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Agricultural input markets in Ghana

A descriptive assessment of input dealers in eight districts

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ABSTRACT

This paper provides a description of the agricultural input market in Ghana in 2019 across six districts with high maize production and two municipal districts noted for agricultural marketing activities. Since 2017, Ghana's agricultural policy has been heavily focused on implementation of the Planting for Food and Jobs (PFJ) program, which has rapidly scaled up the distribution of subsidized seed and fertilizer with the aim of increasing agricultural productivity and production. Agricultural input dealers play a crucial role in the PFJ program as the final node in the supply chain of seed and fertilizer for farmers. Their operations are expected to enhance the availability of and access to these agricultural inputs. Understanding the characteristics and operations of agricultural input dealers can help policymakers to formulate, implement, and reform seed and fertilizer policies. Our study shows low levels of specialization among agricultural input shops, high participation in the sector association, an increase in the entry of traders into the agricultural input market since the launch of PFJ, and a continuing concentration on fertilizer sales compared to seed sales. Major constraints that agricultural input supplier face in expanding their businesses include difficulties in obtaining financial support from the banking sector, still unreliable supplies, and, for subsidized inputs, the slow processing by government of the subsidy vouchers farmers gave them in exchange for inputs.

1. INTRODUCTION

Agricultural input dealers can boost agricultural productivity and production by providing farmers with reliable access to needed agricultural inputs. This is especially important in sub-Saharan Africa where, despite national and international efforts to increase productivity, the gap in productivity levels with the rest of the world continues to grow (Bold et al. 2017; MoFA 2016). Previous research identified access and affordability as the primary obstacles to increased adoption of inputs (IFDC 2019). In 2017 the government of Ghana introduced the Planting for Food and Jobs (PFJ) program as its flagship strategy to boost the production of smallholder farmers, to strengthen market linkages, and to create jobs along various agricultural value chains. The program provides subsidized seed and fertilizer and broadly improved extension services in the form of on-farm support. PFJ is centered around five pillars namely: (1) seed access and development, (2) fertilizer, (3) extension services, (4) marketing and (5) e-agriculture (Pauw 2021; MoFA 2017). Constrained access to markets and financial resources as well as input supply bottlenecks have limited smallholders from using improved seed and applying fertilizer at the required rates to raise their agricultural productivity (Pauw 2021). Agricultural input dealers serve as the final point in the supply chain that delivers inputs directly to Ghanaian farmers. However, there is scarce information on the characteristics of these input dealers, the constraints they face in their operations, and their knowledge of the PFJ program in serving farmers' input needs.

This paper presents a description of the agricultural input sector in six districts and two municipal district assemblies across Ghana, based on a survey of 207 agricultural input dealers carried out in 2019. We provide information on 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, particularly with the implementation of the PFJ program. The most recent earlier study of the agricultural input market in Ghana was a joint study conducted by the International Food Policy Research Institute and the International Fertilizer Development Center in 2009 based on a census of agricultural input dealers (Krausova and Banful 2010). We built upon and updated that study through a survey of agricultural input dealers in 2019 to assess private sector participation, participation in the PFJ program, and constraints faced by input dealers in districts that produce a large share of the total maize harvest in Ghana.

The survey results show a concentration of sales in fertilizers and pesticides compared with seeds. Around 98 percent of agricultural input dealers sell inorganic fertilizer, 91 percent sell herbicides, 89 percent sell insecticides, 56 percent sell seed, and only 2 percent sell animal feed. In the lean or minor cropping seasons, 13 percent also sell cement and other building materials. Most input dealers prefer to join district level associations rather than the national association, the Ghana Agricultural Input Dealers Association. Personal financial resources were the most significant source of start-up capital for the agricultural input dealers surveyed and equally important for financing current operations. The entry of agricultural input dealers into business is driven particularly by policies that enable their participation in the distribution or sale of inputs in input subsidy schemes. Major constraints hindering the growth of agricultural input dealers are lack of capital, unreliable supply chains, and high transportation costs.

The structure of the paper is as follows: Section 2 provides details on the study areas, the sampling of input dealers, and the data used for analysis. Section 3 presents descriptive results focusing on the characteristics of respondents and owners, the business operation environment, and experience in the PJF program and with fertilizer subsidy schemes in general. Section 4 presents the conclusions of the paper. This is a descriptive paper that details the perspectives of

input dealers. In future research, we will provide a deeper analysis of the perceptions of fertilizer quality from farm households, combined with results from analyses of the chemical and physical characteristics of fertilizer samples.

2. STUDY AREA, SAMPLING AND DATA

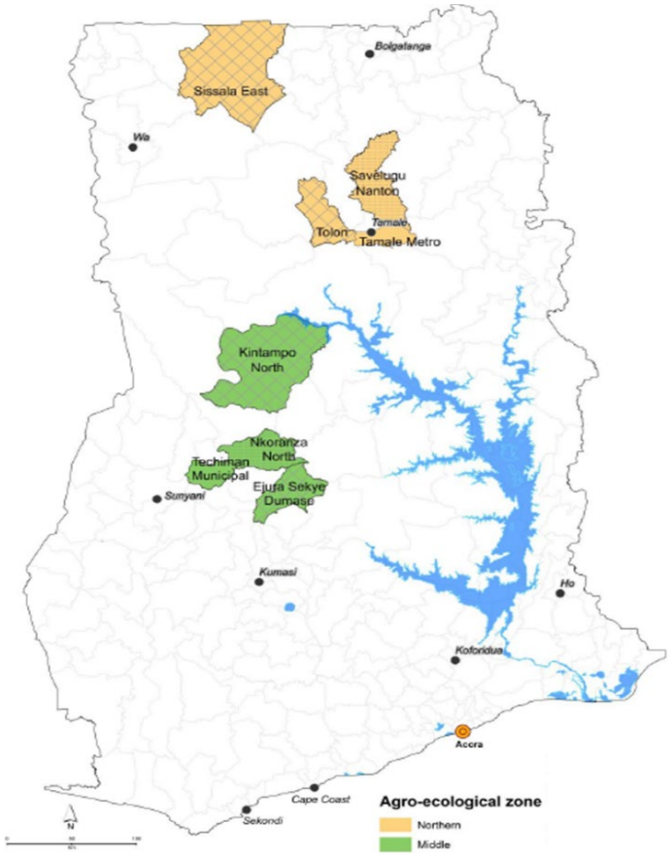
The data for this study were obtained through a survey conducted in 2019 jointly by IFPRI's Ghana Strategy Support Program and the Plant Protection and Regulatory Services Directorate (PPRSD) of Ministry of Food and Agriculture (MoFA). This study adopted a multi-stage sampling technique. The first stage involved the purposive selection of districts, while the second stage entailed the random selection from a comprehensive list of registered input dealers compiled by PPRSD as of July 2019. The list obtained from PPRSD captured information on: (i) name of company, (ii) location, (iii) region and district, (iv) contact person, and (v) telephone numbers. However, the list of input dealers did not include tabletop input suppliers, since they move from market to market within or across districts. We selected a random sample of 40 input dealers from the list for each district. For districts with fewer than 40 registered input dealers, we surveyed all the input dealers listed. For a chain of input dealer outlets with the same owner in a district, the study restricted the survey to only one outlet of the chain within the district.

