NATIONAL SEED TRADE ASSOCIATION OF GHANA - (NASTAG)

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Barriers to Effective Seed Trade in Ghana and the West African Sub-region

A TECHNICAL REPORT FOR NATIONAL SEED TRADE ASSOCIATION OF GHANA - NASTAG

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Authors: Shaibu Baanni Azumah (PhD.)
Paul Yao Anani (MPhil.)
Asdev Consult

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List of Acronyms/Abbreviations

AGRA	Alliance for a Green Revolution in Africa
ATT	Agriculture Technology Transfer Project
CABI	Center for Agriculture and Bioscience International
CAPI	Computer Assisted Personal Interviews
CRI	Crops Research Institute
CSD	Crop Services Directorate
CSIR	Council for Scientific and Industrial Research
ECOWAS	Economic Community of West African States
EGS	Early Generation Seeds
GHC	Ghanaian cedis
GIAT	Ghana Inclusive Agriculture Transformation Project
GHS	Ghana Health Service
GSID	Ghana Seed Inspection Division
IFDC	International Fertilizer Development Center
KG	Kilogram
KII	Key Informant Interviews
MoFA	Ministry of Food and Agriculture
MT	Metric Tons
NASTAG	National Seed Trade Association of Ghana
NGO	Non-Governmental Organizations
NSEZ	Northern Savannah Ecological Zone
OPV	Open Pollinated Varieties
PFJ	Planting for Food and Jobs
PPRSD	Plant Protection and Regulatory Services
USAID	United States Agency for International Development
TOR	Terms of Reference
WHO	World Health Organization
ZOI	Zone of Influence

1. Background to the Study

The African Seed Access Index (TASAI, 2019) report reveals that plant breeding has been highly successful, with the delivery of highly productive crop varieties through donor sponsored programs. The International Fertilizer Development Center (IFDC)-led Ghana Agriculture Technology Transfer (*ATT*) Project by Feed the Future USAID, recorded progress among farmers that used improved seed varieties. For example, the average age of maize varieties currently in the market is 12.5 years. The OPV *"Obatanpa"* maize seed (released in 1992) is the oldest variety on the market, and as of 2014, it accounted for 77% of certified maize seed production (AGRA, 2016). This is due to farmers' preference for its characteristics and the lack of awareness of the new maize varieties released in 2015. Additionally, the institutional challenges of implementing and enforcing the Plants and Fertilizer Act, 2010 (Act 803) are a hindrance. For example, seed inspectors do not have adequate resources to perform their tasks properly. There are still spurious and low-quality seeds swarming the markets and causing extensive damage to the seed sector by discouraging farmers against patronizing certified seeds or newly improved varieties.

The National Seed Trade Association of Ghana (NASTAG), Government, and other partners continue to work together to facilitate the increased availability of quality seeds for improved crop yields and incomes of smallholder farmers. With the National Seed Policy, National Seed Plan, the Seed Law and Ghana's Seed Regulations aligned with the Economic Community of West African States' (ECOWAS) Harmonized Regulations of 2008, NASTAG is well-placed to harness its resources as well as partner with key stakeholders to address the key challenges related to the seed trade that contribute to addressing some of intractable challenges militating against the development of Ghana's seed sector. Some of these challenges include: the unsatisfactory implementation of the seed sector policy and regulations to for enhanced investments in the seed sector; poor marketing of high-quality seeds of improved varieties; limited participation of the private sector in the seed quality standards control and certification; and low uptake/adoption rates of certified seed of improved varieties among smallholder farmers in Ghana. It is expected that contributions to addressing these challenges from the private sector could contribute to strengthening the seed system and speed up competitiveness in the delivery of high-quality seeds to farmers in Ghana and within the ECOWAS sub-region.

With support from the United States Agency for International Development-Ghana Inclusive Agriculture Transformation (USAID GIAT) project, through the Alliance for a Green Revolution in Africa (AGRA), NASTAG is implementing a two-year project under the theme *"Strengthening the Ghana Seed System to Enhance Quality Seed Delivery to Farmers Project"* with the overall goal of catalyzing and sustaining an inclusive agricultural transformation to increase incomes and improve food security by strengthening the seed system to enhance quality seed delivery and improve the seed trade for farmers in the Upper West, Upper East, Savannah, North East and Northern regions; as well as part of Bono East region of Ghana by 2022. Specifically, the project is enhancing the seed trade for members of NASTAG; enhancing private sector participation in seed quality control and certification; advocating for improved policy and regulatory environment for the seed industry; and strengthening the capacity of seed sector stakeholders' platform (NASTAG) to identify and address seed sector development challenges in Ghana. To facilitate improved seed trade in the country, NASTAG commissioned this study to assess the barriers militating against seed trade in Ghana and the sub region.

1.2 Objectives of the study

The purpose of this study is to provide a better knowledge on the impediments to effective seed trading in Ghana and the West African sub-region as well as suggest viable remedies based on the findings as a way forward to improving the business environment to boost seed business in Ghana. This report is done through a review of all seed market segments including but not limited to production, aggregation, processing, marketing and utilization. The results of this study depict the importance of the seed industry in terms of economic growth, potential market growth and key

interventions that will be needed in order to transform the seed sector. The report also presents a review of relevant documents and specifically focuses on:

1. Volumes of maize, groundnut, cowpea and soybean seeds produced and traded locally in the last two years;
2. Volumes of imported and traded maize, groundnut, cowpea and soybean seeds in the last two years (includes total volumes sold and left overs);
3. Demand for Ghanaian seeds in the West African sub-region;
4. Barriers faced by seed companies in the seed trade both locally and in the sub-region; and
5. Solutions to the bottlenecks identified in the seed sector of Ghana.

2. Technical Approach to the Study

2.1 Study locations

The scope of the study is nationwide, with a focus on the project's five administrative regions in Ghana's Northern Savannah Ecological Zone (NSEZ). Geographically, the NSEZ defines the area north of the 8th parallel, constituting the regions of Northern, Upper East, Savannah, North East, Upper West and some parts of Bono and Oti regions of Ghana. The zone is described as Ghana's "breadbasket", and is the principal source of most of the nation's rice, soybean, maize, millet, sorghum, yam, tomatoes, cotton, cattle, sheep and goats. Additionally, there is significant trade between Ghana and its immediate neighbors Burkina Faso to its North, Togo to its East, Côte d'Ivoire to its West and other West African countries. However, the regions in the NSEZ are confronted with a plethora of challenges including serious incidence of poverty, climate change and poor agricultural infrastructure, which are compounded by low adoption of improved technologies by farmers - exacerbating the issue of poor farm outcomes.

