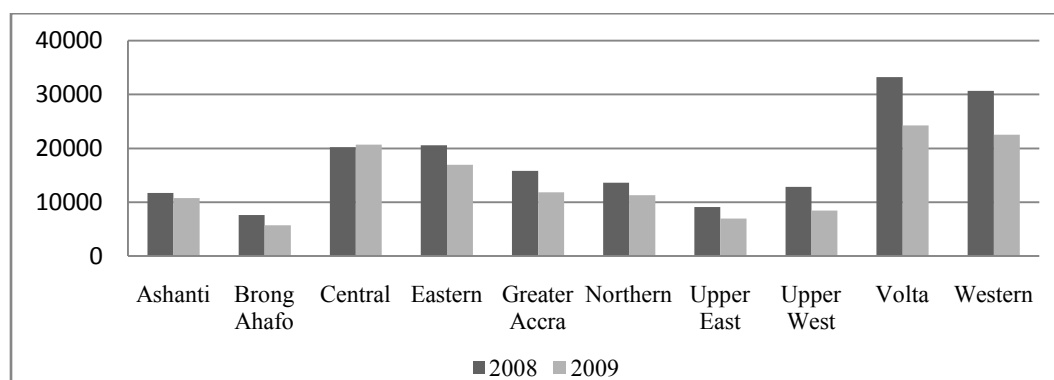


Source: IFPRI/IFDC (2009).

While the percentage of fertilizer dealers accepting vouchers is important information, it does not provide the full picture of farmers' ability to redeem vouchers because the density of agro-dealers per thousand farmers differs significantly across regions. Figure 14 shows the number of farmers per fertilizer retailer who accept vouchers. The Brong-Ahafo and Upper East regions had the highest number of retailers accepting vouchers per farmer and Volta and the Western regions had the lowest. Because more fertilizer dealers started accepting vouchers in 2009 and over 20 percent of enterprises existing in 2009 were also established that year, the number of farmers per fertilizer retailer accepting vouchers is lower in

2009 than in 2008. The exception is the Central region. Volta and the Western regions experienced the sharpest drop in the number of farmers per retailer.

Figure 14. Farmers per subsidized fertilizer retailer



Source: IFPRI/IFDC (2009).

A high percentage of fertilizer retailers reported selling fertilizers without vouchers: 86 percent of fertilizer sellers in 2008 and 84 percent in 2009. The only exceptions were found in the Upper West and Northern regions where significantly lower percentages of sellers reported selling fertilizers without vouchers in both years. In 2008, 62 percent of fertilizer retailers in the Upper West region sold fertilizer without vouchers, but in 2009 only 42 percent did so. In the Northern region, the proportion of retailers who sold fertilizer without vouchers fell from 51 to 39 percent. This shows that in this region the fertilizer retail network became increasingly influenced by the government subsidy program. In the remaining regions, the percentage of retailers who sold fertilizers outside the voucher program ranged from 78 to 96 percent and remained fairly constant through both years.

The majority of agricultural dealers who did not accept vouchers in both years stipulated that they could not redeem them (Table 12). Only in the Greater Accra region did fertilizer dealers not accept vouchers primarily due to an inability to obtain fertilizers to stock. In both Greater Accra and the Northern regions, difficulty to redeem the vouchers ranked very high among dealers' complaints.

Table 12. Reasons for not accepting vouchers in 2008 and 2009

Regions	Reason for not accepting vouchers in 2008			Reason for not accepting vouchers in 2009		
	Could not redeem vouchers	Too difficult to redeem	Could not obtain fertilizer to stock	Could not redeem vouchers	Too difficult to redeem	Could not obtain fertilizer to stock
Ashanti	91	5	3	89	7	4
Brong-Ahafo	99	0	1	98	2	1
Central	95	4	1	92	7	1
Eastern	75	13	13	75	15	10
Greater Accra	20	27	53	16	32	52
Northern	68	33	0	72	26	2
Upper East	90	0	10	88	3	8
Upper West	96	0	4	100	0	0
Volta	88	9	3	94	3	3
Western	91	7	2	87	8	4

Source: IFPRI/IFDC (2009).