Considerations for the purposive selection of the districts included maize production levels, potential for increased production, and proximity to major markets. The districts selected were Ejura Sekyeredumase in Zone 1; Techiman Municipal, Kintampo North, and Nkoranza North in Zone 2; Tolon, Savelugu and Tamale Municipal in Zone 3; and Sissala East in Zone 4. The four zones are drawn from the major agro-ecological zones in Ghana – the Transition zone (Zones 1 and 2), Guinea Savanna (Zone 3), and Sudan Savanna (Zone 4).

The main distinguishing factor among these zones is rainfall pattern. In the Transition zone, the annual rainfall distribution is bimodal, allowing for two cropping seasons, while in the Guinea and Sudan Savanna zones rainfall distribution is unimodal, which gives a single growing season under rainfed farming. Based on the definition of the Ghana Statistical Service of agro-ecological zone as geographical areas exhibiting similar soil and climatic conditions that support rain-fed agriculture (GSS 2020), the study further classifies the Transition zone as the 'Middle zone' and the Northern Savanna zone as the 'Northern zone'.

Figure 1 shows the districts in which agricultural input dealers were chosen for the study sample. A total of 207 agricultural input dealers were surveyed, distributed as follows; Ejura Sekyeredumase (40), Kintampo North (22), Nkoranza North (17), Savelugu (31), Tolon (31), Sissala East (25), Techiman

Figure 1. Map of the eight study districts in Ghana



Municipal (23) and Tamale Municipal (18). A descriptive approach has been adopted to present findings from this sample of agricultural input suppliers in the areas of business operation environment, participation in PFJ, and development of the agricultural input sector.

3. RESULTS

First, we present the characteristics of the respondent agricultural input dealers, followed by the business operating environment which describes the types of inputs they sell, their sources of finance, the supply chains of which they are a part, and the major constraints to growth that they face. Lastly, we examine participation in PFJ and market developments linked to the experience of input dealers with fertilizer subsidy schemes.

Characteristics of agricultural input shops

Table 1 highlights the characteristics of our primary respondents – the owner of the agricultural input retail establishment or another person designated as manager of the establishment by the owner. Similar to the findings of Krausova and Banful (2010), management of agricultural input dealerships is male dominated. Forty-three percent of surveyed respondents were owners, while 34 percent were managers. The most commonly reported level of education attained by agricultural input dealers was Senior High School, followed by Junior High School. The average years of experience in the sale of agricultural inputs is about 7 years.

Table 1. Descriptive statistics of respondents (contact person at input shop)

Variable	Overall, %	Of which female, %	Observations
Female	28.0	--	207
Position of respondent			
Owner	43.0	3.9	89
Manager	34.3	12.1	71
Caretaker	18.4	9.2	38
Family member, friend	4.4	2.9	9
Educational level attained			
None	9.2	2.4	19
Primary	5.8	1.0	12
Junior High School / MSLC	21.3	8.2	44
Senior High School	37.7	13.5	78
Vocational certificate	1.0	-	2
Higher National Diploma or Diploma	12.1	1.9	25
University degree	13.1	1.0	27
Years of experience			
Less than 5years	46.4	16.4	96
5 -10 years	32.4	6.3	67
More than 10 years	21.3	5.3	44

Source: GSSP-IFPRI Survey 2019
Note: MSLC = Middle School Leaving Certificate.

Table 2 reports how much of the household income of the owner is derived from profits from the sale of agricultural inputs in contrast to other income generating activities engaged in by the owners. Out of the 89 agricultural input dealer owners who provided information on their income sources, almost half indicated that less than half of their household is income is from derived profits from their agricultural input business followed by about one-quarter deriving about half of their household income from the sale of agricultural inputs. Just over 10 percent derived nearly all their household income from the sale of inputs, while a smaller share derived almost none.

In assessing the other income generating activities engaged in by owners of agricultural input shops, a majority are engaged in farming, followed by about one-quarter being engaged in other private businesses. Income generating activities listed in the “other” categories included driving, mobile money agent, leading a religious congregation, or trading in other goods.

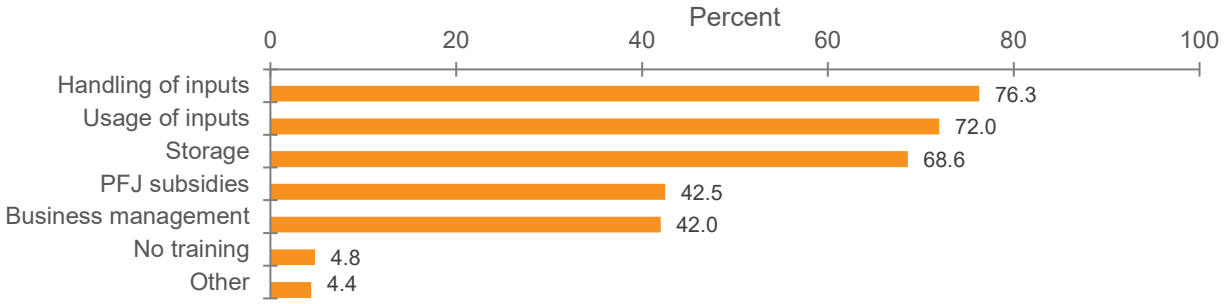
Table 2. Share of total owner income from sale of agricultural inputs; other sources of income reported by owner

	Percentage (%)	Observations
Share of owner’s total income derived from agricultural inputs supply business profits		
Nearly all	11.2	10
More than half	9.0	8
About half	22.5	20
Less than half	49.4	44
Almost none	7.9	7
Other income generating activities		
Other government employment	11.2	10
Other salaried position	6.7	6
Farming	78.7	70
Other private business	27.0	24
Other	5.6	5
None	7.9	7

Source: GSSP-IFPRI Survey 2019

Lack of knowledge poses a threat to the effective and profitable use of improved inputs and, ultimately, increased agricultural production. Figure 2 shows that most agricultural input dealers have received training, while less than 5 percent have no training, usually because they just started operations. The “other” training category included training received from or experiences shared by other dealers and consultations with agricultural extension officers.