2.2 General approach

The study was explorative, employing a mixed research design. A mixture of tools were used in a flexible and complementary manner - conducting desk review of literature that was complemented by field visits to collect primary data across the project areas from selected seed companies and producers; and also, major farmers (end users). The selection of the seed companies, producers and farmers was based on their role and influence in the seed value chain of the selected crops.

2.2 Sampling and data collection

Farmers, seed producers/companies and marketers, staff of Ghana Seed Inspection Division (GSID) under the Plant Protection and Regulatory Services (PPRSD) of Ministry of Food and Agriculture (MoFA), NASTAG and SARI were the target groups for this data collection study. Standardized questionnaires and key informant interview guides were designed and used for data collection. Credible secondary sources such as World Bank, Ghana Statistical Service (GSS) and MoFA reports, as well as published articles in peer reviewed journals concerning the seed sector of Ghana were also explored for the purpose of analysis and reporting. Heads of the GSID of the target regions and in Accra were interviewed. We also applied a census sampling methodology to target and interview all the members of NASTAG in the project regions to collect quantitative and qualitative information for the study.

2.3 Analytical framework

We employed thematic component analyses (TCA), and organized the report along the main themes as captured by the objectives of the study. Data was analyzed and presented mostly in frequency tables supported by minimum, maximum and mean analyses.

2.4 Covid-19 protocols for data collection

We took note of the Covid-19 contingency measures issued by the World Health Organization (WHO) and the Ghana Health Service (GHS). In collecting data from the field during this assignment, virtual data collection methods were explored to compliment the face-to-face interview sessions - using computer assisted personal interview (CAPI) tools to limit physical contacts as much as possible.

Email and phone calls were utilized to reach out to a majority of the respondents in order to arrange for meetings. With the help of Google Forms and the Google Docs application, we were able to collect real time data. When it became necessary for face-to-face interviews, the appropriate “physical/social distance” of more than 2-metres between the participants was observed, with a strict requirement that facemasks be worn, in addition to compulsory hand washing be observed.

3. Key Findings

3.1 Basic information about the respondents

3.1.2 Sex distribution of seed producers/companies in the study area

According to MoFA PPRSD (2021), a total of two hundred and fifty-two (252) seed producers/ companies were certified and approved to cultivate various varieties of seeds in the year 2021 in the project areas (Savanna, North East, Upper West, Upper East and Northern regions). Females constituted about 9.9% of the respondents (seed producers/companies) while the remaining 90.1% were males. Table 1 shows the regional distribution of seed producers/companies.

Table 1: Sex distribution of seed growers in the project locations for 2021

Gender/ Region	*Northern*	*Upper East*	*Upper West*	*Savanna*	*North East*	*Total*
Male	80	39	55	17	36	***227***
Female	10	9	5	0	1	***25***
Total	***90***	***48***	***60***	***17***	***37***	***252***

Source: MoFA PPRSD (2021)

3.1.3 Annual gross turnover

Quality seeds are a prerequisite to a successful grain production (Republic of Ghana, 2013).[1] In Ghana, where farming is the primary source of income for the majority of the population it is critical to guarantee that seeds are readily available, economically affordable and suitable for production. It is against this backdrop that the Government of Ghana trains individuals and companies who have interest in seed production. In order for seed producers/companies to make margins on their investments, they must be able to sell their seeds. A total of 80 seed producers and companies were interviewed. Analysis of the responses suggests that their total gross annual turnover was GHS 78,889,000.00, as against total annual expenditure of GHS 72,338,000.00. This translates to an annual gross profit margin of about GHS 6,551,000.00, representing about 8% of their investments. This low profit margin was the result of the inability to sell all their total stocks for the year coupled with other factors as outlined under section 3.5 of the report. The annual turnover of the majority of the seed producers and companies were below average. Table 2 shows the summary of revenue and expenditure of the 80 respondents.

Table 2: Summary of respondents' revenue and expenditure

Category	Gross Turnover (GHS)	Expenditure (GHS)	Profit margin (GHS)	Percent (%)
Maximum	30,000,000.00	29,500,000.00	500,000.00	1.6
Average	986,112.50	904,225.00	81,887.50	1.9
Minimum	8,700.00	8,000.00	700.00	8.0
Total (N=80)	78,889,000.00	72,338,000.00	6,551,000.00	8.3

source: Analysis of field data (2021)

[1] Ghana Seed Policy, pp 13.

3.1.4 Current acreages under production

Currently the seed producers in the five regions of the North cultivate a total of 1,939 hectares of Maize, 2,082 hectares of Soybean, 169 hectares of Cowpea and 452.6 hectares of Groundnut as shown in Table 3.

Table 3: Farm size (Hectares) of seed production under production in 2021

Region / Crop	*Maize(ha)*	*Soybean (ha)*	*Cowpea(ha)*	*Groundnut(ha)*	*Total(ha)*
Northern	547	832	37	58	1474
Upper East	166	99	7	1.6	273.6
Upper West	704	799	121	389	2013
North East	425	242	0	0	667
Savanna	97	110	4	4	215
Total	***1,939***	***2,082***	***169***	***452.6***	***4642.6***

Source: MoFA PPRSD (2021)

3.1.5 Production of hybrid seeds

Hybrid maize is one of the most remarkable examples of the contribution of plant breeding to agricultural development. It is important to recognize that hybrids represent a fundamentally different seed technology to farmer-saved seed. Rather than being produced by the simple multiplication of the previous harvest. Hybrid seed is the product of a cross between two or more inbred lines (IFPRI, 2015), which produces better farm outcomes. Maize is normally cross-pollinated, and the seed obtained from one plant is the product of fertilization from a number of neighboring plants. A maize inbred, on the other hand, is produced by repeated self-fertilization, resulting in an inbred line that is itself low-yielding, but when cross-pollinated with another inbred gives hybrid seed that will produce uniform plants of high yield. However, the second generation of hybrid seed will generally produce a much lower yield. Although farmers have interest in hybrid seeds in Ghana, its production has been on the low side, hence, to a large extent seed companies have resorted to importing stocks from other countries.

There are several conditions in opting for hybrid seed production. First, farmers must learn that they need to buy fresh seed every year, which they do not have to do with the open-pollinated varieties (OPVs) they are traditionally accustomed to. Second, because of the investment involved in maintaining and multiplying inbred, hybrid seed costs at least three times as much as commercial OPV seed. Third, hybrid seed production requires greater investment by seed companies compared to the requirements for multiplying conventional seeds. These factors make it difficult for seed producers/companies in Ghana to venture into hybrid seed production. Some of the varieties of hybrid maize seeds produced in Ghana include *Kparifaako*, *Opaeburo*, *Etubi*, *Kunjorwari*, *Salinkawana*, *Wang-Basig*, *Ahoefe*, *Dzifoo*, *Tintim*, *Legon Aburo* and *Danbea*.