Voucher Redemption by Fertilizer Retailers

In both 2008 and 2009, about 30 percent of dealers reported submitting vouchers to a Yara wholesaler for redemption. About 5 percent in 2008 and 3 percent in 2009 submitted to a Dizengoff wholesaler and slightly less than 10 percent submitted to a Golden Stork wholesaler for redemption. However, despite the program design that envisioned that vouchers would be largely redeemed through fertilizer importers/wholesalers, the bulk of fertilizer sellers submitted vouchers for redemption to another agricultural input dealer (47 percent in 2008 and 52 percent in 2009). This was primarily because many retailers who wanted to participate in the subsidy program did not have relationships with fertilizer importers. To be able to sell fertilizer to farmers with vouchers, such retailers were required to sell fertilizer on behalf of retailers who had relationships with importers, who would then be willing to pass on vouchers to the importer for redemption.

Forty-four percent of fertilizer dealers in 2008 and 47 percent of dealers in 2009 reported that they received fertilizer for sale under the subsidy program on credit and thus did not receive cash for the value of the vouchers they had submitted. About a quarter of fertilizer retailers participating in the program in 2008 and 2009 reported receiving the cash value of the vouchers. Three and 2 percent of fertilizer retailers participating in the subsidy program in 2008 and 2009, respectively, reported never receiving payment for the value of the vouchers (Table A8 in appendix). While the nonpayment rate was very low in the majority of the regions, in the Central region; almost 20 percent of fertilizer retailers reported never receiving payment for some part of the vouchers they had submitted in both years of the subsidy program. In the Ashanti region in 2009, 15 percent of fertilizer retailers reported being forced to redeem the vouchers in the form of more products without the option to receive payment in cash.

There was a wide range of time frames within which dealers received payment for submitted vouchers. Fifty-nine percent of dealers reported immediate payment in 2008 and 60 percent reported immediate payment in 2009. However, 8 percent reported having to wait several weeks in 2008 and 6 percent in 2009. Brong-Ahafo had the fastest repayment time, with 70 and 71 percent of dealers in 2008 and 2009 receiving immediate payment. However, only 36 percent of agro-dealers in the Upper West region received immediate payment.

8. CONCLUSION

The agricultural input sector has a critical impact on a nation's agricultural productivity. In 2009, the International Food Policy Research Institute (IFPRI) and the International Fertilizer Development Center (IFDC) jointly conducted a census of agricultural input dealers in Ghana to fill a critical data gap on the nature of the agricultural input sector in Ghana. This paper has presented information about the size and characteristics of the sector, its supplier network, and how well it responded to the 2008 and 2009 fertilizer subsidy programs.

The survey revealed that the number of agricultural input retailers is much higher than previously thought. It revealed significant regional variation in the density of agricultural input dealers and the types of products sold. The data showed that the dominant fertilizer wholesale hub is in Kumasi in the Ashanti region. According to the dealers, the biggest constraint to operating an agricultural input business in Ghana is lack of capital to start and expand the business. This suggests that improved access to financing can have a significant positive influence on the sector's growth. Despite the government's goal of making the 2008 and 2009 fertilizer subsidies supportive of the private market through the use of vouchers, up to 60 percent of fertilizer retailers were unable to participate in the 2008 and 2009 fertilizer subsidy programs. This is because the design of the program did not take into account that only a small proportion of fertilizer retailers had relationships with fertilizer importers from whom they could redeem the vouchers.

This paper has presented a broad overview of the agricultural input sector in Ghana. The information provided is intended to serve as a starting point upon which much needed analysis of various aspects of the sector can be based.

