



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative

FEED THE FUTURE GHANA AGRICULTURE POLICY SUPPORT PROJECT (APSP)

**SEED MARKET INDUSTRY FRAMEWORK AND STRATEGY STUDY
(SMIFS)**

Contract No. 641-C-14-00001



USAID
FROM THE AMERICAN PEOPLE

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ABBREVIATIONS AND ACRONYMS

ADVANCE	Agricultural Development and Value Chain Enhancement
ADVANCE	Agricultural Development and Value Chain Enhancement
AGRA	Alliance for Green Revolution in Africa
APSP	Agriculture Policy Agricultural Policy Support
ATT	Agricultural Technology Transfer
CIMMYT	International Maize and Wheat Improvement Center
CRI	Crop Research Institute
CS	Certified Seed
CSIR	Council for Scientific and Industrial Research
DCS	Directorate of Crop Services
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture Organization of the United Nations
FBOs	Farmer Based Organizations
FinGAP	Financing Ghanaian Agriculture Project
FS	Foundation Seed
FSS	Farmer Saved Seed
GADCO	Global Agri-Development Company
GADDP	Ghana Agro-dealer Development Project
GAIDA	Ghana Agro-Input Dealers Association
GAPs	Good Agricultural Practices
GLDB	Grains and Legumes Development Board
GMOs	Genetically Modified Organisms
GoG	Government of Ghana
GSC	Ghana Seed Company
GSID	Ghana Seed Inspection Division
GTZ	German Technical Cooperation
IFDC	International Center for Fertilizer and Agricultural Development
IFPRI	International Food Policy Research Institute
IITA	International Institute of Tropical Agriculture
IPRs	Intellectual Property Rights
KNUST	Kwame Nkrumah University of Science and Technology
LPI	Logistics Performance
MESTI	Ministry of Environment, Science, Technology and Innovation
METASIP	Medium Term Agriculture Sector Investment Plan
MoFA	Ministry of Food and Agriculture
MT	Metric Tons
NARI	National Agricultural Research Institutes
NASTAG	National Seed Trade Association of Ghana
NGOs	Non-Governmental Organizations
NSC	National Seed Council

NVRRC	National Variety Release and Registration Committee
OECD	Organization for Economic Cooperation and Development
OPV	Open Pollinated Variety
PBR	Plant Breeder Rights
PFJ	Planting for Food and Jobs
PPRSD	Plant Protection and Regulatory Services Directorate
SARI	Savanna Agricultural Research Institute
SEEDPAG	Seed Producers Association of Ghana
SMEs	Small and Medium Enterprises
SMIFS	Seed Market Industry Framework and Strategy Study
SSTP	Scaling Seed and Technology Partnership
TASAI	The African Seed Access Index
TRIPS	International Union for the Protection of New Varieties of Plants
TVRC	Technical Variety Release Committee
UG	University of Ghana
UN	United Nations Organization
UPOV	International Union for the Protection of New Varieties of Plants
USAID	United States Agency for International Development
WACCI	West Africa Center for Crop Improvement
WEF	World Economic Forum
AGRA	Alliance for Green Revolution in Africa
APSP	Agriculture Policy Agricultural Policy Support
ATT	Agricultural Technology Transfer
CIMMYT	International Maize and Wheat Improvement Center
CRI	Crop Research Institute
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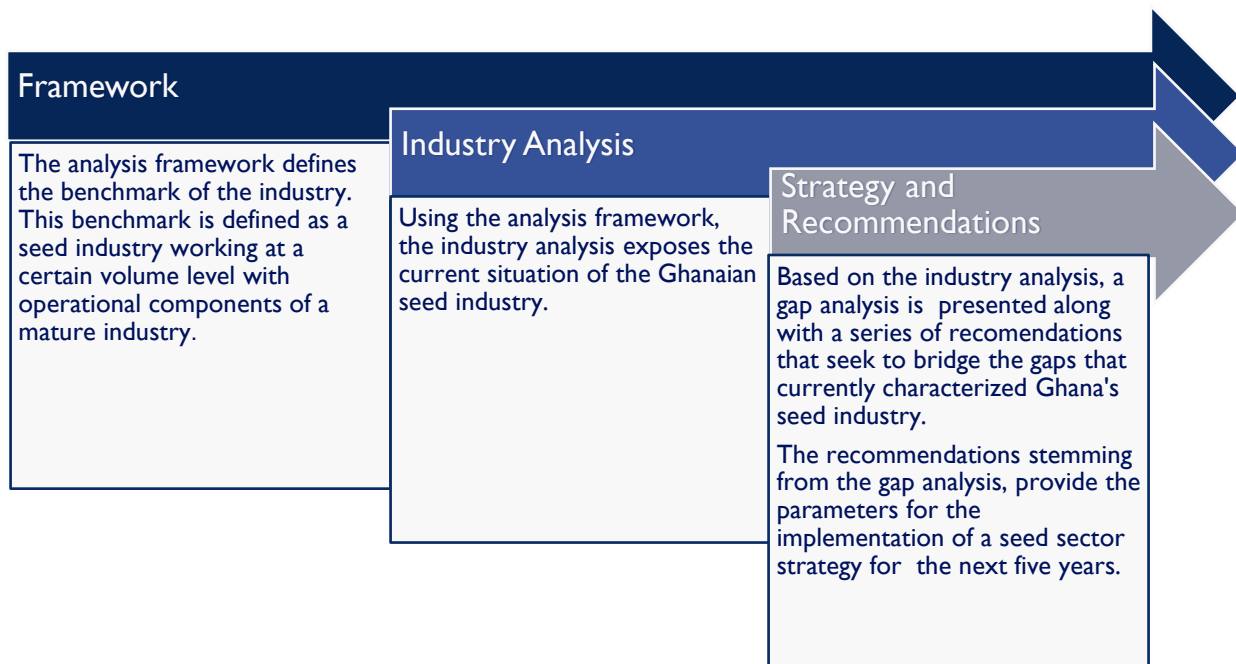
I. INTRODUCTION

The Seed Market Industry Framework and Strategy Study (SMIFS) is an industry-wide analysis of the seed breeding, growing and marketing in Ghana for five crops: maize, rice, soya, cowpea and sorghum. The work hypothesis of the SMIFS is:

The current seed industry in Ghana has deficiencies throughout its entire value chain that require a series of integral adjustments from both the Government (GoG) and the private sector towards specific targets

Under this premise, the study must define a baseline of the desired industry structure, before analyzing the current situation. The report will be developed in three phases, as shown in Figure I.

Figure I: Study Structure



This approach allows for a linear flow of the analysis covering all the elements involved in the industry. The document hierarchy structure is chapter, title, section and subsection, where there is a chapter for each one of the phases indicated above. Below, each one of these phases is presented in greater detail.

I.1 FRAMEWORK

In this first stage, a benchmark of what the general expectations of the seed industry are is presented. These general expectations result from the revision of documents related to the industry, recommendations from research papers, and what are considered good practices in countries with similar seed industry profiles. The benchmark has two main foundations. First, the definition of the target level of the certified seed coverage area; the second, is a characterization of the components operating within

the industry. Each component will be presented with its main set of characteristics for a detailed assessment of the current 42 elements operating within all the components.

This framework will define the grounds on which to compare the status of the seed industry to a fully functional seed industry of a specific size as determined in the target model. It is important to state that the overarching goal of having a solid seed industry is to improve agricultural productivity, thus improving the overall conditions of all seed industry stakeholders.