Figure 1: Photo of newly developed hybrid maize varieties by CSIR-CRI

3.1.6 Sources of foundation seeds

The majority of seed companies and producers in Northern Ghana obtained their foundation seeds from Savanna Agriculture Research Institute (SARI). Others also procured theirs from IWAD and other seed companies that produce for their own with support from PPRSD. In the past years, this major source of foundation seeds for seed growers has been quite reliable.

3.1.7 Branding and packaging of seeds

Branding and packaging of seeds by seed producing companies has been a major concern. Currently, about 85% of the seed producers/companies still depend on a common packaging material provided by GSID. This makes it difficult for them to promote their own seeds since they all use common packaging material with the same brand name. This has been so because the seed producers/companies do not have enough funds to procure their own packaging materials. However, there are a few other seed companies in the study area that use their own packaging materials to brand their seeds. These companies include Antika, Heritage, Ariku, IWAD, Big Ajar and "18th April".

Figure 2: Branded certified maize seeds by Antika

3.1.8 Main customers of the seed producers/companies

The Government of Ghana's flagship program, Planting for Food and Job (PFJ) has long been an important market for seed growers in Northern Ghana. Out of about 85% of total OPV seeds consumed locally by farmers, about 90% of them were supplied between 2019 and 2021 through the PFJ subsidy program for onward distribution and sale to farmers. About 6% of the seeds were absorbed by NGOs while the remaining 4% were taken up directly by other smallholder farmers at open market prices.

Figure 3: PFJ beneficiary on his farm planted with certified seeds

3.2 Volumes of seeds produced and traded locally in Ghana (2019-2021)

Over the years, seed producers/companies have been adjusting their acreages to meet farmer demand. Both weather and seed sales from the previous year determine the acreage to produce in the subsequent season. Seed production is a risky endeavor due to the unpredictable rainfall pattern and the lack of irrigation facilities. The Government's subsidy policy on seed also affects many seed producers/companies who do not fall under the subsidy program. These factors have made the seed producers/companies decrease their acreages for easy sales. Tables 4, 5, 6 and 7 show the volumes of Maize, Soybean, Cowpea and Groundnut seeds produced and sold during the 2019 and 2020 production seasons. The results from Table 4 revealed that there was a sharp decline in the production of maize in 2020, occasioned by a reduction in the contractual arrangement between the Government and seed producers/companies for the PFJ program. However, this reduction in local production was augmented by imported hybrids (Table 8).

Table 4: Trend of production and sale of maize seed in Metric Tons (2019-2021)

Crop	Region	2019		2020	
		Produced (MT)	Traded (MT)	Produced (MT)	Traded ()
Maize	Northern	6,272	4810	429	350
	Upper East	337	337	610	520
	Upper West	3,147	2850	1,321	1100
	North East	-	-	1,008	870
	Savanna	-	-	46.15	35
	TOTAL	*9,755.70*	*7,997*	*3,414.15*	*2,875*

Source: MoFA PPRSD (2021)

Table 5: Trend of production and sale of soybean seed in Metric Tons (2019-2021)

Crop	Region	2019		2020	
		Volume Produced (MT)	Volume Traded (MT)	Volume Produced (MT)	Volume Traded (MT)
Soybean	Northern	5,636	4990	1,051	800

Crop	Region	2019		2020	
		Volume Produced (MT)	Volume Traded (MT)	Volume Produced (MT)	Volume Traded (MT)
	Upper East	56	56	98.65	85
	Upper West	396	305	549	420
	North East	-	-	285	200
	Savanna	-	-	124	110
	TOTAL	6,088.00	5,351.00	2,107.65	1,615.00

Source: MoFA PPRSD (2021)

Table 6: Trend of production and sale of cowpea seed in Metric Tons (2019-2021)

Crop	Region	2019		2020	
		Volume Produced (MT)	Volume Traded (MT)	Volume Produced (MT)	Volume Traded (MT)
Cowpea	Northern	67	67	53	53
	Upper East	14	14	22.7	22.7
	Upper West	16	16	33	33
	North East				
	Savanna				
	TOTAL	97.00	97.00	108.70	108.70

Source: MoFA PPRSD (2021)

Table 7: Trend of production and sale of groundnut seed in Metric Tons (2019-2021)

Crop	Region	2019		2020	
		Volume Produced (MT)	Volume Traded (MT)	Volume Produced (MT)	Volume Traded (MT)
Groundnut	Northern	17	17	88	88
	Upper East	-	-	3.45	3.45
	Upper West	3	3	166	166
	North East	-	-	6.3	6.3
	Savanna	-	-	-	-
	TOTAL	20.00	20.00	263.75	263.75

Source: MoFA PPRSD (2021)

3.2.1 Main varieties of seed produced and traded between 2019 and 2021

The empirical survey with the seed producers/companies revealed the following main varieties of seeds grown in the study area:

- **Maize:** OPV (*Obatanpa, Wang Dataa*, *Sanzal Sima*, *Bihilifa*, *Omankwa*).

- **Soyabean:** *Jenguma*, *Afayak*, *Favour*.
- **Cowpea:** *Padi tuya*, *Songotra*, *Kirkhouse benga*, *Wang-kae*.
- **Groundnut:** *Chinese*, *Nkatiesari*, *Obolo*, *Yenyawoso*, *Oboshie*, *SARINUT 1*, *SARINUT 2*, *Sumnut 23*.

3.3 Volumes of imported and traded seeds in the last two years

3.3.1 Seeds imported into the country

To supplement the locally produced seeds, some Ghanaian seed companies have been importing diverse seeds into the country. The Government's flagship program, PFJ has created a huge demand for certified seeds in the system. Currently, locally produced seeds are unable to meet the demands of PFJ. This has created avenues for some seed companies to import more seeds into the country. About 99% of the imported seeds are hybrids while the rest of the 1% are inbred lines. Table 8 shows the volume of seeds imported and sold in the last two years.