APPENDIX: SUPPLEMENTARY TABLES

Table A.1. Crop protection chemicals

	Ashanti	Brong-Ahafo	Central	Eastern	Greater Accra	Northern	Upper East	Upper West	Volta	Western	Ghana
% of agro-dealers that sell particular product											
Insecticide and weedicides	95	94	97	96	92	60	34	75	87	90	84
Herbicides	97	94	99	97	95	92	31	80	92	94	90
Other protection chemicals	20	33	39	39	19	21	7	2	30	26	25
% of agro-dealers reporting particular type of customer											
Smallholder farmers	99	95	99	99	97	95	71	91	95	98	95
Commercial/large scale	44	19	29	23	60	60	15	26	29	15	31
Other agro-input dealers	20	7	13	18	42	32	17	16	23	7	17
NGOs or special projects	2	1	9	4	18	8	2	10	5	2	4
Other	1	9	10	2	2	15	33	9	9	4	8
% of agro-dealers reporting crops cultivated by customers											
Cocoa	54	27	67	34	5	0	0	0	7	85	40
Maize	90	84	95	93	80	99	81	99	93	73	88
Cassava	54	49	71	53	17	41	0	11	61	38	47
Rice	20	9	10	6	17	80	74	82	27	7	24
Millet or sorghum	15	5	1	1	5	54	18	78	12	0	15
Oil palm	19	10	38	27	2	0	0	0	12	18	16
Pineapple, orange or banana	26	17	53	19	25	0	1	0	9	8	18
Tomatoes, garden egg, pepper, onion, okra	89	87	96	78	95	39	99	70	87	85	82
Cabbage, lettuce, carrot	51	49	85	55	73	6	71	38	34	31	46
Other	10	27	32	7	8	18	0	9	7	5	13

Source: IFPRI/IFDC (2009). The percentages do not add to 100 as multiple responses are possible per respondent. NGO is a nongovernmental organization.

Table A.2. Fertilizers

	Ashanti	Brong - Ahafo	Central	Eastern	Greater Accra	Northern	Upper East	Upper West	Volta	Western	Ghana
% of agro-dealers that sell particular product											
NPK 15-15-15/other NPK	80	83	95	86	84	66	97	80	77	81	82
Sulfate of ammonia	78	82	89	82	74	65	93	78	76	75	79
Urea	44	53	47	51	68	39	91	29	50	15	45
Muriate of potash/other	6	2	9	2	8	0	2	2	4	1	4
Potassium nitrate	5	3	13	9	32	1	8	4	8	1	6
Magnesium sulfate	2	2	10	5	15	1	3	0	5	1	3
% of agro-dealers reporting particular type of customer											
Smallholder farmers	88	87	98	92	90	78	99	83	85	87	88
Commercial/large scale farmers	40	14	26	20	50	50	18	27	26	11	27
Other agro-input dealers	16	7	14	15	34	24	31	14	16	4	15
NGOs or special projects	1	1	7	4	13	8	3	11	6	1	3
Other	12	18	11	9	11	33	11	17	18	14	15
% of agro-dealers reporting crop cultivated by customers											
Cocoa	51	27	64	29	4	0	0	3	10	76	36
Maize	84	87	91	89	94	100	97	96	95	70	87
Cassava	44	47	70	47	11	24	0	20	46	35	39
Rice	18	8	9	5	13	91	86	72	25	6	27
Millet, sorghum	14	6	1	1	2	64	30	88	8	0	16
Oil palm	19	8	40	27	2	0	0	0	8	15	15
Pineapple, orange, banana	23	18	52	21	28	1	3	1	10	9	17
Tomatoes, garden egg, pepper, onion, okra	92	88	98	83	96	48	98	71	92	90	87
Cabbage, lettuce, carrot	52	50	89	60	74	9	52	32	34	36	49
Other	4	27	28	4	2	5	1	3	6	2	9

Source: IFPRI/IFDC (2009). The percentages do not add to 100 as multiple responses are possible per respondent. NGO is a nongovernmental organization.