I.2 INDUSTRY ANALYSIS

Following the framework developed, the industry analysis will contrast the current volumes and coverage with the target ones, revealing the existing gaps for the five crops. Next, it was considered that an analysis of the regulatory framework was required to understand the interaction among government and private stakeholders. Finally, each one of the elements of the industry will be analyzed in detail. The analysis exposes how the industry currently works and how this actual situation conditions or affect seed stakeholders.

The analysis is structured in line with the framework elements. The current situation and characteristics of each element is revealed. Additional to the current situation, the analysis includes the main actors at each level. The analysis of the 42 elements that comprise the Ghanaian seed industry is composed of six matrices, one for each industry component. The basis for this analysis is a consolidation of interviews, group meetings and literature, resulting in a combination of hard facts, and empirical evidence that describes in detail the extension and dynamics of the industry.

I.3 RECOMMENDATIONS AND STRATEGY

By contrasting the characteristics of the target industry as developed in the framework, with the actual status of the Ghanaian seed industry as presented in the analysis, it enables us to expose a series of gaps all along the industry. Clearly, the most important one is the market size difference, but that is the reflection of an immature industry that requires plenty of development. Our gap analysis reveals that there are deficiencies at every step within the 42 elements that make up the seed system in Ghana.

In this chapter, a matrix containing the main gaps, recommendations, score, critical level and responsible party is developed as a base for the strategy. Three critical success factors were found to help addressing the recommendations. The strategy is based in these factors.

The following chapter will start with a presentation of the framework.

2. FRAMEWORK

The framework includes two main elements. First, the process used to develop the framework will be presented; next, the process behind determining the target size for the industry is included. Finally, the elements and its characteristics are presented.

2.1 FRAMEWORK DEVELOPMENT

The analysis framework was developed based on how the industry components should be conformed and operate in Ghana. The seed industry is made up of six main components as shown in Figure 2. The first three components are the core structure of the seed industry and the last three are industry stakeholders; for the three latter components, the framework will focus only on the elements that are directly related to the seed industry.

Each one of these components has its own set of actors and internal dynamics. Additionally, within each component there are external actors operating in the industry, one of the most important of these actors is the government, which intervenes along all the components, either directly or indirectly. The government develops public policy which shapes certain areas of the industry, paving the way for promoting private investments since subject to the nature of such policies, there will be an enabling or hindering business environment. The government also intervenes directly, when for instance, produces and purchases seeds, sets reference prices, and subsidizes agricultural inputs¹.

Figure 2: Seed Industry Components



The framework will define the main functional characteristics at which each component needs to operate efficiently at the desired target level; with minimum government intervention other than public policy development and regulation. Accordingly, the determination of this target level requires a definition of the size of the industry based on a series of variables. Therefore, the framework involves two dimensions, one of a quantitative nature as well as a qualitative one.

The quantitative dimension includes the size of the target industry that is used as a benchmark for the analysis. The qualitative dimension contains the characteristics of each element of the industry. This

¹ The Government has produced seeds through the Grains and Legumes Board, defined reference prices (MoFA, 2015) and subsidized seeds and fertilizers (MoFA, 2017).

framework will be used henceforth to analyze the seed industry in Ghana today, and a gap analysis will be used to make the proper recommendations to reach the target level.

2.2 TARGET INDUSTRY SIZE

The industry size is built based on the potential revenue generated by each of the components within the seed industry value chain². To determine the size of each component, the volumes are worked backwards from the certified seed's target coverage area for each crop based on the actual cultivated areas reported for 2014 by the Ministry of Food and Agriculture (MoFA) (MoFA, 2015). Based on the specific seeding and yield variables for each crop, the seed volume required at each stage is defined. To determine the target coverage, an adjusted yield is defined, based on the potential yield for each crop according to the 2014 Facts and Figures Report of MoFA. The variation of coverages of certified seeds among crops, is in turn, based on three main variables. One is intrinsic to the seed itself, which is the degeneration of yields. The second one, is directly related to the marketing capacity of the certified seed companies. Finally, a demand for a precise quality of the commodity will force the farmer to use a certified seed.

An example for the first case, is that the market for hybrid maize seed will tend to be larger (Tripp & Mensah-Bonsu, Ghana's Commercial Seed Sector: New Incentives or Continued Complacency?, 2013), since the farmer cannot use saved seeds, therefore every season the farmer will have the need to purchase new seed. In the second case, a crop with a potential for a higher aggregated value will allow seed companies to invest more in marketing for that specific crop. For the last case, farmers supplying grains to industrial operations need to deliver a product of a specific quality, which can only be achieved using certified seed.

The target industry size is based on five assumptions:

- Cultivated area estimates.
- Mature seed industries in Africa (Tripp & Mensah-Bonsu, Ghana's Commercial Seed Sector: New Incentives or Continued Complacency?, 2013).
- Seeding rates.
- Expected yields for breeder seed and foundation seed parental for hybrids.
- Prices at each stage (prices double at each stage) (Marno, 2017).

The total seed inventory is sold at each stage, with no year to year carryover.

The reality may be that the volumes for foundation seed and breeder seed are higher. It should also be considered that the revenue of the certified seed company in some cases is shared with the agro-

² Currently, the model does not account for potential seed exports, though an efficient seed industry has the potential to export. Within the model, the exporter assumes the position of an additional agro-input dealer.

input dealers (please refer to section 2.3.4). Table I shows the assumptions for each crop (except for the areas).

Table I: Assumptions Utilized for Target Estimations (US\$)

Crop	Seeding Rate (kg/ha)*	Breeder & Foundation Seed Yield (MT/ha)	Certified Seed Yield (MT/ha)	Breeder Seed/Parentals Price (\$)	Foundation Seed Price (\$)	Certified Seed Price (\$)
HybridMaize	22	4.50	4.00	\$ 11.16	\$ 5.58	\$ 2.79
OPVMaize	22	3.00	2.50	\$ 6.10	\$ 3.05	\$ 1.53
Rice	100	3.50	3.30	\$ 4.65	\$ 2.33	\$ 1.16
Soya	40	1.80	1.80	\$ 13.95	\$ 6.98	\$ 3.49
Cowpea	20	2.00	1.80	\$ 5.21	\$ 2.60	\$ 1.30
Sorghum	5	1.60	1.50	\$ 9.30	\$ 2.79	\$ 1.53

Source: MoFA and author market analysis. Rice seeding rate based on non-irrigated requirements

Table 2 shows the target industry size in terms of seed volumes and coverage area in hectares. This table assumes the characteristics of a mature seed industry in Africa and it is built based on the current cultivated areas for each crop (MoFA, 2015) and the target percentage of certified seed coverage mentioned below³. It is important to note that the volumes shown below for breeder and foundation seed, are the quantities needed to reach the coverage area as per the target industry. It is expected that under stable market conditions, production of these volumes should be ramping up year by year until reaching the coverage area as indicated in the table.