Figure 2. Training received in agro input sales



Source: GSSP-IFPRI Survey 2019

The benefits input dealers reported that they derived from training are presented in Table 3. As a result of training, a majority have been able to provide better advice to buyers. Other benefits input dealers identified included keeping up to date with government policies, better customer relationships, networking with other input dealers, and ensuring proper chemical usage and other health and safety practices.

Table 3. Benefits respondents reported having received from training

	Percentage (%)	Observations
Better management	53.6	111
Increased sales	33.3	69
Better advice to buyers	89.9	186
Good record keeping	41.1	85
Other	11.1	23

Source: GSSP-IFPRI Survey 2019

Road transport is the dominant carrier of goods and passengers in Ghana's land transport system. Table 4 presents how input shops in our sample are accessed by different qualities of road. The business facilities for a most input dealers in the study sample can be accessed through tarred roads, just over a quarter through untarred dirt roads, and a few can be accessed only through footpaths.

Table 4. Characteristics of agricultural input shops

	Percentage (%)	Observations
Main access to input shop		
Tarred road	70.5	146
Untarred/dirt road	28.0	58
Footpath	1.5	3
Type of input dealer		
Wholesale	28.0	58
Retail with fixed structure	100.0	207
Importer	0.5	1
Business ownership		
Sole proprietorship	88.4	183
Partnership/company	11.6	24
Size of input shop		
Micro (1-5 persons engaged)	96.1	199
Small (6-30 persons engaged)	3.9	8
Transport Ownership		
Small low-bed truck	10.1	21
Medium size truck	11.1	23
Heavy duty truck or articulator	5.3	11
Pick-up	7.7	16
Three-wheeled motorcycle	18.4	38
Motorcycle (two-wheel)	29.0	60
Bicycle	3.9	8
Other (e.g., taxi)	0.5	1
None	50.2	104
Number of storerooms or other storage units		
0	29.0	60
1	47.8	99
2	14.5	30
3	5.8	12
4	1.5	3
5	1.5	3

Source: GSSP-IFPRI Survey 2019

Conceptually, we identified four broad groups of dealers – tabletop dealers, general retailers with a fixed business structure, importers, 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 to display for sale.
- Retailers operate medium-sized enterprises that usually have a fixed structure and frequently sell multiple types of agricultural inputs.
- Importers are those who obtain different types of agricultural inputs from different countries.
- Wholesalers manage larger enterprises that typically focus on the sale of one type of agricultural input to other retailers.

In our survey sample, we found that all respondents were retailers, while over a quarter also operate as wholesalers, in addition to running their retail business. We also found one importer who doubled as both a wholesaler and importer. In our random selection of input dealers, no tabletop dealers were surveyed, as they moved from market to market so did not appear in the list of input dealers from which our sample was drawn in the eight study districts. This suggests that these dealers are not registered and are unlikely to be linked to registered outlets. Table 4 provides an indication of the type of dealers that make up the agricultural input network in the study districts.

While the types of agricultural input dealers differ among districts, the ownership structure of enterprises is uniform across the country. Most of the agricultural input enterprises in Ghana are family owned, sole ownerships, established and operated from owners' own funds (Table 4). In contrast to the findings of Krausova and Banful (2010), we found 12 percent of the ownership of agricultural input businesses to be in the form of partnerships or a company – the earlier study found 3 percent to have such an ownership structure. Furthermore, we find that half of the outlets surveyed were standalone, while the other half were part of a chain of agricultural input outlets.

The size of input shops was classified by the number of persons working in them. Following the definitions of the Ghana Statistical Service (GSS) in industrial surveys, large-sized establishments are those engaging more than 100 persons in total, medium-sized are those with 31 to 100 employees, small-sized establishments have 6 to 30 persons engaged, while micro-sized are those with a total of five persons or less engaged (GSS 2015). All of the agricultural input shops surveyed in the eight study districts are classified as micro or small-sized establishments – 96 percent are micro-sized, and 4 percent are small sized. This pattern conforms to the dominance of micro-sized firms within Ghana's commercial sector (GSS 2015).

Table 4 also shows the distribution of transport vehicles owned by input dealers for their business operations. Half of the input shops surveyed had no vehicle. Out of those with vehicles, 63 percent had one, while 37 percent had more than one. The most popular type of transport owned by these shops was a motorcycle.

Finally, Table 4 presents information on the number of storerooms or other facilities agricultural input dealers owned. Twenty-nice percent of the dealers surveyed had no dedicated storage space. A single storage facility was the most frequent size of storage.

Business operating environment of agricultural input dealers

Registrations completed

In Table 5, information is presented on registrations with government agencies that have been completed by agricultural input dealers in following policies on firm registration and agricultural input regulations. Almost all respondents were certain that they had successfully completed all registrations needed for their agricultural input supply business. Most had registered with PPRSD, the Environmental Protection Agency, the Registrar-General's Department, and the local district assembly. With changes in the implementation of the PFJ program with respect to the distribution of subsidized inputs, input dealers are required to be register with PPRSD, and the survey showed

that most are. Compared to registrations by firms in the food processing sector (Andam and Asante 2018), registrations by agricultural input suppliers at the Registrar General's Department are high. That study found 17 percent of food processing firms to have registered with the Registrar General's Department.