Table A.3. Improved seeds, animal feed, and tools

	Ashanti	Brong - Ahafo	Central	Eastern	Greater Accra	Northern	Upper East	Upper West	Volta	Western	Ghana
% of agro-dealers that sell particular product											
Any Improved seeds	59	62	79	80	79	45	30	60	70	65	66
Maize	52	52	75	75	68	41	21	58	66	54	53
Rice	1	0	1	0	0	9	9	12	6	1	3
Millet, sorghum, cowpea	7	4	7	7	23	9	8	33	13	8	8
Soy bean	10	5	16	1	3	12	11	17	7	10	9
Groundnut	2	1	3	0	8	3	1	9	5	1	2
Garden eggs, onion, okra	27	23	54	39	69	12	12	18	35	39	29
Tomatoes	25	32	49	32	69	18	25	22	43	25	29
Pepper	23	36	58	39	68	8	19	22	40	29	29
Cucumber, cabbage, lettuce	21	25	47	38	76	14	21	15	33	15	25
Tools and Equipment											
Any tools	68	77	91	75	77	54	21	49	75	82	67
Hoe	19	22	34	17	21	15	7	20	28	21	19
Cutlass	43	41	71	47	35	21	12	30	57	49	41
Machete	17	16	48	20	21	5	4	4	12	26	17
Sell knap sack or sprayer	42	59	80	64	66	44	14	43	64	71	52
Rent knap sack or sprayer	16	17	27	20	21	13	4	7	12	4	14
Mask	32	43	74	48	71	27	8	23	46	37	37
Gloves	32	40	70	53	69	26	10	23	49	32	36
Other	8	22	22	18	10	13	6	1	12	16	13
Animal Feed											
Any animal feed	1	1	9	6	18	1	2	5	13	3	3
Poultry	1	0	7	6	15	0	0	3	12	3	3
Sheep	0	0	1	0	10	0	1	1	3	1	1
Cattle	0	0	0	0	5	0	2	1	2	0	0
Pigs	0	0	4	1	15	0	0	2	4	1	1
Goats	0	0	2	0	10	0	2	1	3	1	1
Other	0	1	0	0	5	1	0	0	1	0	0

Source: IFPRI/IFDC (2009). The percentages do not add to 100 as multiple responses are possible per respondent.

Table A.4. Sources of start-up capital and financing for current operations

	Ashanti	Brong Ahafo	Central	Eastern	Greater Accra	Northern	Upper East	Upper West	Volta	Western
% of agro-dealers with banking account	80	84	93	84	87	51	55	76	85	80
Source of start-up capital (% of agro-dealers reporting)										
Personal resources	93	91	86	86	87	95	92	76	89	87
Family	8	10	4	6	10	7	12	21	10	9
Friends	1	3	2	5	0	2	4	3	4	2
Banks	5	6	13	12	8	2	6	4	16	7
Microfinance institutions	1	1	3	1	2	0	3	1	2	1
Coops/associations	0	1	0	2	0	0	0	1	1	1
Other sources	2	1	4	4	3	0	2	7	2	7
Sources of financing current operations (% of agro-dealers reporting)										
Profits from this business	60	97	93	73	97	96	83	78	92	93
Personal resources	87	86	45	73	66	93	80	75	73	78
Family	3	5	2	3	5	4	9	10	3	4
Friends	1	0	1	2	2	1	1	4	4	1
Banks	7	7	10	11	13	4	3	7	15	7
Microfinance institutions	2	0	6	1	8	0	3	1	1	1
Coops/associations	1	0	0	2	0	1	0	1	1	1
Other sources	2	2	3	11	0	0	1	5	5	12

Source: IFPRI/IFDC (2009). The percentages do not add to 100 as multiple responses are possible per respondent.