Table 2: Target Industry Seed Volumes

Crop	Target Area (%)	Total Area (Has)*	Target Area (Has)	Breeder Seed Volume (MT)	Foundation Seed Volume (MT)	Certified Seed Volume (MT)
HybridMaize	60%	1,025,000	615,000	0.36	74	13,530
OPVMaize	10%	1,025,000	102,500	0.15	20	2,255
Rice	40%	224,000	89,600	7.76	272	8,960
Soya	40%	86,000	34,400	0.68	31	1,376
Cowpea	25%	166,000	41,500	0.09	9	830
Sorghum	25%	227,000.00	56,750.00	0.00	1	284
Total	54%	1,728,000	939,750	9.04	407	27,235

*For Maize both OPV and Hybrid the total area is the same as it treated as the same crop.

Based on the estimated volumes, the market size revenue of the industry is assessed as shown in Table 3. The total size of the industry is close to \$60M, which makes it very attractive for businesses. From the total size of the market for all five crops, hybrid maize accounts for about 60% of total revenues. This is

³ There are certain inconsistencies regarding MoFA published cultivated areas for 2015 that do not match the historic data. In this case, the areas for 2014 are used for consistency.

the result of a combination of having the largest coverage area (600,000 hectares) and the highest certified seed prices (\$2.79/kg).

Table 3: Target Industry Seed Market Revenue

Crop*	Target Area (%)	Total Area (Has)*	Target Area (Has)	Breeder Seed Revenue (\$)	Foundation Seed Revenue (\$)	Certified Seed Revenue (\$)
HybridMaize	60%	1,025,000	615,000	\$ 5,076	\$ 311,505	\$ 37,758,140
OPVMaize	10%	1,025,000	102,500	\$ 2,031	\$ 83,068	\$ 3,440,186
Rice	40%	224,000	89,600	\$ 72,163	\$ 631,431	\$ 10,418,605
Soya	40%	86,000	34,400	\$ 9,481	\$ 213,333	\$ 4,800,000
Cowpea	25%	166,000	41,500	\$ 858	\$ 25,736	\$ 1,080,930
Sorghum	25%	227,000.00	56,750.00	\$ 27.50	\$ 2,639.53	\$ 432,883.72
Total	54%	1,728,000	939,750	\$ 89,637	\$ 1,267,712	\$ 57,930,744

*For Maize both OPV and Hybrid the total area is the same as it treated as the same crop.

The estimates presented above illustrate a mature and stable industry. Such an industry in turn, requires specific characteristics. The next title describes these characteristics.

2.3 TARGET INDUSTRY CHARACTERISTICS

The target industry requires that all its components operate within a minimum set of features to run efficiently. First and foremost, each country should have a legal framework regulating seed breeding, growing and trading. As seen below, each one of the components may require specific regulations.

In the following sections, the elements for each component are presented. Within each component, the main actors, the overall desired characteristics of the components, and the role of external players will be determined, with special emphasis on the government.

2.3.1 RESEARCH AND BREEDER SEED COMPONENT

The first component of the seed industry is made up by the breeders, which in the case of Ghana are mainly national agricultural research institutes (NARI's) and universities⁴; while in mature markets, seed companies also employ their own breeders to cater to their R&D needs. Their main responsibility is to develop new and improved varieties, and seek their release from the proper government authority. In general terms, the volumes of breeder seed are low due to the multiplication ratios. Thus, the market size is also rather small⁵, and additional methods of remuneration are required to have a healthy research base. Table 4 shows the main characteristics for the Research and Breeder component of the seed industry.

⁴ In general, the institutions who own and release the new varieties will be referred to as breeders throughout the document, unless otherwise noted in the context.

⁵ The estimates for volumes and market size for breeder seeds, are based on the strict requirements to reach a certain volume of foundation seed. Depending on the market size, the breeder will produce a higher volume of seeds to create a critical mass, and to have available different options for foundation seed growers.

Table 4: Research and Breeder Component Elements

Research and Breeder Elements

Private Elements

1. Properly funded Institutions
2. Releasing a regular amount of varieties per year (between 2 and 5 per crop)
3. New varieties aligned with farmer, consumer, and industry requirements
4. A specified agricultural package to achieve the variety potential
5. Superior quality-traceable breeder seed
6. Seed inventory to supply the demand from foundation growers based on contracts

Government Elements

7. Plant breeder rights legislation and licensing system
 8. An institutional and legal framework allowing for timely variety releases
-

Below, each one of these elements will be determined to set the proper context for the industry analysis in Chapter 3.

2.3.1.1 PROPERLY FUNDED INSTITUTIONS

The first step for any national seed system is a functional research base. A key aspect for these institutions is to secure founding to assure its operation. Most of these are public institutions. Funding may come from various sources, but, due to the structure of most of the institutions, their main source of income is the government. Other sources of income are either sales and licensing of materials as an output of their research, grants from international donors, or research services provided to third parties. In the case of universities, tuitions are another source of funding. Private and mixed ownership research institutions also exist.

Proper funding allows the institutions to operate focused on their main objectives, with a certain of number of researchers, and an adequate level of technology and infrastructure available. In the specific case of seeds, breeders will be able to develop new varieties, creating a critical mass of seeds to be tested under different conditions. Besides, the funds allow to run through the approval process required for release.

The Ghanaian Research Institutions require funds to:

- Run their day to day operations, including proper remuneration for the well qualified breeders and researchers
- Funding seed growing farms in different regions.
- Owning basic infrastructure including laboratories for developing and testing, irrigation systems to be operated during the off seasons, working environments less prone to cross contamination and transportation equipment.
- Owning equipment for farming, processing, and logistics (storage, transportation and distribution).

2.3.1.2 RELEASING A REGULAR QUANTITY OF VARIETIES PER YEAR

Breeders should release a regular quantity of varieties per year. This number will vary amongst crops, depending on the need for new varieties and the allocated resources. For a market to function properly breeders need to compete, offering the varieties that provide an added value to the farmers. The new varieties will not only be competing with other new varieties released in the same period, but with the ones that have been previously released as well. By releasing attractive varieties, breeders assure a potential financial income through licensing agreements, which not only contribute to diversifying their funding but fundamentally, help boost the seed industry by promoting stronger and long-lasting relationships with the private sector (please refer to subsection 2.3.1.7 below).

2.3.1.3 NEW VARIETIES ALIGNED WITH FARMER, CONSUMER, AND INDUSTRY REQUIREMENTS

Breeders must align their research with all the requirements and needs of the components located downstream the seed industry value chain⁶. Breeders need to compete for the demand of their varieties. This requires working with seed growers, farmers, and industry to understand their needs. This will assure the market for the certified seed, therefore making their breeder seed more attractive.

2.3.1.4 A SPECIFIED AGRICULTURAL PACKAGE AND GAPS TO ACHIEVE THE VARIETY POTENTIAL

All new varieties should include the information for the agricultural package required to achieve claimed performance. The information of the agricultural package will include, among other things: the seeding rate, use and type of fertilizer, water required, and any other input needed. The absence of this information, may prevent all the growers and farmers downstream from achieving the variety's best performance. This will put the variety's credibility, and ultimately, that of the breeder at risk. Also, the breeder should have a mechanism to follow up, and receive feedback on the performance of its varieties.

2.3.1.5 QUALITY-TRACEABLE BREEDER AND FOUNDATION SEED

Breeders should have the highest quality standards for their seeds. Regardless of whether the seed is grown by themselves or by a third party, breeders should be able to assure that the traits and performance of the seed adhere to the original claims. Breeders should have quality manuals, storage facilities, and the required tools to guarantee the quality of the seed, and to trace it back to its original source if issues arise.