Table 5. Business registration and association membership

	Percentage (%)	Observations
Registrations completed		
Registrar-General's Department	84.1	174
Plant Protection and Regulatory Services Directorate (PPRSD)	94.2	195
District assembly	61.8	128
Environmental Protection Agency	84.5	175
None	1.9	4
Do not know	2.9	6
Agricultural input dealer associations		
District or community association	32.4	67
Regional association	23.7	49
National association – Ghana Agricultural Input Dealers Association	16.4	34
Other	1.5	3
Do not know	9.2	19
None	44.0	91

Source: GSSP-IFPRI Survey 2019

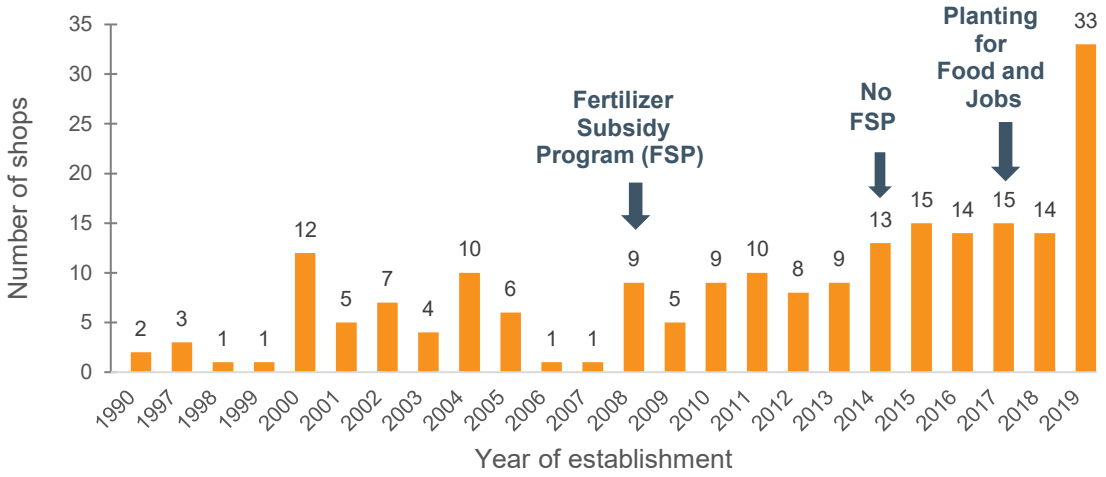
Forty-seven percent of input dealers belong to an agro-dealer association, while 44 percent reported no such affiliation (9 percent did not know their association status). Table 5 shows the different associations to which input shops belong, including those at district or community, regional, or national levels (Ghana Agricultural Input Dealers Association).

Business entry

Historically, several interventions have been implemented to enhance the entrance of new dealers into the agricultural input market in Ghana. In the 1970s and early 1980s, government interventions in the agricultural sector through direct input subsidies formed a key element in the country's agricultural policy (Resnick and Mather 2016). However, the implementation of the Economy Recovery Program in 1983 to restore macroeconomic stability through structural adjustments gradually phased out agricultural input subsidies until all were completely removed in the 1990s.

Thereafter, the government pursued the Word Bank's Agricultural Services Rehabilitation Project which sought to increase participation of the private sector in fertilizer retailing, wholesaling, and importation. Four private companies imported all fertilizers on the Ghanaian market during the liberalization of the fertilizer sector in early 1990s (Krausova and Banful 2010). Fertilizer subsidies were reintroduced by the Ghana Cocoa Board in 2003 under the Cocoa High Technology Program. However, input subsidies for food crops did not return recur until 2008 (Kolavalli et al. 2010) when, in response to the global fuel and food crises of 2007/08, the government of Ghana introduced a comprehensive fertilizer subsidy program as part of a strategy to mitigate the food crisis by increasing fertilizer use on food crops to boost production. This fertilizer subsidy continued until the end of 2013. In 2014, there was no fertilizer subsidy as a result of financial challenges making it difficult for government to meet its payment obligations to input suppliers (Houssou, Andam, and Asante-Addo 2017). In 2015, the fertilizer subsidy program was restored. However, the program suffered when Yara Ghana, a company with more than 50 percent of the Ghana fertilizer market share, closed its operations in the country.

Figure 3. Business entry of agricultural input dealers, by calendar year



Source: GSSP-IFPRI Survey 2019

The year that the agricultural input suppliers surveyed began business is presented in Figure 3. The fertilizer pillar component of PFJ implementation underwent several changes over time to enhance farmers access to fertilizer. In 2017, input supply and payment were implemented though a coupon system, which required farmers to travel to banks at often distant district centers to make payments before obtaining seed and fertilizer from the PFJ program. This discouraged many farmers from using fertilizer. These challenges led MoFA to adjust the modalities of PFJ implementation in 2018 through the use of a waybill system that allows input dealers registered with MoFA to distribute or sell subsidized seed and fertilizer directly. With these changes in implementation, we see in Figure 3 a large increase in agricultural input shops established for business in 2019. This pattern is consistent with Benin et al (2013) suggestion that the introduction of fertilizer subsidies would be accompanied by the establishment of large numbers of agricultural input outlets.

Types of products sold

There are variations in the type of inputs sold by agricultural input shops (Table 6). Almost all dealers reported selling inorganic fertilizers, while about 20 percent reported selling organic fertilizer. After inorganic fertilizer, herbicides and insecticides are the next most popular items sold by agricultural input dealers. Fifty-seven percent of agricultural input dealers sell seed. About half sell tools while 38 percent sell other equipment. Few dealers sell animal feed. This finding is consistent the finding of Krausova and Banful (2010) of 3 percent of agricultural input dealers nationally selling animal feed. In lean periods for agricultural activities, our survey found that 13 percent of dealers will sell cement and other building materials.

Table 6. Types of inputs sold

Inputs	Percentage (%)	Observations
Inorganic fertilizer	97.6	202
Organic fertilizer	21.7	45
Herbicides	91.3	189
Insecticides	88.9	184
Seed	56.5	117
Tools	51.7	107
Other equipment	38.2	79
Animal feed	1.5	3
Cement and building materials	13.0	27
Other	4.4	9

Source: GSSP-IFPRI Survey 2019

Sources of financing

For most input dealers, personal resources are the main type of financing they use to start their business-up and for ongoing working capital (Table 7). Only one-quarter of the agricultural input dealers surveyed reported obtaining their start-up capital through bank loans. However, in their 2010 study, Krausova and Banful found that only 7 percent of the input dealers in their study had used a bank loan as the source of their start-up capital, so the engagement of banks in agricultural input supply in Ghana is strengthening. The other important source of funds to start an input supply business are family and friends – 19 percent of the surveyed input suppliers reported this source. Alternative sources of start-up capital, such as farmer groups or cooperatives, play a less prominent role.