Table 8: Volumes of imported and traded seeds in the last two years[2]

Crop	*Volume (MT) Imported in 2019*	*Volume (MT) traded in 2019*	*Volume (MT) Imported in 2020*	*Volume (MT) traded in 2020*
Maize	2,223	2,020	3,554	3,504
Soybean	0.15	0.15	13.15	12
Cowpea	0	0	0.295	0
Groundnut	0	0	0.12	0
Total	***2,223.15***	***2,020.15***	***3,567.56***	***3,516.00***

Source: MoFA PPRSD (2021)

3.4 Demand for Ghanaian seeds in the sub-region

3.4.1 Demand for Ghanaian seeds in the sub-region

With the ratification of the ECOWAS seed harmonization law, many countries in the sub-region have made the transition from the production of Open Pollinated Varieties (OPV) to hybrids which have higher productivity effects. The fact of the matter is that hybrids are high yielding and can be cultivated on the same piece of land where OPVs grow. Although hybrids demand more inputs, the improved yield compensates for the extra cost of production. A majority of Ghanaian seed producers/companies still produce OPVs for the Ghanaian markets. There are few seed producers/companies that are involved in the production of hybrid seeds in Ghana. Over 99% hybrid seeds produced in Ghana are consumed locally. Less than 1% is available for export to the sub-region because the demand for Ghanaian seeds in the sub-region is still very low at due to the inability of seed producers/companies in Ghana to produce hybrids in large volumes. Other reasons for the low demand of Ghanaian seeds are stated below.

[2] Combining the imports and the local production gives about 55% of what was available for production in 2019. This is purely an issue of demand and supply controlled largely by the PFJ program.

3.4.2 Factors that hinder export of Ghanaian seeds

ECOWAS seed harmonization law facilitates farmer access to high-quality seed varieties that can be used for cultivation in any of the ECOWAS member states. Despite this framework, Ghanaian seed producers/companies are unable to meet the requirements for harnessing the full benefits of this policy. Several factors that hinder the exportation of Ghanaian seeds have been highlighted in literature corroborated by this study. These include:

1. Over concentration on the production of OPVs by Ghanaian seed producers/companies. According to PPRSD, over 80% of seed producers/companies in Ghana are involved in the production of OPVs, which have low demand in other countries due to the preference of hybrid seeds.
2. Over reliance on imported hybrids seeds. Over the years, seed traders have been importing large volumes of seed into the country to support farmers' quest for hybrid seed since the yields of those produced locally are far less than those imported. This does not encourage seed companies and producers to go into large scale production of local hybrids for export.
3. High freight and transport costs for seed exports to the sub-region. Seed producers with contracts from the sub region to supply hybrid seeds face high transport costs to air-lift the seeds to those countries. This normally contributes to the high prices of the seeds which in one way or the other, reduces the interest in the demand for the seeds from Ghana.
4. Inadequate knowledge and know-how to produce volumes with premium standards to meet export quality and quantity demand.

3.4.3 Volumes, types of seeds, and countries exported to in the sub-region

Currently, only one Ghanaian company (Legacy Crop Improvement Centre) has been exporting hybrid maize to the sub-region. So far, the company has been able to export only 1.2 MT of Hybrid Maize (foundation) in 2019 to Mali, 0.9 MT in 2020 to Togo and Angola. The company has the capacity to produce in large volumes to meet demand from any country in the sub-region but could only supply these based on current demand.

3.5 Barriers faced by seed producers/companies in seed trade

Three key categories of barriers have been found to affect the seed trade in Ghana. viz: Institutional, legal/technical, and production barriers.

3.5.1 Institutional barriers hindering seed trade in Ghana

a. The lack of adequate capital - In order to make effective investment decisions on business, seed producers need to have sufficient funds to support their activities smoothly. This enables them to turn around their production and marketing plans. Over the years, raising funds for seed production has been a major challenge for seed producers. As a result, several businesses and producers have reduced the size of their land holding in order to better manage it. This concurs with Olafare (2015) who also found that seed companies required huge capital to support their businesses. Unfortunately, the support system is either lacking or limited in many cases for the seed producer/companies. The capability of seed producers or companies to invest in expanding the quantities of certified seed produced largely depends on the availability of finances for their operations. The absence of financial support hinders the commercialization of seed production thus the need to include it as an incentive package

for seed producers/companies and other actors in the seed value chain, and to make it a profitable business in the seed industry.

Figure 4: Photo of a seed processing unit

b. High interest charges on credit/loans - Seed producers or companies that had been touch with the banks/financial institutions for credit assistance complained about the high interest charges on facilities from the banks. This discourages many of them against taking credit facilities to invest in the seed business. Those that happen to access these facilities from the bank or other financial institutions are usually unable to offset their loans within the stipulated time and this impacts their businesses negatively.

c. Inadequate seed conditioning equipment – Seed conditioning is one of the major activities that need to be carried out for the production of quality seeds. Most seed companies in Ghana depend on the government facility to condition harvested seeds. Given the relatively high number of seed producers and companies that want their seeds to go through this process in the shortest time possible, there is undue delay in making seed ready for the shelf, as well as timely access by farmers and even for export.

d. Subsidizing seeds by the Government - Many governments try to cushion their citizens against hostile factors and to make life better for them. Farmers are not left. Over the years, the Government of Ghana has subsidized the price of seed for smallholder farmers to enable them access improved seeds and optimize farm yields so that agriculture, which is the backbone of Ghana, can contribute significantly to GDP. The main challenge for seed companies and producers is that the government gives quotas for the volume of seeds under the subsidy program. Once that volume is achieved the rest of the seeds must be sold at the prevailing market price. The majority of seed producers in the project's zone of Influence do not enjoy this subsidy hence making their seeds too expensive for the smallholder farmers. Farmers rush to the subsidized seed first before turning to buy the unsubsidized one. This makes seed marketing extremely difficult for both the seed companies and producers respectively, whose seeds don't find their way into the subsidy regime. Many of them eventually sell their seeds as grain in the open market and end up running losses.

e. Inability of seed companies to set their own price - Ever since seed production in Ghana was regularized, the Government is the authority that sets the price of seeds based on certain production factors. This means that no matter the production cost of any individual seed company or producer, he/she must follow the selling price announced by the Government. This causes some of the seed companies/producers to either run at a loss or end up making a small margin on the business.