2.3.1.6 SEED INVENTORY TO SUPPLY DEMAND FROM FOUNDATION GROWERS BASED ON CONTRACTS

Breeder should have a contract system in place to assure the timely delivery of seeds to the foundation seed grower; similarly, foundation seed growers will sign contracts with the certified seed growers. This also guarantees an investment in production. Achieving this requires two main activities: demand forecasting and inventory management.

⁶ Upstream" and "downstream" are general business terms referring to a company's location in the supply chain. The closer to the end user a function or firm is, the further downstream it is said to be. Raw material extraction or production are elements of the supply chain considered to be upstream.

The demand forecast rolls back from the front end of the market. As farmers show interest for a certain variety, a chain of contracts should derive from the agro-input dealers back to the breeder seed grower. The main clauses that should be included in all contracts throughout the components⁷ are shown in Figure 3. The contract system will allow the breeder to properly forecast the demand, helping their inventory management. Proper inventory management allows breeders to maximize the use of their assets and resources, contributing to their financial security.

Figure 3: Seed Delivery Contract Main Clauses

Quality Specs	Price and Condition	Quantity	Delivery date
<ul style="list-style-type: none"> • Specific Variety • Agricultural Package • Performance Claims 	<ul style="list-style-type: none"> • Unit price • Payment Conditions • Payment advance percentage • Licencing Agreements (discussed in section 2.3.1.7) 	<ul style="list-style-type: none"> • Volume Requirement • Packaging Specifications 	<ul style="list-style-type: none"> • Date for delivery of full quantity • Penalties for late delivery

2.3.1.7 PLANT BREEDER RIGHTS AND LICENSING SYSTEM

Throughout the global seed industry, plant breeders own the varieties they have released. This is defined under the laws that govern Plant Breeder Rights (PBR) based on the guidelines defined by the International Union for the Protection of New Varieties of Plants (UPOV) (UPOV, 2014). The combined value of a 100% licensed certified seed market in Ghana with an average royalty of 1.8% of the certified seed revenue⁸ is of \$960,000, compared with aggregated breeder seed revenues of \$1,040,000⁹. Each country has its own legislation defining these rights, although in some cases these laws have either not been approved or the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement have not been ratified at all (Lesser, 2007). Under common regulations of Plant Breeder Rights, the owner of the variety has the right to license it and collect royalties for the use of its seed. This licensing system creates additional incentives for the breeders and promotes a more intense competition. Based on target seed industry licensing, contracts require that breeding institutions should establish a follow up and inspection structure to ensure the full collection of royalties.

⁷ Different versions of these contracts (breeder, foundation and certified seed) should be signed along the value chain to ensure proper planning and financial support to the members of each industry component.

⁸ The target certified revenue is \$57.6M as shown in Table 3.

⁹ Including the royalties and the seed sales revenue. These values are estimates for the target industry in Ghana.

2.3.1.8 AN INSTITUTIONAL AND LEGAL FRAMEWORK ALLOWING FOR TIMELY VARIETY RELEASES

The seed industry should have an institutional and legal framework assuring the required steps and approval process for releasing new varieties. The framework includes all the requisites for approval costs as well as the process that must be completed to obtain the approval. Additionally, the reviewing and releasing bodies should agree on a fixed releasing schedule with at least one approval and release communication per quarter. All the released varieties should be available in a varieties catalog, along with their specifications. This information should be public and easily accessible by all interested parties.

2.3.2 FOUNDATION SEED COMPONENT

Availability of foundation seed (FS) drives the seed market. While the nature and mandate of the breeder is to develop new varieties; the foundation seed grower is the decisive force behind the flow of varieties downstream the industry. The varieties that these growers decide to develop are the ones that will be available for planting in the next seasons¹⁰.

In economic terms, keeping small batches of breeder seed does not imply a high financial cost, while keeping foundation seed inventory does have a higher financial impact on a scaled farming operation. Therefore, market absorption of a high percentage of foundation seed is fundamental. This premise is one of the key factors that justifies the contract system described in subsection 2.3.1.6. Table 5 specifies the elements of the foundation seed component.

Table 5: Foundation Seed Component Elements

Foundation Seed Elements
Private Elements
1. Stable and high-quality breeder seed supply
2. Private companies involved in production
3. Outgrower model for NARIs
4. Estimated demand
5. Equipment for farming, processing and storage
Government Elements
6. Legal framework for private companies

The subsections below describe each of these elements in greater detail.

2.3.2.1 STABLE AND HIGH-QUALITY BREEDER SEED SUPPLY

The link between the breeder and the foundation seed components is crucial for the flow of new varieties into the market. Foundation seed growers must communicate in advance with the breeder to assure the supply of the seed required to grow the foundation seed demanded by the certified seed growers. Another important aspect refers to the supply of parental material for hybrids. Breeders need to provide the

¹⁰ This apply in general terms, but different crops and technology may shorten availability periods.

correct ratios of male to female. The quality of the seeds is crucial. A poor breeder seed will distort the whole value chain.

2.3.2.2 PRIVATE COMPANIES INVOLVED IN PRODUCTION

A strong seed industry requires a combination of public and private foundation seed producers. The former involves the NARI's and Universities, who produce and grow their own foundation seed, while the latter is comprised by private companies. Each one has distinct reasons to get involved in this production. Overall, in a foundation seed market of around \$1.5M¹¹, the number of growers should be no greater than 15 in all¹².

In the case of research institutes, the production of foundation seeds is a forward integration. This integration may assure the adoption of a specific variety. Also, institutions increase their income by selling foundation seed¹³, and by pushing the licensing contracts. Although this helps the breeder, their core activity is not the production of foundation seed and it may distract them from their research duties (in the next subsection an alternative to assist them with this production is discussed). For this reason, participation of private companies gains relevance.

Private companies may focus exclusively on producing foundation seed; alternatively, certified seed companies may integrate backwards to assure the supply. In the first case, the specialization is one of the core competences, and provides these companies with competitive advantages. This may be reflected in higher quality seeds, especially in the production of parental material for hybrids. The profitability of an exclusive foundation seed grower is challenging (IFPRI, AGRA, ATT, & APSP, 2015), and this model may require tight management.

Certified seed companies that also produce FS, have two main advantages. The first one is securing their FS supply, assuring the delivery of required volumes for planting on precise dates. The second advantage, is cost reduction; or even an additional income stream, if they operate their certified seed production under an outgrower model (see subsection 2.3.3.6 below) or if they sell foundation seed to other certified seed companies. Overall, the open competition among these three business models assures a good supply downstream.

2.3.2.3 OUTGROWER MODEL FOR NARIS

The NARI's participation in the foundation seed market is an opportunity which offers various benefits, as mentioned in the previous subsection (2.3.2.2). To be more competitive, these institutes, may adopt an outgrower¹⁴ model. The use of these models helps the NARI's expand their foundation seed operation, with limited compromise of their core activities. Additionally, this system expands the capacity of the NARI's to participate in this component; allowing them to collect more revenues from the sales of the foundation seed one season prior to the collection of licensing revenues.

¹¹ Based on the target industry volumes.

¹² On average, each grower will sell around \$100,000, which may be attractive enough to enter the business.

¹³ The foundation seed market is fifteen times bigger than the breeder seed market as seen in Table 3.

¹⁴ Outgrower schemes, also known as contract farming, are broadly defined as binding arrangements through which a firm ensures its supply of agricultural products by individual or groups of farmers (Felgenhauer & Wolter, 2008).