Table 7. Sources of financing for agricultural input dealers

Sources	Source of start-up capital (%)	Source of capital for financing current operations (%)
Personal	85.2	61.4
Family or friends	19.3	6.3
Bank loan	25.0	12.7
Farmer groups/cooperatives	3.4	2.4
Other	1.1	11.1
Credit from suppliers	5.7	51.2
Profit from business	-	40.6
Observations	88	207

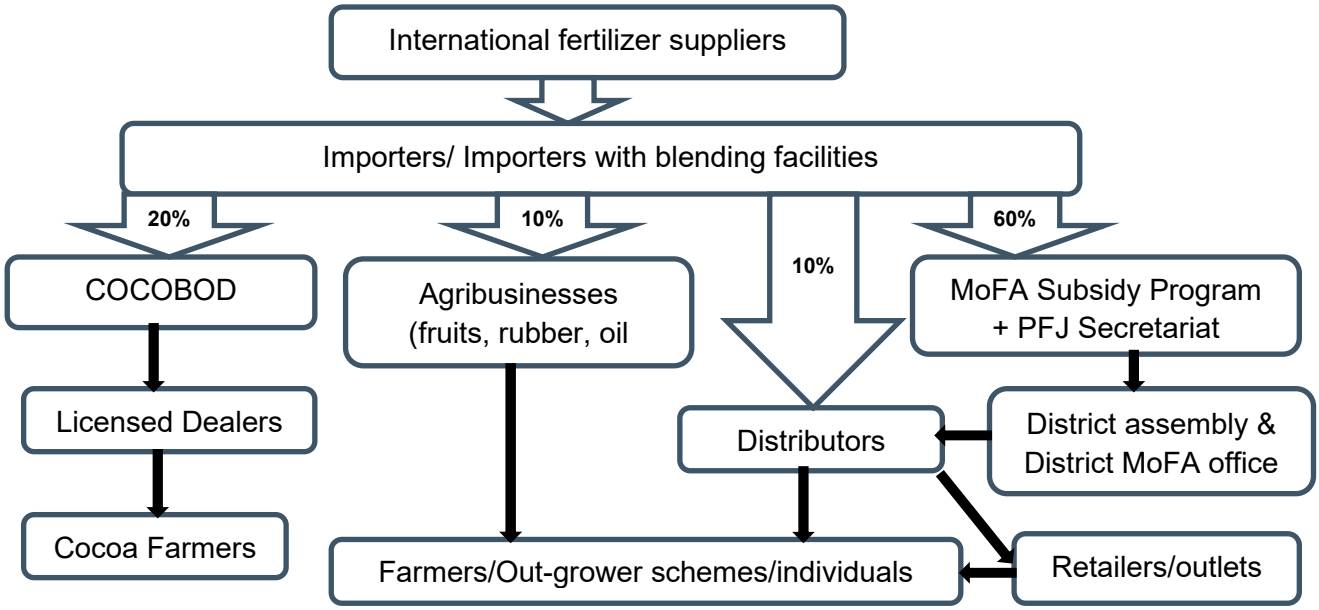
Source: GSSP-IFPRI Survey 2019

For financing current operations, aside from personal sources of funding, just over half of the respondents reported financing their current operations through credit from their suppliers. The other important source of funds for current operations is profits from their business operations.

Fertilizer supply chains and sales

Figure 4 shows the structure of the flow of fertilizer from importers to farmers and how it is partially influenced by private-public partnerships setup for the government subsidy programs (IFDC 2019).

Figure 4. Illustration of fertilizer distribution system



Source: Adapted from IFDC (2019), Scoping visits May 2019

In scoping visits to the study districts, we identified the following as common features of fertilizer supply among the districts. At the national level, the issuing of tenders for the supply of fertilizer and management of bidding by potential suppliers is managed by the PFJ Secretariat at MoFA. The Regional Coordinating Council manages activities related to PFJ at regional level. At the district level PFJ is handled by the Management and Information Systems officer in the district MoFA office, who receives directives from the national PFJ Secretariat.

When fertilizer arrives in the district, the importer or distributor presents his or her waybill to the stores officer. The stores officer inspects the invoice and consignment. The Municipal Chief Executive and the District Director of MoFA each designates a person to monitor the inspection. In addition, assigned Nation Builder's Corps (NABCO) personnel are also present for these inspection and checks. Photocopies are made of the waybill that has been signed by the inspectors, which are kept by the District Assembly and the MoFA office. After these processes are complete, the distributor then delivers fertilizers to the various registered retail outlets. A major challenge mentioned by those involved with this fertilizer distribution system is the significant time spent on the inspection and verification process.

With respect to sales, in a typical day during the high sales season before the main cropping season, the 207 input dealers surveyed reported selling an average of GHS 8,617 worth of inputs, while an average of GHS 588 in sales was realized daily in the low sales period. Each dealer sells an average of 54,086 bags of fertilizer annually.

Table 8. Transport and credit arrangements and input shop modes of operation

	Percentage (%)	Observations
Who arranges for transport for buyers		
Seller	6.8	14
Buyer	75.9	157
Both	17.4	36
Sales on credit to buyers, %	53.1	110
Input shops not operating certain months or sells other goods, %	39.6	82

Source: GSSP-IFPRI Survey 2019

With respect to transport arrangement after sale of the inputs, three-quarter of input buyers organize their own transport (Table 8). Much smaller shares of buyers rely either wholly or in part on the input supplier to transport the inputs they purchased.

Fifty-three percent of the input dealers surveyed reported that they sold to buyers on credit (Table 8). Somewhat more than half of input dealers operate year round – 60 percent. In a typical day during the major sales period, an average of 63 customers visit the shop daily, while 15 customers visit the shop daily in the low sales period.

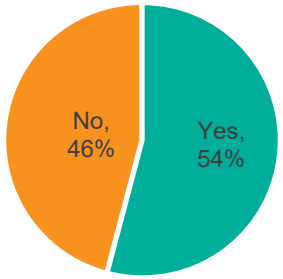
Table 9. Main crops to which customers of agricultural input suppliers apply fertilizer, percent of suppliers reporting

		District or Municipality							
Crop	All Districts	Ejura	Kintampo North	Nkoranza North	Savelugu	Tolon	Sissala East	Techiman	Tamale
Maize	100	100	100	100	100	100	100	100	100
Rice	44	18	41	-	90	100	12	-	78
Sorghum	4	5	14	6	-	3	-	4	-
Soybean	8	-	5	-	26	26	-	-	-
Tomato	35	10	73	88	23	19	-	100	6
Onion	12	-	9	29	10	-	-	65	-
Pepper	42	3	86	82	36	55	-	96	17
Other	17	-	59	41	-	13	-	48	6
Observa-tions	207	40	22	17	31	31	25	23	18

Source: GSSP-IFPRI Survey 2019

Input dealers were asked to what crops their customers applied fertilizer (Table 9). All input dealers across all districts reported their customers apply fertilizer to maize. Rice, pepper, and tomato are the next most common crops to which customers apply fertilizer, although these vary across districts.