3.5.2 Legal/technical barriers hindering the seed trade in Ghana

a. Low volumes of available foundation seeds: Certified seeds are produced from foundation seeds that are currently supplied by research institutions and a few accredited private companies in the country. The volumes of foundation seeds available at the research stations do not meet the demand of the seed companies and producers in terms of quantity and quality. On the other hand, the seed companies do not have the requisite skills and knowledge for producing foundation seed. Since companies produce relatively small quantities of certified seed, allowing them to produce their own foundation seeds may not be a profitable venture. Also, an assessment by PPRSD may be difficult since private seed inspectors do not operate in Ghana. The major input for the production of foundation seeds is breeder seeds, which also

come from the research institutions. The breeder seeds are limited in supply, hence, limiting the production of foundation seeds, which in turn affects the production of certified seeds. Since there is a direct link between the certified seed, foundation seed and breeder seed production, any challenge that impacts one will also affect the others.

b. Inadequate Seed inspectors for seed field inspection: in order for a seed company or producer's field to be certified, seed field inspectors must visit the seed field a minimum of four (4) times within one (1) production season. Due to the limited number of staff at the Ghana Seed Inspection Division, seed growers experience challenges meeting or arranging for these crucial visits to their fields. As a result, seed growers cut down on the number of seed fields and this eventually reduces their volumes. Inadequate supervision also affects the quality of the seeds produced.

c. Sale of uncertified seeds (in the informal sector) - Over the years, grains find their way into the certified seed market. This is usually carried out by dishonest individuals who want to make fast money from businesses they are not involved in. This has made farmers lose trust in the "approved certified seeds", making it difficult for them to differentiate between the certified and uncertified seeds. The activities of these bad seed marketers make certified seed marketing for farmers problematic. Seed producers have had to put in extra time and effort to persuade farmers to buy their seeds.

3.5.3 Production barriers hindering the seed trade in Ghana

a. Inadequate early generation seeds (EGS) for the production of hybrids and certified seeds. This is further compounded by limited public-private partnerships to boost the production of EGS. The inability of seed producers or companies to take up the production of hybrids is largely due to the limited availability of inbred lines. Although many seed producers have developed an interest in the production of hybrids, their efforts to get inbred lines from research institutions have proven futile, making them resort to the production of OPVs although these do not give them the required yield to compete favorably in the seed business.

b. Poor uptake of improved seed by farmers - The uncertainty associated with farmers' decisions on the type of seed to plant has implications for the seed producers. Farmers' mistrust for certified seed further compounded the issues of seeds purchase for them. Seed companies have to do more to educate smallholder farmers on the qualities of the seeds to convince them to buy. One other factor hindering farmers ability to procure certified seed is its availability in the farming communities. Most of the seeds are in the regional or district capitals, located many kilometers away from the smallholder farmer. It does not make any economic sense for a smallholder farmer to travel several kilometers to procure seeds for a 2-hectare farm. This assertion is supported by CABI (2014), that improved seed varieties are simply not there to buy, especially in the more remote and marginal areas.

c. Climate change and poor irrigation facilities for regular production - Unfavorable climate conditions continue to affect the ability of seed producers/companies to improve the genetic qualities. Weather aberrations, especially during seeding, have led to severe fluctuations in overall seed production and the quality of seeds produced. Similarly, severe environmental conditions can sometimes lead to total crop failure, presenting serious financial consequences to the seed producers. Plant breeding will also play a critical role in climate adaptation strategies (Rosegrant et al., 2014). Changes in weather patterns are already affecting growing seasons and crop production, particularly in tropical regions (Access to Seeds Index, 2019). These problems are expected to worsen as temperatures and extreme weather events increase (Challinor, 2016).

d. High energy and labor costs - Seed producers depend heavily on energy and labor for seed production, processing, packaging and marketing. The unavailability of labor, coupled with its cost affects the smooth running of the seed production business. Seed production is carried out at the same time in a particular geographical area. The demand for labor is scarce since all the producers need this service at the same time, and this makes labor costly.

e. Inadequate mechanization service providers - Mechanizing farming activities make it less strenuous. Seed producers/companies always wish to own farm machinery to cultivate their fields. Due to financial constraints, the majority of seed growers have to rely on public mechanization service providers to cultivate their fields. These service providers are limited in the zone of influence (ZOI). Due to the limited numbers of mechanization service providers in the regions, seed growers sometimes go into the production late which eventually affects their output adversely. Others don't receive these services at all and therefore had to cancel their seed businesses during a particular production season.

Other well-established barriers to seed trade in Ghana include inadequate seed markets and industry data which limit the potential for proper demand forecasting and planning. The seed system in Ghana appears unstable and unreliable and has a small and unstructured market.

Also, we found inadequate linkages between local companies and multinationals to scale-up hybrid seed production as a major challenge to seed production and trade among dealers in Ghana. There are limited institutional linkages among the various EGS producers, with the central government also providing limited funding for research into improved seeds.

In addition, there is an undeveloped seed marketing and distribution system, with the bulk of the work left for some advanced agro-dealers spread across the country. Currently, we see an unsustainable public system being used to distribute seeds under the PFJ program, which will likely collapse when the policy is over. Promotional activities for the use of improved seeds are left in the hands of projects, which are not carried out beyond the lifetimes of those interventions.

The regulatory barriers are still injurious to the seed sector, with the period of the release of new varieties still too long and expensive for the seed producers to shoulder. The poor payment regime by the main customer, PFJ, is a disincentive and ties down the capital of seed producers/companies.

4. Conclusion

From the empirical findings, we conclude that there is a downward trend in the production and trade of seeds in Ghana. For example, seeds produced in Northern Ghana in 2019 were 9,755.7MT of Maize, 6,088 MT of Soybean, 97 MT of Cowpea and 20 MT of Groundnut seeds. However, only 7,997MT Maize, 5351MT of Soybean, 97MT of Cowpea and 20MT of Groundnut seed were sold in the 2020 production season. In 2020, a total of 3,414.15MT Maize, 2,107.65MT of Soybean, 108.7MT of Cowpea and 263.75MT of Groundnut seeds were produced and made available to smallholder farmers across Ghana but only 2,875MT Maize, 1,615MT of Soybean, 108.7MT of Cowpea and 263.75MT of Groundnut seeds were sold in the 2021 production season. Some of the remaining seeds were stored and carried over to the following year while others were sold as grain for food to offset part of the production costs.

In the case of seed importation, a total of 2,023MT and 3,554MT of hybrid maize were imported into Ghana in 2019 and 2020 respectively. Some 2,020MT and 3,504MT of hybrid maize were sold in 2020 and 2021 production seasons respectively.

Generally, there is very low demand for Ghanaian seeds in the West African sub-region, because of an over concentration on the production of OPVs and over reliance on the importation of hybrid seeds. Some technical, institutional, and legal challenges have been found to confront seed companies in the production and trade of seeds locally and in the sub-regions. These include the lack of adequate investable capital; high interest charges on credit; inadequate seed conditioning equipment; the sale of uncertified seeds by unregistered seed producers due to poor regulation; inadequate foundation seeds for multiplication; and inadequate early generation seeds (EGS) for the production of hybrids and certified seeds.