2.3.2.4 ESTIMATED DEMAND

Foundation seed growers need to know the seed demand, by variety, at least two growing periods ahead of delivery. On one hand, they need to program the breeder seed availability; on the other, they need to prepare their resources. This is even more important when working under an outgrower model (see subsection 2.3.2.3). Additionally, a certain demand forecasting model can help plan investments in equipment and infrastructure. The best tool available to forecast the demand is a contract system (as mentioned in subsection 2.3.1.6) that runs all the way from the farmer to the breeder. Otherwise, the grower faces the risk of having to carry inventory to the following seasons, dumping the seeds on the open market at a lower price, or not being able to fulfill the potential sales. As mentioned above, the contract system also includes an advance payment, which helps finance the operation.

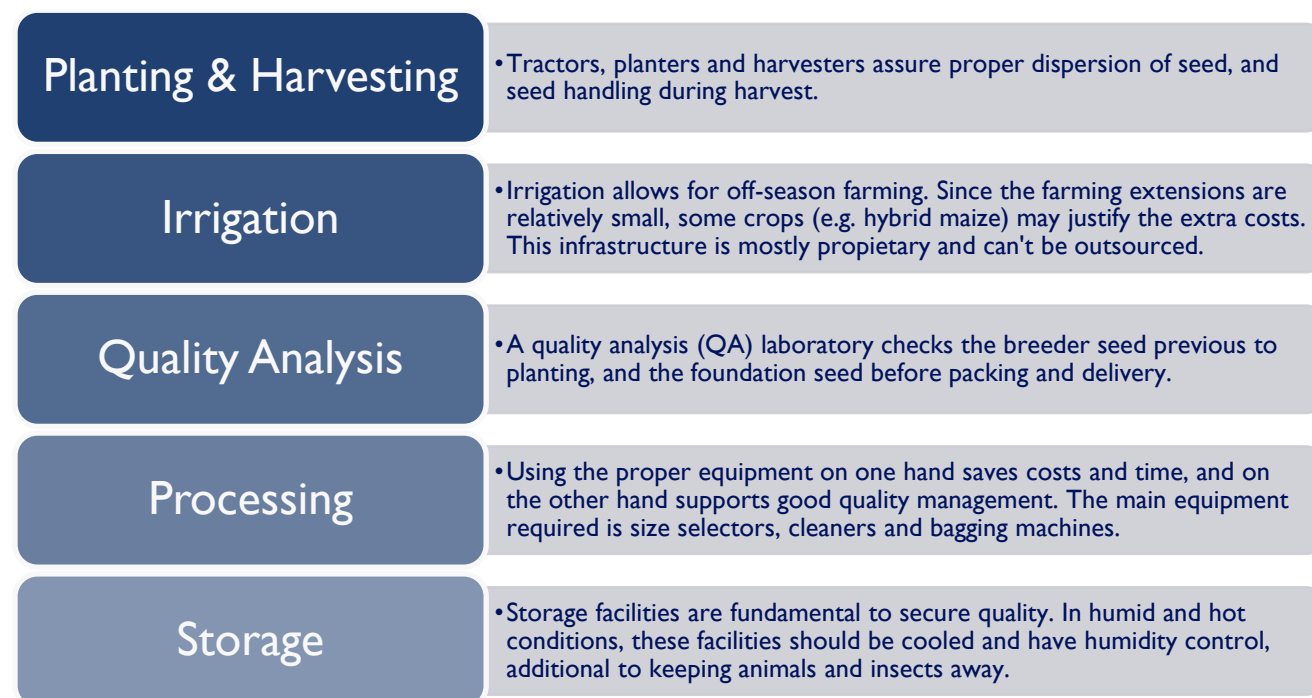
2.3.2.5 EQUIPMENT FOR FARMING, PROCESSING AND STORAGE

The foundation seed growers should have access to infrastructure and equipment¹⁵. Depending on the volume and the type of equipment, the equipment may be owned or rented. The equipment guarantees the quality of the seed and the proper flow of all the processes¹⁶. The equipment and infrastructure differs between crops and may be divided into five main categories: planting and harvesting, quality analysis, processing, irrigation and storage. Figure 4 describes the impact of the equipment on the product quality and overall operation.

¹⁵ Some of this equipment is the same equipment required by certified seed companies.

¹⁶ Processes include, but are not limited to cleaning, selection and bagging.

Figure 4: Equipment and Infrastructure for Seed Production



The equipment required for foundation seed growing and processing is similar to the one used by the certified seed growers. Given the scale of the foundation seed market, the investment in this equipment may not be financially feasible. As the industry integrates, there is higher availability of equipment for smaller players to use; either through equipment rentals and shared facilities, or through outgrower and nuclear farming models (see subsection 2.3.3.6. for further detail of this models).

2.3.2.6 LEGAL FRAMEWORK FOR PRIVATE COMPANIES

Foundation seed production is a key element of the seed industry. Enterprises trading in foundation seeds should operate under a specific legal framework. Within this framework, specific guidelines should include a registration process, inspection regimes and a delivery log for traceability.

2.3.3 CERTIFIED SEED COMPONENT

Certified seed (CS) is the biggest and most heterogeneous of the core components of the seed industry, comprising more than 90% of the seed industry target market value. The total coverage area estimation for this component is around 8,500 hectares (Table 6). These growers differ in size, organization and specialization. As mentioned above, larger companies, integrate backwards to produce their own foundation seed, have their own planting and harvesting equipment, and quality labs and integrate other farmers in outgrower schemes. Other producers are smaller, who either participate in an outgrower schemes or as independent growers. Table

Table 6: Area Required for Target Certified Seed Production (based on

Crop	Coverage Area (Has)
HybridMaize	3,383
OPVMaize	902
Rice	2,715
Soya	764
Cowpea	461
Sorghum	189
Total	8,414

7 shows the elements of this component, which naturally has the highest number of participants, with more complex dynamics.

Table 7: Certified Seed Component Elements

Certified Seed Elements
Private Elements
1. Competitive market
2. Participation of formal companies
3. Quality control
4. Distinctive and appropriate packaging
5. Wide offer of varieties
6. Availability of farming and processing equipment and agricultural machinery
7. Shared storage facilities
8. Access to competitive credit
9. Strong producer's association
10. Training and education programs
Government Elements
11. Reliable certification system
12. Strong legal framework for seed companies
13. Clear land ownership laws

Below the detail each of these components is presented.