Figure 5. Input shops selling in small quantities, percent



Source: GSSP-IFPRI Survey 2019

As seen in Figure 5, a common practice among input dealers is to sell fertilizer in small tins or buckets to persons who cannot afford an entire 50 kg bag of fertilizer. Just over half of the surveyed input dealers sold fertilizer in small quantities from open bags to customers. Both subsidized (PFJ) and commercial fertilizers were sold in this way (Table 10).

Table 10. Type of fertilizer sold in small quantities

Type of fertilizer	Percentage (%)	Observations
Planting for Food and Jobs (PFJ)	19.6	22
Commercial	17.0	19
Both PFJ and Commercial	63.4	71
Observations	100.0	112

Source: GSSP-IFPRI Survey 2019

Major constraints to business growth and operations

The top three constraints perceived by input dealers to the growth of their business are lack of capital, lack of reliable supplies or delays in those supplies, and the high cost of transporting products (Table 11). Given that most input shops were started with personal finances, the importance of the constraint of lack of capital is not surprising. Delays or lack of supply can be attributed to the processes involved in clearing fertilizer imports from the ports to the retail outlets.

Table 11. Major constraints to the growth of your business

Constraint	Percentage (%)	Observations
Lack of capital	84.1	174
Lack of reliable supply/delay in supply	56.5	117
Low demand from customers	28.5	59
High cost of transporting products	50.7	105
Lack of adequate storage facilities	18.8	39
Lack of safe storage facilities	7.3	15
Lack of technical expertise about products	10.1	21
Low quality of products	4.8	10
Expiry of products	1.0	2
Other	38.2	79

Source: GSSP-IFPRI Survey 2019

Findings from IFDC (2019) confirm that fertilizer products face the highest transaction costs when delivered to the most remote areas, given high fuel costs and poor condition of roads in such areas. Additionally, in both the Tema and the Northern regional corridors, there are multiple weight bridges and police checkpoints that cause additional delays – at times unofficial payments at these contribute to cost increases.

Twenty-nine percent of the input dealers surveyed perceive low demand from customers as a major constraint to the growth of their business, suggesting a continuing role for agricultural extension services to promote the uptake of fertilizer by Ghanaian farmers.

Comparing the findings on constraints to business growth and operations for agricultural input dealers in Ghana to similar studies in Nigeria, Liverpool-Tasie et al. (2010) found in Nigeria that participation in the fertilizer subsidy program did not improve the timeliness of fertilizer receipt. In fact, in some locations it increased the probability that the product was received late. Likewise, from a discussion with key stakeholders in the Nigeria fertilizer sector, Banful and Olayide (2010) found that subsidy programs there are overwhelmed with pervasive problems of late delivery.

Participation in the Planting for Food and Jobs program and agricultural input market development

The agricultural input dealers surveyed were asked about their participation in the PFJ program from 2017 to July 2019. The level of their participation is high across the years of program implementation with virtually all of those surveyed being involved (Table 12).

Table 12. Participation in Planting for Food and Jobs program

	Percentage (%)
Engaged in any stakeholder meetings about the selection of fertilizer for the PFJ program	52.2
Participation in PFJ in any of the seasons 2017/18 and 2019	96.6
Participation in PFJ in 2017/18 season	67.6
Participation in PFJ in 2019 season	93.7
Observations	207

Source: GSSP-IFPRI Survey 2019
Note: PFJ = Planting for Food and Jobs program

Table 13 shows the reasons for non-participation in the 2017/18 season and the 2019 season among the small sub-set of surveyed input suppliers that did not participate in those seasons. “Other” reasons that had not been precoded for the survey dominate. In 2019, these reasons include lack of time, no or late information, the shop not yet being in existence, and the type fertilizer demanded by local farmers was not provided in the PFJ. In the 2017/18 season, “other” reasons for non-participation included that the shop was not yet established or that the coupon system was not managed sufficiently well to encourage them to participate.

Table 13. Reasons for not participating

Reason	2017/18 season (%)	2019 season (%)
Late delivery of inputs	3.0	15.4
High transaction costs	4.5	23.1
Process is too complex	1.5	7.7
Political interference	3.0	15.4
Other	82.1	46.2
Declined to answer	11.9	15.4
Observations	67	13

Source: GSSP-IFPRI Survey 2019

The supply of fertilizers under the PFJ program was identified to largely occur between April - July (Table 14). However, comparing deliveries by month between the 2017/18 and the 2019 seasons, shows slightly more delays in delivery in the earlier season.

Table 14. Delivery of first batch of Planting for Food and Jobs program fertilizer in 2017/18 and 2019 seasons, by month, percent of input suppliers reporting