The barriers include inadequate seed market and industry data, limiting the potential for proper demand forecasting and planning; inadequate linkages between local companies and multinationals to scale up hybrid seed production; limited institutional linkages among the various EGS producers, with the central government also providing limited funding for research into improved seeds. The regulatory barriers are still injurious to the seed sector, with the period of the release of new varieties still too long and expensive for the seed producer to shoulder. The poor payment regime by the main customer, PFJ, is a disincentive and ties down the capital of seed producers/companies. Others include the inability of seed companies to set their own prices; inability of seed companies to produce their own foundation seeds, inadequate seed inspectors for seed field visits; subsidizing seeds by the Government some of which is imported; and low improved seed uptake by farmers. Climate change and poor irrigation facilities for regular seed production; high energy and labor costs, and the unavailability of mechanization for service providers have also been found to hamper the seed business in Ghana.

5. Recommendations for a Viable Seed Sector in Ghana

Results from interviewing key informants, as well as the seed producers and companies outlined some remedies to the problems of the seed sector of Ghana. They are of the view that if the following are implemented, the seed industry could experience growth and be able to supply all the seed required locally as well as for the sub-region:

a. Create opportunities for seed companies to build their capacity through structured courses at selected institutions (Universities). The training process should also involve receiving practical field level support from experienced seed companies and producers. This capacity building course could include Seed Enterprise Management courses, as well as quality and traceability programs for developing the sector. This should be backed by massive investment in the seed sector through the provision of the needed infrastructure and capital for seed producers and companies. There should be a credit scheme with low interest rates for seed producers to access and expand on their production and supply of seeds in Ghana and for export. NASTAG could be supported to operationalize the Seed Fund with support from the Government to pre-finance seed business for members of NASTAG.

b. There would be a need for stakeholders and the government to support NASTAG to set up mechanization and seed conditioning centers at some district capitals to support seed production and conditioning. This will minimize the cost and unavailability of labor during the critical period of the production season. It will reduce the cost and time of transporting the raw seed to the regional capitals for cleaning and conditioning before transporting the seed back to the district capitals for marketing.

c. Stakeholders must partner with NASTAG to encourage and facilitate the formation and linkages of agricultural value chain actors for the effective production and marketing of seeds across the sub-region. This should be coordinated by NASTAG which should be given permanent recognition in national policy documents on seed. Likewise, NASTAG should be given the authority to control the seed trade in Ghana, backed by law.

d. There must be a deliberate encouragement towards the production and use of local hybrid seeds and making inbred lines available to seed companies and producers for multiplication, while effectively enforcing Act 803 which states in section 38 that, a person who is registered to produce or market seeds of a particular class may only market or produce seeds of that class (Act 803).

e. A Public Private Partnership (PPP) agenda should be considered to drive the seed industry - promoting investment of the private sector in the seed system that engenders business outcomes for collective benefits. Within such an arrangement, seed companies and producers could be supported to partner with foreign entities to leverage on their experiences and financial support.

f. There is a need to fully implement the ECOWAS seed harmonization law, which facilitates farmer access to high-quality seed varieties that can be used for cultivation in any of the ECOWAS member states. Increasing food production calls for improving farmers' access to high-quality seed of improved varieties through a well facilitated cross-border seed trade.

g. Enhance the quality of basic seed production: In order for seed companies to grow, research institutions should be supported to increase the production of Early Generation Seeds (EGS) for multiplication. This will reduce the dependency on imported hybrids and encourage more seed producers to go into hybrid seed production for Ghana and international markets.

h. Finally, there is the need for intense awareness creation and sensitization to boost the use of improved certified seeds among farmers in Ghana. This could be carried out by setting up community demonstrations farms, organizing technology fairs, radio programming, deployment of information via mobile phone and the use of farmer-to-farmer extension approaches.

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Appendices

Appendix 1: List of respondents and their location

S/n	Region	Name of respondent	Maize	Soybean	Cowpea	Groundnut
1.	Upper West Region	Seidu Mubarak A.	Yes	Yes	Yes	Yes
2.	Upper West Region	Abdul Shamir Iddrisu	Yes	Yes	Yes	Yes
3.	Upper East Region	Ariku A. Martin	Yes	Yes	Yes	Yes
4.	Upper West Region	Dakui Dawuda J.		Yes	Yes	Yes
5.	Northern Region	Joshua Toatoba	Yes	Yes		
6.	Upper West Region	Adam Abdul Samad	Yes			
7.	Upper West Region	Adam Nuhu Danyagri	Yes			
8.	Upper West Region	Alhassan Badoun	Yes	Yes		
9.	Upper West Region	Awinboya Fuseini S.	Yes	Yes		
10.	Upper West Region	Awudu Aminu	Yes	Yes		
11.	Upper West Region	Belaire Florence		Yes		
12.	Upper West Region	Chimmie Braimah N.	Yes	Yes		
13.	Upper West Region	Hamidu Delinwne	Yes	Yes	Yes	Yes
14.	Upper West Region	Juliana Gaamo		Yes		
15.	Upper West Region	Jane Francis		Yes		
16.	Upper West Region	Mashood Dori	Yes	Yes	Yes	
17.	North East Region	James Sampana	Yes			
18.	North East Region	Mahama Ramatu	Yes	Yes		
19.	Savannah Region	Albert Nyandaye Altah	Yes	Yes		
20.	North East Region	Moses Tampuri	Yes			
21.	North East Region	Sulemana Alhassan	Yes			
22.	North East Region	Mahama Yamusah	Yes			
23.	North East Region	Bangmarigu Amos	Yes			
24.	Upper West Region	Osman Hussein Sulley	yes			yes
25.	North East Region	Fuseini Nurudeen		Yes		
26.	North East Region	Mustapha A. Majeed		Yes		
27.	Savannah Region	David Mensah	Yes	Yes		
28.	Savannah Region	Khalid Abubakari G.		Yes		
29.	Savannah Region	Karim Shamsudeen	Yes	Yes		
30.	Savannah Region	Karim Musah		Yes		
31.	Savannah Region	Dauda A. Salam	Yes	Yes		
32.	Savannah Region	Laryea Kenneth O	Yes	Yes		Yes
33.	Northern Region	Abukari Abdulai	Yes	Yes	Yes	Yes
34.	Savannah Region	Salifu Muniru Silas	Yes			
35.	Savannah Region	Saame Francis	Yes			
36.	Savannah Region	Muniru Mustapha	Yes	Yes		