2.3.3.1 COMPETITIVE MARKET

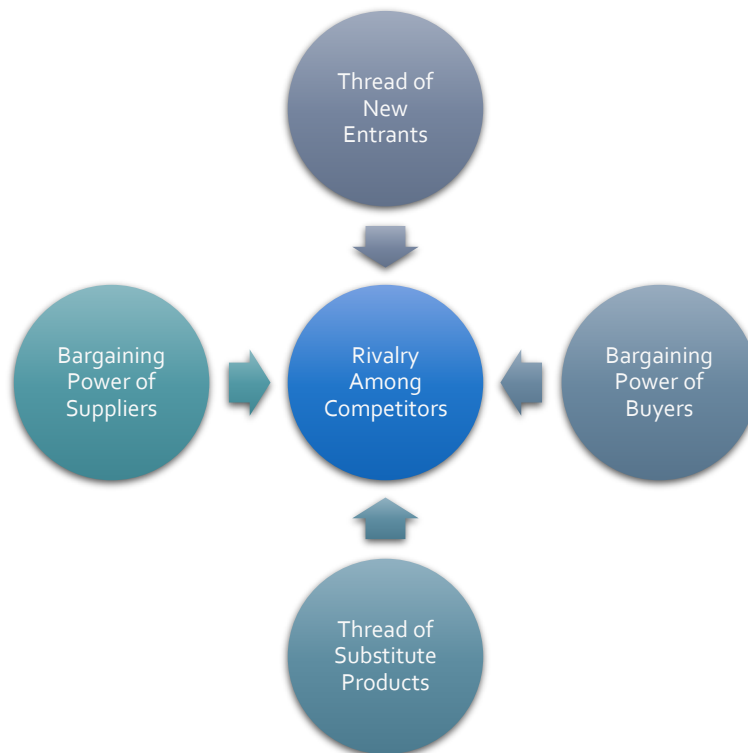
The (CS) market has the scale to operate as a functional market and can be analyzed under Porter's five force analysis framework (Porter, How Competitive Forces Shape Strategy, 1979). Figure 5 shows the diagram for this framework¹⁷. This analysis is appropriate for this component of the industry given its size and dynamics. Below, each one of the forces framed within the certified seed component will be explained.

¹⁷ "Every industry is different, but the underlying drivers of profitability are the same in every industry. The Five Forces determine the competitive structure of an industry, and its profitability. Industry structure, together with a company's relative position within the industry, are the two basic drivers of company profitability. Analyzing the Five Forces can help companies anticipate shifts in competition, shape how industry structure evolves, and find better strategic positions within the industry." (Institute for Strategy and Competitiveness, n.d.).

2.3.3.1.1 Bargaining Power of Suppliers

The direct suppliers of certified seed growers are foundation seed growers; except in those cases where the CS grower has integrated backwards, then their direct supplier is the breeder. Foundation seed growers are a few (see subsection 2.3.2.2) and very specialized, in a relatively small market¹⁸. Their bargaining power will depend on the quality and performance of their variety. NARI's with better than average varieties can exercise more power through licensing agreements, but private foundation seed producers will be more limited regarding the conditions they can impose. The other limitation that all foundation seed growers have is the price ratios between CS and FS, since the FS price variations are restricted by the expected ratio to CS.

Figure 5: Porter's Five Forces Diagram



2.3.3.1.2 Threat of New Entrants

The entry barriers for the industry are low, particularly on open pollinated varieties (OPVs) where the growing process requires little specialization. Other factors that influence the ease of entry, is the availability of process equipment for rent and shared storage under target industry standards; and the use of the outgrower model (all discussed below). Under the target volumes, the growth potential is still high; thus, new growers should be constantly attracted to the business. Also, a mature industry with high demand opens the market to imported seed, as will be discussed below.

2.3.3.1.3 Threat of Substitute Products

The principal substitute product for certified seed is farmer saved seed (FSS). Traditionally FSS has been the main seed for planting, as it will be discussed ahead. The thread of farmers using FSS varies among crops. The main factor determining the use of certified seed are productivity, resistance to plagues, and weather conditions; as well as the grain's characteristics. The threat of FSS is greater when CS do not perform better on the field. The expectation for the industry in general is that farmers who uses CS will not switch back.

2.3.3.1.4 Bargaining Power of Buyers

¹⁸ The FS market is less than 3% of the CS market (Table 3).

Certified seed companies have three¹⁹ types of clients: farmers, agro-input dealers, and aggregators²⁰. Independent farmers, especially in atomized environments of subsistence or small plot farmers, have lower bargaining power; while buyers with a higher demand, such as the latter two, will have a higher bargaining power. The target industry has a combination of both buyers, as well as players who sell directly to farmers or through intermediaries.

2.3.3.1.5 Rivalry Among Competitors

Based on the coverage of the target industry of around 8,600 hectares, around 250 CS growers are expected, Table 8 shows an exercise for a distribution of growers by plot size²¹. A distribution of growers along these lines, defines the market dynamics. The larger growers are formal companies with specialized personnel and processes, while the smaller growers operate informally.

Table 8: Estimated number of CS enterprises to produce the target volume by plot size

Plot Size (Has)	1	10	50	250	500	Total
Quantity of Growers	100	75	50	15	3	243
Total Area (Has)	100	750	2500	3750	1500	8600
Category	Micro Producers		Medium	Industrial		

These conditions lead to diverse levels of rivalry. While smaller companies will tend to cooperate with each other, larger ones will be more competitive, with more resources vested in the activity. This degree of competition will be reflected in their marketing, distribution and specialization, leading to a variety of competitive strategies.

Small companies (or individuals), will incline to compete based on price in geographically reduced areas, having limited experimentation with new varieties. This situation will evolve as the market matures and becomes more demanding. The bigger players will run a more sophisticated operation with distribution networks and well-established marketing plans. This requires higher investments in marketing, which necessarily means they have to differentiate their product by quality, innovation, and image²².

Under the target industry conditions, smaller companies require assistance in shifting their strategy away from a low-price competition towards a more sophisticate strategy, including marketing and innovation, by pulling resources together at community or district levels. On the other hand, bigger companies will drive innovation and adoption of certified seeds.

2.3.3.2 PARTICIPATION OF FORMAL ENTERPRISES

As shown in the previous subsection, the industry requires the participation of formal companies along with smaller informal companies. Formal companies create higher expectations among all stakeholders.

¹⁹ As discussed further on, in certain instances the government may get involved in the purchasing of certified seeds, but this is not typical in the target industry model described in this chapter. Although it works as way to activate the industry and increase adoption rates.

²⁰ Aggregators are local businesses who trade in agricultural products, and purchase commodities from farmers while supplying inputs. Agro-industries also qualify in this category (Issaka, 2017).

²¹ This exercise is conceptual and based on other African countries such as Kenya and South Africa (TASAI, 2015).

²² According to Porter, companies can compete by prize or differentiation (Porter, What is a strategy? , 1996).

Upstream the value chain²³, formal seed enterprises have a higher bargaining power, and can demand certain quality levels, better varieties, and formality regarding deliveries. This will ultimately permeate their suppliers, becoming the expected standard. This will also apply to the developing of contracts throughout the entire industry, since they have more exposure given their volumes and investment.

On the other hand, downstream the value chain²⁴, they have the resources to promote CS uptake. Additionally, they can come together in an organized manner and demand that the government fulfill its commitments, particularly for certification and seed inspection. An additional advantage of having bigger formal companies, is their capacity to import certified seeds, which in the long run benefits national standards. The import of seeds is an indirect incentive to rise the quality to international standards, since formal CS companies will observe the impacts on production of the seeds sold into the market and will try with time to capture the revenue by producing their own seed under the standards of the imported one. Eventually, Ghanaian seeds will attain international quality standards to be exported; initially to neighboring countries, taking advantage of ECOWAS Seed Protocols. In all this will work out to create new business opportunities for CS enterprises.

2.3.3.3 QUALITY CONTROL

The importance of quality was discussed above for the upstream components, and this applies as well to the certified seed. Assuring the quality of the certified seed is fundamental for uptake. The certified seed growers should have a quality management system with a minimum set of standards applying to all seed producers independently of their size. This should at least be aligned with the certification process, but preferably it will exceed it. The evolution in the competition arena, from a price strategy to a differentiation strategy, will require all growers to focus on the quality of their product. Universities, higher education institutions and international cooperation projects can assist with quality management programs in different areas.