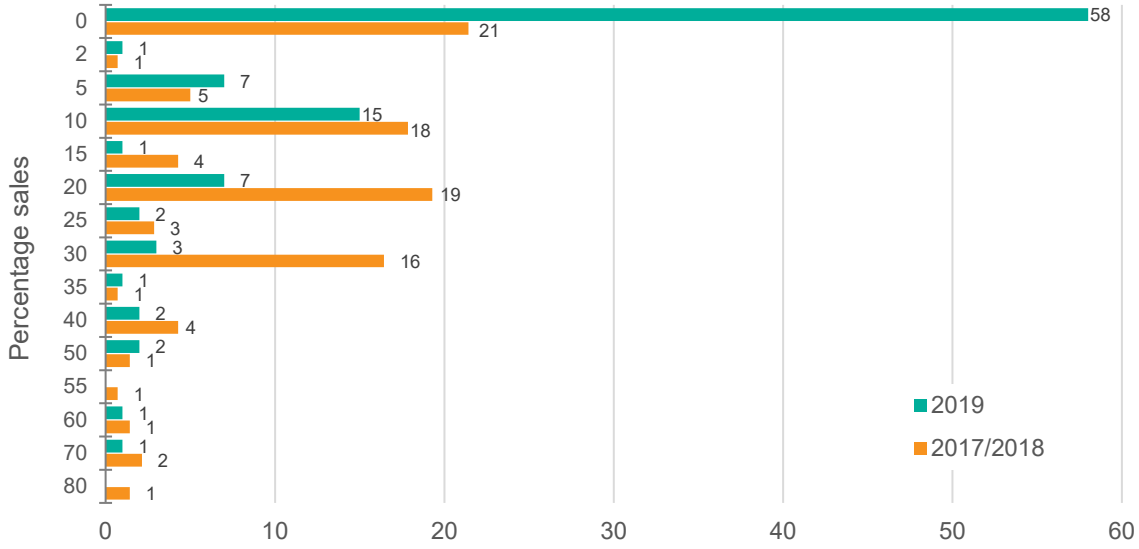
Month	2017/18 season	2019 season
January	0.71	0.5
February	-	-
March	9.3	9.3
April	20.0	20.1
May	34.3	26.3
June	22.9	39.2
July	3.6	9.3
August	0.7	-
September	0.7	-
October	-	-
November	-	-
December	-	-
Don't know	12.9	0.5
Observations	147	204

Source: GSSP-IFPRI Survey 2019

Crowding out: Planting for Food and Jobs program versus commercial input supplies

The PFJ program provides farmers with a maximum of 15 bags of fertilizer (10 bags of NPK and 5 bags of urea, i.e. 750 kg of fertilizer per farmer) at a cost that has been subsidized at 50 percent of the commercial price for the fertilizer. These subsidized inputs are made available to smallholder farmers who own 2 hectares (5 acres) of land or less. Distributing subsidized fertilizer to farmers who otherwise may purchase commercial fertilizer at near their profit-maximizing application rates may result in a reduction in the commercial purchases of such farmers. This raises the issue of crowding out in the fertilizer market due to the displacement of commercial fertilizer patronage due to the presence of government subsidies.

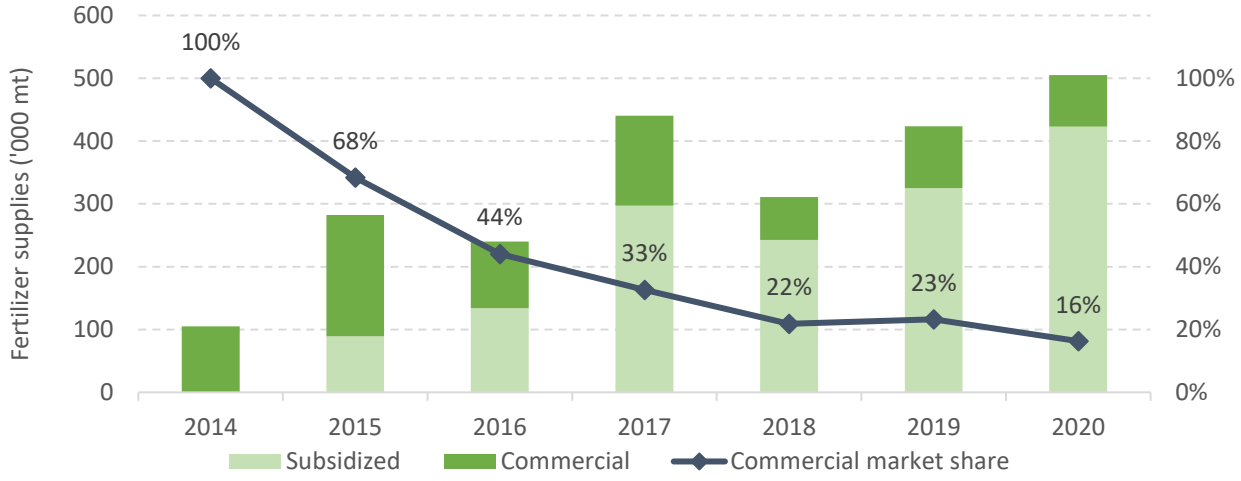
Figure 6. Percentage of sales from commercial fertilizer



Source: GSSP-IFPRI Survey 2019

Figure 6 shows signs of such a crowding-out effect for the first six months of the 2019 season compared to the 2017/18 cropping season as a result of the introduction of fertilizer subsidies. We find the proportion of no sales of commercial fertilizer to be significantly higher in 2019 than in 2017/18. In addition, we observe that only one percent of agricultural input dealers made 80 percent of their sales with commercial fertilizers in the 2017/18 cropping season, while there are no input dealers making such a level of commercial fertilizer sales as a share of their total fertilizer sales in the first six months of 2019. Comparing this finding to other studies in Ghana, Pauw (2021) estimated that commercially supplied fertilizer sales declined by 164 kilograms for every 1,000 kilograms of subsidized fertilizer supplied from 2014 to 2020. Based on this displacement rate and subsidized fertilizer supplies of 423,000 metric tons in 2020, commercial fertilizer sales were estimated to have shrunk by 82,000 metric tons in 2020, or 16 percent of total supplies (Figure 7).

Figure 7. Supply of commercial and subsidized fertilizer in Ghana, 2014 -2020



Source: Adapted from Pauw (2021)
Note: Subsidized fertilizer supply for 2020 is provisional, while commercial sales for 2020 are projected based on an estimated displacement rate of 16.4 percent.

Evidence from other countries with fertilizer subsidy programs confirms that such displacement of commercial sales can be significant. In Zambia, Mason and Jayne (2013) show that one kg of subsidized fertilizer crowds out 0.13 kg of fertilizer purchased from commercial retailers. Likewise,

Xu et al. (2009) find that subsidized fertilizer almost completely crowds out commercial fertilizer in areas of Zambia where the private sector is relatively active and average wealth is higher, to the point of lowering total fertilizer use. In contrast, in poorer areas with weak private sector engagement in agricultural input supply, subsidies help to create demand and crowd in private sector retailers.

In Malawi, Ricker-Gilbert, Jayne, and Chirwa (2011) show that on average between 2003 and 2007, 1 kg of subsidized fertilizer crowded out 0.22 kg of commercial fertilizer. However, crowding out ranges from 0.18 among the poorest farmers to 0.30 among relatively non-poor farmers. In Nigeria, Takeshima, Nkonya, and Deb (2012) found that 100 kg of subsidized fertilizer distributed to a farm household decreased the likelihood of its participation in the commercial fertilizer market by 10 to 21 percentage points, but did not affect fertilizer use.