S/n	Region	Name of respondent	Maize	Soybean	Cowpea	Groundnut
37.	Savannah Region	Sanatu Mustapha	Yes	Yes		
38.	North East Region	Mathew Adua	Yes			
39.	Upper East Region	Abu Nafisah	Yes	Yes		
40.	Upper East Region	Gordon Agyenta	Yes			
41.	North East Region	Issahaku Zakaria	Yes	Yes		
42.	Northern Region	Abdul-Mumuni M. A.	Yes	Yes	Yes	
43.	Northern Region	Alhaji N. Fusheini	Yes	Yes	Yes	
44.	Northern Region	Zibilila Fuseini	Yes	Yes	Yes	
45.	Northern Region	Mohammed Alhassan	Yes	Yes	Yes	
46.	Northern Region	Alhassan Kamil	Yes	Yes	0	
47.	Northern Region	Alhaji Iddrisu A. Ayuba	Yes	Yes	Yes	
48.	Northern Region	Kaleem Haruna	Yes	Yes	Yes	
49.	Northern Region	Alhassan Amadu	Yes	Yes	Yes	
50.	Northern Region	Zakaria Inusah	Yes	Yes	Yes	
51.	Northern Region	Abdulai Abdul-Rafiu	Yes	Yes	Yes	
52.	Northern Region	Mohammed A. Khama	Yes	Yes	0	
53.	Northern Region	Shani Abukari Aduwa	Yes	Yes	Yes	
54.	Northern Region	Ibrahim Mahama	Yes	Yes	Yes	
55.	Northern Region	Dr. Yahaya Adam	Yes		0	
56.	Northern Region	Abdul R. Mohammed	Yes	Yes	0	
57.	Northern Region	Chief Alhassan	Yes	Yes	Yes	
58.	Northern Region	Abdulai I. Adama	Yes		Yes	
59.	Northern Region	Abdul M. Mustapha	Yes	Yes	Yes	
60.	Northern Region	Abukari Zakari Napatia	Yes	Yes	Yes	
61.	Northern Region	Alhassan Dahamani	Yes	Yes	Yes	
62.	Northern Region	Abdul Rashid Issah			0	Yes
63.	Northern Region	Mohammed A. Rahman	Yes		Yes	
64.	Northern Region	Alhassan Abdulai	Yes		0	
65.	Upper East Region	Abdul Rashid Alhassan	Yes			
66.	Upper East Region	Abu Razak Apugang	Yes	Yes	Yes	Yes
67.	Upper East Region	Adeyelsum Meridian	Yes			
68.	Upper East Region	Adjue Wusuma Limited		Yes		
69.	Upper East Region	Atinbilla Morrison	Yes			
70.	Upper East Region	Ayamba Asaa Paul	Yes	Yes	Yes	Yes
71.	Upper East Region	Baba Kumasi	Yes	Yes		
72.	Upper East Region	Chief Bukari	Yes			
73.	Upper East Region	Denis Apoita	Yes			
74.	Upper East Region	Dr.Roger Kanton	Yes			
75.	Upper East Region	Emmanuel Andema	Yes			
76.	Upper East Region	Francis Anafo	Yes	Yes		

S/n	Region	Name of respondent	Maize	Soybean	Cowpea	Groundnut
77.	Upper East Region	Inusah Abdullai	Yes			
78.	Upper East Region	Ishmael Yamyola	Yes	Yes		
79.	Upper East Region	Keneth Adabayeri			Yes	
80.	Northern Region	Ibrahim Alabani	Yes	Yes		

Appendix 2: Questionnaire for seed companies and producers

Assessing the Barriers to Effect Seed Trade in Ghana

Date of Interview:

Region:

Community:

Section 1: Basic information about business:

1. Company name:
2. Name of respondent:
3. Gender of respondent: (i) Male (ii) Female
4. Year of establishment of company:
5. Annual gross turnover (GHC):
6. Annual estimated expenses (GHC):

Section 2: The Volumes of seeds produced and traded locally in the last two years

7. Please provide information of volumes of seed **Produced** from 2019 to 2021

Crop	*Volume in kg (2019)*	*Volume in kg (2020)*	*Volume in kg (2021)*
Maize			
Soybean			
Cowpea			
Groundnut			

8. Please provide information of volumes of seed **Traded/Sold** from 2019 to 2021

Crop	*Volume in kg (2019)*	*Volume in kg (2020)*	*Volume in kg (2021)*
Maize			
Soybean			
Cowpea			
Groundnut			

9. Main variety of seeds produced from 2019-2021.

Crop	*Variety (ies)*
Maize	
Soybean	
Cowpea	
Groundnut	

10. Acreage under seed production from 2019-2021.

Crop	*Acres - 2019*	*Acres - 2020*	*Acres - 2021*
Maize			
Soybean			
Cowpea			
Groundnut			

11. Does your company produce hybrid Maize seeds?
YES/NO

12. If YES in question 11 which varieties of hybrid Maize seeds do you produce?

Crop	*Variety*
Maize	

13. What is the source of your foundation seed for the various seeds (between 2019-2021)?

Crop	Variety	Source of Foundation seed
Maize		
Soybean		
Cowpea		
Groundnut		

14. How do you brand and package your seed?

Reasons	Thick
Own branding and packaging	
Partly own branding and packaging; partly through MoFA Seed Unit	
Plan to do own (re-)packaging and branding in tailor made quantities	
MoFA packaging and branding only	

15. Who are your main customers? Thick all that apply.

Main Customers	Thick
Agro-input dealers	
Government (PFJ)	
FBOs	
Own outlets / walk-in farmers	
NGO/projects	

Section 3: The Volumes of imported and traded seeds in the last two years

16. Have you imported and sold foreign seeds in the last two years? YES/NO

17. Volumes of imports between 2019-2021

Crop	*Volume in kg (2019)*	*Volume in kg (2020)*	*Volume in kg (2021)*	*Countries of import*
Maize				
Soybean				
Cowpea				
Groundnut				

18. Which seed companies in your area are into the importation of seeds?

Crop imported	Name of Company	Contact (phone, email etc.)

Section 4: Demand for Ghanaian seeds in the sub region

19. Have you ever exported seeds to other countries? YES/NO

20. If YES in question 20, please indicate the volumes of export for the period 2019-2021.

Crop	*Volume in kg (2019)*	*Volume in kg (2020)*	*Volume in kg (2021)*	*Countries of import*	*Name of company*
Maize					
Soybean					
Cowpea					
Groundnut					

21. If NO in 21, what prevents you from exporting your seeds to other countries? Is there any support required?

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22. Do you think seeds from Ghana have higher/lower demand from other countries in the sub-region? Please explain your answer.
23. Do you know any Ghanaian seed company that has exported seeds to other countries in the last two years?