Table A.5. Credit information

	Ashanti	Brong-Ahafo	Central	Eastern	Greater Accra	Northern	Upper East	Upper West	Volta	Western
Percentage that sell on credit	64	64	60	62	37	66	71	77	72	53
Sell on credit (% of retailers carrying product)										
Fertilizer	54	53	36	50	40	49	71	74	53	42
Insecticides	60	63	46	57	36	38	56	66	56	46
Weedicides	62	64	49	57	37	58	52	66	64	49
Tools	26	25	30	26	15	29	33	53	41	20
Animal feed	0	0	13	33	18	0	25	20	36	18
Other agriculture goods	1	5	16	3	6	7	1	2	12	4
Receive credit from most important supplier (% of retailers carrying product)										
No credit	78	58	85	61	60	60	39	41	64	82
Pesticide	19	35	10	35	27	30	32	41	29	15
Fertilizer	15	37	9	27	31	40	61	56	24	15
Improved seeds	6	19	8	14	10	17	33	13	16	11
Tools	7	16	7	14	8	30	20	16	22	10
Animal feed	0	0	7	14	9	0	0	0	14	0
Veterinary products	0	0	0	0	2	0	0	0	5	0

Source: IFPRI/IFDC (2009). The percentages do not add to 100 as multiple responses are possible per respondent.

Table A6. Top challenges to business operation

	Ashanti	Brong-Ahafo	Central	Eastern	Greater Accra	Northern	Upper East	Upper West	Volta	Western
Top Challenge to Running Business										
Low customer demand for items for sale	16	10	10	15	6	8	19	5	25	17
Lack of reliable suppliers	4	5	4	4	3	13	3	15	6	5
Lack of capital	49	65	55	55	76	53	65	59	56	46
High cost of transporting products	10	7	14	8	5	16	6	12	5	13
Lack of technical knowledge	3	1	5	5	0	3	2	2	1	1
Lack of adequate and safe storage facilities	3	1	3	2	6	5	2	5	1	2
Low quality of products	1	1	2	1	0	0	0	1	0	1
Other	9	8	6	8	3	2	3	0	6	14

Source: IFPRI/IFDC (2009).

Table A7. Training

	Ashanti	Brong-Ahafo	Central	Eastern	Greater Accra	Northern	Upper East	Upper West	Volta	Western	Ghana
Formal training received (% of dealers)											
Less than 2 years ago	64	69	80	55	63	34	18	63	62	51	56
More than 2 but less than 5 years	4	3	7	9	13	7	3	3	6	9	6
More than 5 years ago	1	0	1	1	6	3	4	2	2	1	1
Never received formal training	31	28	12	36	18	55	75	32	30	39	36
Content of training (% of dealers who have received training)											
Proper application/recommended dose of chemicals or fertilizers	94	94	98	94	86	96	96	94	86	93	94
Demonstrating product use and safe handling to customers	79	91	92	82	65	77	91	86	60	92	83
Specific products that resolve specific farmers' complaints	59	77	65	47	45	70	53	38	38	65	60
Safe handling and storage of products while in a store	79	91	84	78	84	76	85	70	79	82	82
General business management	79	55	64	50	57	43	43	35	64	26	57
Other	12	29	40	10	14	21	26	3	9	4	16

Source: IFPRI/IFDC (2009). The percentages for the content of training do not add to 100 as multiple responses are possible per respondent.

Table A.8. Redemption of vouchers, 2008 and 2009

	Ashanti	Brong-Ahafo	Central	Eastern	Greater Accra	Northern	Upper East	Upper West	Volta	Western
Payment for vouchers in 2008 (% of participating retailers)										
Fertilizer received on credit	28	75	39	24	13	30	47	30	52	53
Got cash	20	9	32	22	53	37	43	52	30	8
Volunteered to use value of vouchers toward cost of supplies	47	23	15	53	7	43	16	36	30	36
Forced to use value to purchase additional products	17	0	5	4	27	1	1	3	4	0
Did not receive payment	3	0	17	5	7	0	0	0	0	6
Payment for vouchers in 2009 (% of participating retailers)										
Fertilizer received on credit	29	78	53	29	10	26	49	24	62	51
Got cash	21	9	20	16	45	38	48	52	21	4
Volunteered to use value of vouchers toward cost of supplies	46	21	13	49	15	43	17	40	29	41
Forced to use value to purchase additional products	15	0	5	8	45	0	1	2	3	0
Did not receive payment	1	0	18	6	5	3	0	0	0	6

Source: IFPRI/IFDC (2009). The percentages do not add to 100 as multiple responses are possible per respondent.

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