Without accounting for the illicit diversion of program fertilizer into commercial distribution channels, Jayne et al. (2013) find that an additional ton of subsidized fertilizer would crowd out 180 kg, 134 kg, and 431 kg of commercial fertilizer purchased by farmers in Malawi, Zambia, and Kenya, respectively. In areas of Malawi where fertilizer demand was relatively low, an additional ton (1,000 kg) of subsidized fertilizer crowds out only 103 kg of commercial fertilizer. In areas with relatively high demand, an additional ton of subsidized fertilizer crowd out 265 kg of commercial purchases. The most extreme case of crowding occurred in the high-potential areas of western Kenya, where commercial fertilizer channels are relatively well developed. In these areas, a ton of additional subsidized fertilizer was found to crowd out 534 kg of commercial fertilizer. On the other hand, they find that at a diversion rate of program fertilizer into commercial distribution channels of 33 percent, an additional ton of subsidized fertilizer distributed to farmers crowd out 490 kg, 464 kg, and 761 kg of commercial fertilizer purchases in Malawi, Zambia, and Kenya, respectively.

Experience with fertilizer subsidy schemes

In Table 15, input dealers experience with fertilizer subsidy schemes is examined using a Likert scale. Eighty five percent of input dealers agreed that a greater proportion of fertilizers were sold under input subsidy schemes than without such a scheme. Although some challenges such as late delivery or delayed supply of inputs existed, 59 percent of input dealers agreed that the delivery of fertilizers was timely. Two-thirds of input dealers disagreed that the subsidy scheme created conflicts between customers and input dealers. About half stated that the fertilizer subsidy scheme was too time-consuming, while less than 11 percent agreed that uncertainty over payments was an issue. Only 20 percent said the time taken to process vouchers into cash was too long. However, more than half of input dealers indicated that the process under the fertilizer subsidy scheme was too complex.

Table 15. Experience with fertilizer subsidy scheme, percent of input suppliers reporting

Indicator	Strongly Agree	Agree	Neutral	Disagree	Strongly disagree
My shop sold more fertilizer under this system	46.9	38.2	8.2	4.4	2.4
Delivery of fertilizer was timely	13.5	45.4	13.5	23.7	3.9
It brought conflicts between customers and the shop	2.4	19.3	11.6	46.4	20.3
It was too involving, tedious, or time-consuming	21.3	30.9	14.0	31.4	2.4
There was uncertainty over whether payments would be made	0.5	10.1	39.6	35.8	14.0
Time taken to process the vouchers into cash was too long	5.8	14.5	35.3	28.0	16.4
Process was too complex	23.2	33.8	14.0	25.6	3.4

Source: GSSP-IFPRI Survey 2019.
Note: Observations: 207 agricultural input suppliers.

Nation Builders Corps (NABCO) staff monitoring of Planting for Food and Jobs input distribution

Staff from the Nation Builders Corps (NABCO), an initiative to provide jobs to unemployed post-secondary school graduates, were used in the agricultural sector to assist with extension activities and to ensure the effectiveness of the operations of the PFJ program. Some NABCO personnel were also tasked with ensuring a reduction in the incidence of fertilizer smuggling along border towns.

At the agricultural input distribution level, NABCO staff were assigned to input shops to record details of farmers and the various quantities of fertilizer and seed that were being purchased. We assessed in the survey of agricultural input suppliers whether NABCO personnel were present at various input shops at the time of interview. Over 80 percent of respondents reported such staff present in their shop. However, enumerator checks revealed that only 20 percent of NABCO personnel were present at the time of interview at the input shop (Table 16). In a typical week, 64 percent of respondents reported that NABCO staff were in their input shop each day.

Table 16. Presence and attendance of Nation Builders Corps (NABCO) staff in agricultural input supplier shops, percent of suppliers reporting

Indicators	Percentage (%)	Observations
Shops assigned NABCO personnel for PFJ monitoring	80.9	157
NABCO personnel present (enumerator assessment)	20.1	39
Attendance of personnel in a typical week, respondent estimate		
All working days	63.7	100
Five days a week	16.6	26
Four days a week	5.1	8
Three days a week	9.6	15
Two days a week	2.6	4
Once a week or less	1.9	3
Never	0.6	1

Source: GSSP-IFPRI Survey 2019

4. CONCLUSIONS

In raising crop yields in Ghana, the agricultural input sector plays a vital role. In 2019, the International Food Policy Research Institute (IFPRI) and the Plant Protection and Regulatory Services Directorate (PPRSD) of MoFA conducted a descriptive study of input dealers in eight districts to better understand the agricultural input sector in Ghana under the implementation of government's flagship program, Planting for Food and Jobs (PFJ). This paper reports on the characteristics of input shops, their business operating environment, their participation in PFJ, and input market development.

Several findings from the survey on agricultural input suppliers can help to inform agricultural policies and the design and implementation of the PFJ program. These include the role that PFJ played in increasing the entry of traders into the agricultural input market in the years after the launch of the program and a continuing concentration on fertilizer sales compared to sales of seed. The number of agricultural input dealers more than doubled between 2018 and 2019. On the one hand, this seems to reflect positively on the recent adoption of the waybill system to allow registered dealers to participate in PFJ implementation. This progressive increase in agricultural input suppliers in business is likely to increase farmers' access to fertilizer and other agricultural inputs, thus helping the PFJ to meet its objectives of improving farm technology use and increase crop production in Ghana. On the other hand, it remains to be seen whether the new entrants into the agricultural input market will keep participating in the market, especially if PFJ subsidies are

reduced or removed in the future. The additional business operations adopted by some input dealers, such as the sale of building materials, may help those dealers remain in business even if sales of fertilizer slow in the future.

It is quite likely that the subsidy program is crowding out the commercial market for fertilizers. The Ghanaian government in its fertilizer subsidy programs should seek to effectively target farmers whose subsidized fertilizer use is unlikely to affect their use of commercial fertilizers.

The biggest constraint to operating an agricultural input business 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.

To help sustain the growing number of agricultural input shops so that farmers continue to have access to inputs, distribution of inputs from wholesalers to these retail input shops should be coordinated at the district level by MoFA. Doing so will ensure reliability in their supply chains and keep newly established input shops in operation.

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