2.3.3.4 DISTINCTIVE AND APPROPRIATE PACKAGING

Packaging is an important trait of a product. Within a competitive industry, it helps differentiate the product, transmitting a perception of quality, and working as a messaging platform. Furthermore, packaging protects the product, which contributes to preserve the integrity of the seed, and in the case of CS it also guarantees the certification process. Moreover, including a guideline with the agricultural requirements of the variety will provide it with an additional value.

Larger companies (and agricultural aggregators) can use their packaging as branding material. But packaging is expensive if produced in small batches, meaning that the cost of branding exclusive packaging for small producers is prohibitive. The solution is to have a generic package available for smaller producers, with place holders appropriate for inserting the company's information, batch number, crop, and variety. All packaging must have proof of certification.

Another two important aspects are material and the size. Material can vary from jute, to paper or woven bags depending on the crop and storage condition. Regarding size, small presentations are important to

²³ Upstream from the CS component are the FS and Breeder Components.

²⁴ Downstream the CS component are the Logistics and Distribution, Commodities Farming and Final Market Components.

cater to all farmers, especially and foremost catering for the small holder farmer who demand small quantities of seeds.

2.3.3.5 WIDE OFFER OF VARIETIES

As discussed in subsection 2.3.1.2, breeders should invest in developing new and better varieties with yearly releases. Certified seed growers should follow through, and push these varieties into the market. This will require investment in marketing, which will be compensated with higher volumes and prices²⁵.

A differentiated pricing structure is a relevant aspect of competition. Varieties with better performance, may have higher prices. This should apply not only between OPVs and hybrids; but even, among different varieties of OPV's, and hybrids. This is also important as compensation for the licensing cost. Overall, a constant renovation of varieties improves productivity for the farmer.

2.3.3.6 OPERATION OF OUTGROWER MODELS FOR CERTIFIED SEED

Outgrower models for CS create a system that encourages cooperation, as well as the spreading of technology and new varieties. This model offers advantages for the company running the operation and the farmer growing the seed (contractor). Within the outgrower operation, the contracting company is able to expand certified seed production, creating the economies of scale to enable investing in equipment, storage, and technology. Additionally, the economies of scale allow these companies to engage in bigger contracts with better conditions, both with suppliers and clients.

On the contractor's side, the small grower can focus on farming, while the contracting company will supply the foundation seed and inputs, agricultural guidance, and access to farming and harvesting equipment. Also, under a contract system it may ease the contractor's cash flow, not only by providing services and supplies to be paid at the harvest, but also providing an advance payment of a percentage of the contracted volume (Issaka, 2017). Nevertheless, the contracting company should develop a supervising and inspection program to assure the quality of the seed grown by the contractors.

2.3.3.7 AVAILABILITY OF PROCESSING EQUIPMENT AND AGRICULTURAL MACHINERY

Farming and processing equipment is financially feasible at certain economies of scale. As shown in Figure 6, most of the CS producers fall under the category of micro producers (see Table 8 for details). While medium and industrial producers have more resources to invest in equipment, micro producers have limited alternatives.

One option is to have companies that offer farming and processing equipment for rent. These companies may be independent, owned by one producer, or community owned²⁶. The availability of this equipment lowers overall costs, and helps preserve post harvesting quality. These processing centers need to be in areas with a high concentration of growers in order to reach the required scale. In the case of outgrower models, the contracting companies may offer the farming and processing service, or have agreements with

²⁵Table 2 is based on one price per crop which may be an average of different prices, except hybrid maize as detailed in the section the table is presented.

²⁶ This equipment will be will also be available for breeders and FS growers.

equipment operators and processing stations. Another service that should be available is laboratory analysis.

The transition from manual to mechanical farming and processing, is the stepping stone for the development of the industry. The availability of equipment makes the industry more attractive to new producers, since it reduces entry barriers and costs. As mentioned above, this is desirable given the industry's potential growth.

2.3.3.8 SHARED STORAGE FACILITIES

Shared storages facilities have played the same role as the availability of equipment described in the previous subsection, and have the same scale requirements. The reason it is analyzed separately is because storage may influence prices and bargaining power. If growers have the option to store their seeds safely at a reasonable cost, they will not be forced to dump the seed if there is a decrease in demand²⁷.

2.3.3.9 ACCESS TO COMPETITIVE CREDIT

Credit is required for the healthy development of all industries. Funds are required to make capital investments and finance operations. While credit is required in all core components of the industry, the certified seed component has the highest requirements given its size. Complementing the availability of credit at competitive rates, specialized institutions or advisors to assist companies in the process of credit approval are also required.

Although, competitive interest rates are relative to each country, it should be proportional to the creditors' average net operating margins. Otherwise, the creditors' cash flow will be jeopardized, putting productivity and quality at risk. In the long run, an efficient credit market benefits all the components of the industry.

2.3.3.10 STRONG PRODUCER'S ASSOCIATION

Given the atomization of the certified seed growers and the unique needs each category may have, all producers should be united under a single, strong association. Beyond seed producers themselves, other seed stakeholders who have direct interest in certified seed activities may join (e.g. breeders, agro-input dealers, related industries, etc.). Members should pay a fee to support the activities and management of the association

This association should cater to the necessities of the whole group, representing them in front of other groups and associations to promote the adoption of certified seed. Also, the organization should gather and publish statistics, and keep an updated and detailed registry of producers. Another one of its duties is lobbying in the executive and legislative branches for laws and specific actions to fortify the industry. Finally, it could provide services to its members; filling gaps in the industry, while funding itself.

2.3.3.11 TRAINING AND EDUCATION PROGRAMS

²⁷ This may happen even under a contract system.

A robust seed industry has educational institutions involved in providing continuous training in all fields of the sector. The seed industry has complex issues, from breeding and quality control to seed marketing. As in most agricultural activities in developing countries, a big portion of the actors lack a formal company structure. These educational programs may be provided through public or private institutions.

The programs are divided into two main categories: formal education and training. Formal education programs are offered at technical schools and higher education institutions as part of their regular curricula; and they extend from a technical title to doctorates degrees. On the other hand, training programs may include onsite training, courses on technical seed issues, or short period courses. The compendium of all programs is necessary to achieve a highly skilled labor force within the seed industry.

2.3.3.12 RELIABLE CERTIFICATION SYSTEM

The government must have a certification system that assures full coverage of all seed growers. A team of trained inspectors should follow a visiting program that assures correct use of agricultural practices and seed quality. Additionally, the certification process should include a review of the foundation seed/certified seed ratio. Growers should pay per visit according to the published fee schedule. The government should also look out for counterfeit seed that may be marketed at agro-input dealers, damaging the reputation of certified seeds.

The size of the industry allows for different models of certification schemes as long as the certification is completed correctly. Inspectors may be government employees, or managed by a private company complying with legal requirements. The requirements for private companies undertaking seed certification should be clearly defined within a legal framework.

2.3.3.13 STRONG LEGAL FRAMEWORK FOR SEED COMPANIES

Aside from the framework for certification, certified seed companies must operate under a clear legal structure. All companies, regardless of size, should be registered before the respective institution, and they must file for an operation permit periodically. Regulations should not overreach, making compliance especially difficult for the companies. An institutional hierarchy should be clear, with processes and timelines defined and followed.