Name of Company	Seed exported	Contact Name	Mobile number of exporter

Section 5: Barriers faced by seed companies in seed trade

24. What are the problems hindering your seed business? Choose those that apply to your situation

25.1 Institutional Barriers	*Thick here*	*ranks from 1st to last*
Sale of uncertified seeds by unregistered producers	1	
Unavailability of financial support	2	
High interest charges on credit/loan	3	
Inadequate early generation seeds (EGS) for the production of hybrids and certified seeds.	4	
Slow responsiveness of regulatory agencies to practical needs of the private sector	5	
Inadequate foundation seeds	6	
Inadequate seed inspectors for seed field inspection	7	
Lack of government's commitment for support of the local seed sector.	8	
Lack of extension officers to support seed producers	9	
Poor road infrastructure	10	
Inadequate seed conditioning equipment	11	
others (specify)		

25.2 Legal/ technical barriers	*Thick here*	*ranks from 1st to last*
Inability of seed companies to produce their own foundation seeds		
Technical regulations and procedures for assessment of conformity		
Inability of Seed companies to set their own prices		
Others (Specify)		

25.3 Production challenges/Barriers	*Thick here*	*ranks from 1st to last*
Climate change and poor irrigation facilities for regular production		
High inputs and labor costs		
Poor improved seed uptake by farmers		
Unavailability of mechanization service providers		
Access to suitable land for seed production		
Others (Specify)		

Section 6: Solutions to the bottlenecks in the seed sector of Ghana

25. Please suggest any solution(s) to the problems of the seed sector in Ghana.

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Appendix 3: Questionnaire for seed importers

Assessing the Barriers to Effect Seed Trade in Ghana

The Volumes of imported and traded seeds in the last two years

1. What volume of seeds were imported in the last two years?

Crop	*Volume in kg (2019)*	*Volume in kg (2020)*	*Volume in kg (2021)*
Maize			
Soybean			
Cowpea			
Groundnut			

2. Main variety of seeds **imported**

Crop	*Variety*
Maize	
Soybean	
Cowpea	
Groundnut	

3. Main variety of seeds **traded/sold**

Crop	*Variety*
Maize	
Soybean	
Cowpea	
Groundnut	

4. Does your company Import OPV seed?
   YES/NO

5. What are the crops and varieties for OPV seed you imported?

Crop	*Variety*
Maize	
Soybean	
Cowpea	
Groundnut	

6. Which countries do you import your seeds from?

Crop	*Country*	*Volume (Kg)*
Maize		
Soybean		
Cowpea		
Groundnut		

7. Who are the customers for your seeds?

Seed Customers	**Thick**
Agro-input dealers	
Government (block farms)	
FBOs	
Own outlets / walk-in farmers	
NGO/projects	
Others (specify)	

8. What are the problems hindering seed business in Ghana?

8.1 Institutional Challenges	**Thick here**	
Sale of uncertified seeds by unregistered producers		
Unavailability of financial support		

8.1 Institutional Challenges	Thick here	
High interest charges on credit/loan		
Lack of adequate capital to operate smoothly.		
Poor road infrastructure to farming communities		
Cumbersome import permit acquisition procedures		
others (specify)		

8.2 Legal/Technical Challenges	Thick here	
Inability of Seed companies to set their own price		
Technical regulations and procedures for assessment of conformity		
Others (Specify)		

8.3 Production Challenges	Thick here	
Poor improved seed uptake by farmers		
Others (Specify)		

9. Can you suggest any solutions to the problem enumerated above?

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Appendix 4: Questionnaire for seed PPRSD/GSID

Assessing the Barriers to Effect Seed Trade in Ghana

Section A: Volumes of exported from Ghana to other countries in the last two years

1. What were the volumes of seed exported in the last two years into other countries?

Crop	*Volume in kg (2019)*	*Volume in kg (2020)*	*Volume in kg (2021)*
Maize			
Soybean			
Cowpea			
Groundnut			

2. Main variety of seeds **exported**

Crop	*Variety*
Maize	
Soybean	
Cowpea	
Groundnut	

3. Do you think there is demand for Ghanaian seeds in the subregion? Please explain your answer.

4. What is hindering the export of Ghanaian seeds into the subregion?
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Section B: Volumes of imported into Ghana in the last two years

5. Please provide information of volumes of seed **Imported** from 2019 to 2021

Crop	*Volume in kg (2019)*	*Volume in kg (2020)*	*Volume in kg (2021)*
Maize			
Soybean			
Cowpea			
Groundnut			

6. Main variety of seeds **imported**

Crop	*Variety*
Maize	
Soybean	
Cowpea	
Groundnut	

7. Do Ghanaian Seed companies produce Hybrid seeds?
YES/NO

8. What are the crops and varieties of Hybrids produced by Ghanaian Seed companies?

Crop	*Variety*
Maize	
Soybean	
Cowpea	
Groundnut	

Section C: Barriers to seed trade in Ghana

10. What are the problems hindering seed business in Ghana?

10.1 Institutional Challenges	*Thick here*	*rank from 1st to last*
Sale of uncertified seeds by unregistered producers		
Unavailability of financial support		
High interest charges on credit/loan		
Inadequate early generation seeds (EGS) for the production of hybrids and certified seeds.		
Cumbersome import permit acquisition procedures		
Inability of Seed importers to apply of Permit on time		
Slow responsiveness of regulatory agencies to practical needs of the private sector		
Inadequate foundation seeds		
Lack of government's commitment to support the development of the local seed sector.		
Lack of adequate capital to operate smoothly.		
Poor road infrastructure to farming communities		
Inadequate Seed conditioning equipment		
others (specify)		

10.2 Legal / Technical Challenges	Thick here	*ranks from 1st to last*
Inability of Seed companies to produce their own foundation seed		
Inadequate Seed inspectors for seed field inspection		
Inability of seed companies to set their own price		
Technical regulations and procedures for assessment of conformity		
Others (Specify)		

10.3 Production Challenges	Thick here	*ranks from 1st to last*
Climate change and poor irrigation facilities for regular production		
High energy and labor costs		
Poor improved seed uptake by farmers		
Unavailability of Mechanization service providers		
Others (Specify)		

9. Can you suggest any solutions to the problem enumerated above?

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NATIONAL SEED TRADE ASSOCIATION OF GHANA - (NASTAG)

House No. 666/14 Dzorwulu, Kwei Okyerema Street Accra
PMB CT 7256, Cantonments, Accra
info@nastag.org
www.nastag.org

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