2.3.3.14 CLEAR LAND OWNERSHIP LAWS

This is an issue that may apply specifically in countries where traditional legal systems dominate the land ownership rules or land tenure. The state should assure growers a legal certainty that the land where they farm will not be seized without due diligence. The absence of this certainty raises the operational risk, limiting the willingness to invest in infrastructure. Furthermore, this issue is directly related with the access to credit, since banks and financial institutions may impose limits in using land as collateral for loans. This element is essential across all the components of the seed industry.

2.3.4 LOGISTICS AND DISTRIBUTION COMPONENT

The logistics and distribution component is the first of the non-core components. The actors operating within these components, in contrast to the previous three, are not directly involved in seed development and production; but they either provide services to the seed industry or are end-users of seeds; that is, farmers. This component comprises transportation, traders, and suppliers of agronomical inputs. A large group of CS growers depend on them to reach the farmers, while only a minority may have a direct relationship with farmers. Table 9 shows the elements of this component.

Table 9: Logistics and Distribution Component Elements

Logistics and Distribution Component
Private Elements <ol style="list-style-type: none">1. Countrywide distribution network2. Available credit from CS enterprises to agro-input dealers3. Reliable and constant seed supply4. Availability of local and imported seed5. Exporting capacity
Government Elements <ol style="list-style-type: none">6. Inspection system for counterfeit product7. Regional seed harmonization

Below the details each of the element are shown.

2.3.4.1 COUNTRYWIDE DISTRIBUTION NETWORK

Certified seeds must be available in every district. This requires a network of agro-input dealers willing to carry an inventory of different varieties of seeds. The network should include a group of wholesalers, linked to smaller retailers. These dealers are not exclusive for seeds, they sell other inputs to farmers. Therefore, employees who tend to farmers require specific information on seed varieties. Development of training programs and informative material for them must be a priority. Knowledge and high volumes will motivate agro-input dealers to push certified seeds of better varieties to their clients.

Another important aspect to be consider is inventory management at the point of sale. Dealers and growers should look out for seed storage and rotation. Retail outlets are the last link on the seed value chain before reaching the final client. As mentioned before, proper storage is vital for seed quality.

2.3.4.2 AVAILABLE CREDIT FROM CS ENTERPRISES TO AGRO-INPUT DEALERS

Certified seed companies should offer a normal credit period on their sales to agro-input dealers. Certainly, seeds do not require to be available year-round, but instead prior to the start of the planting season for each crop. CS purchases made by the retailers, should be sold within the following sixty days (Issahaku, 2017). Under these circumstances, a thirty-day credit period for payment will help the agro-

input dealers carry and push more seeds. This credit figure may take different forms, especially if contracts are in place and sales go through whole sellers²⁸.

2.3.4.3 RELIABLE AND CONSTANT SEED SUPPLY

CS companies should encourage agro-input dealers to carry and push their varieties. Agro-input dealers at local levels develop relationships with farmers, and they expect a certain level of reliability on the products' constant supply (constant during planting season). It is in the best interest of CS growers to leverage on these relationships by assuring quality, and availability.

2.3.4.4 AVAILABILITY OF LOCAL AND IMPORTED SEED

The seed industry requires aggressive competition to succeed, otherwise breeders and growers will not have incentives to innovate and improve. In a mature industry, farmers should be able to choose among different products, including imported seeds. High-quality imported CS availability will rise the standards and expectations of locally produced seeds. As mentioned before, formal CS companies may have the resources to import seeds, but agro-input dealers and other agricultural supply enterprises can also do it. Naturally, the imported seed will share shelf space with local seeds at the agro-input dealers, competing side to side. This competition opens the door to seed exports.

2.3.4.5 EXPORTING CAPACITY

Once local seeds can compete side to side with imported sides on price, performance and quality basis, the industry will be ready to export²⁹. Exporting requires an investment in marketing and preparation. First, to compete in international markets, the companies, besides offering a competitive price, need to differentiate their products. This implies attractive packaging and marketing material, varieties with good performance in accordance with environmental conditions, and an excellent quality. Second, companies require access to international logistics and a sales infrastructure in the new market. Finally, as mentioned throughout this framework, the government should be aligned with this goal and be a part of international agreements that allow seeds to be traded (see subsection 2.3.4.7 below).

2.3.4.6 INSPECTION SYSTEM FOR COUNTERFEIT PRODUCT

One of the factors that discourage the use of CS is deficient performance in the field. Aside from elements that are controlled upstream the value chain, one of the most important causes of poor seed performance is counterfeit seeds. Fake seed is plain grain packed in certified seed bags, which might be stolen, counterfeited, or even packed by CS growers to take advantage of the higher prices.

Given the severity of this problem for the whole industry, authorities should devote resources to inspecting and seizing counterfeit seeds. This requires training, and follow up to prosecute the

²⁸ For example, a contract may require for the agro-input wholesaler to advance a 30% when the order is placed, and the rest (70%), 45 days after delivery. Then the wholesaler may extend a 30-day credit to the agro-input retailer for the 100% of the invoice.

²⁹ The production tables presented in the Target Industry Size section do not include seed exports.

counterfeiters. The legal framework regulating seeds should include a legal description of the crime consisting in producing and selling fake certified or foundation seeds³⁰.

2.3.4.7 REGIONAL SEED HARMONIZATION

As mentioned before, all issues related to seeds are very sensible, particularly in countries where agriculture plays a strong economic and social role. For this reason, imports are heavily regulated. To ease the trade of seeds, regional multilateral agreements have been developed in various parts of the world.

“...the harmonized regulations stand to benefit West Africa in many important ways. Under the existing harmonized rules, new varieties of seed will only need to be tested and registered in one member country after which they can be multiplied and traded anywhere in the region. (Keyser, Eilittä, Dimithe, Ayoola, & Sène, 2015, p. viii)”

Governments should subscribe these agreements. First, because these agreements usually allow for import of breeder seeds, which improves the genetic material in the country. Second, these treaties support international trade, which is a motor for the development of the industry as discussed in subsections 2.3.4.4 and 2.3.4.5.

2.3.5 COMMODITIES FARMING COMPONENT

Farmers are the end client of the certified seed sector. All the previous industry components cater to them; therefore, farmers drive the demand. Certified seed uptake is the single most relevant factor in the industry’s development. Aside from a strong demand for CS, other elements influence the CS industry. Farming activities are ample and complex, in this section the focus will be on those elements which have a closer relationship with the certified seed industry. Table 10 shows these elements

Table 10: Commodities Farming Elements

Commodities Farming Component
Private Elements
1. Farmer demand for CS
2. Good agricultural practices
3. Extensive outgrower/nuclear farming schemes
Government Elements
4. Strong extension services

In the next subsections, these elements are discussed in greater detail.

2.3.5.1 FARMER DEMAND FOR CS

As mentioned above, demand is the key for development of the whole industry. In countries with low CS adoption the industry falls behind (Tahirou, Sanogo, Langyintuo, Bamire, & Olanrewaju, 2009). Seed uptake is influenced by several aspects, most of them discussed in the previous subsections. When all the aspects are considered, the two main drivers for low certified seed uptake can be summarized in two elements: education and value.

In first instance, farmers need to understand what a certified seed is and how it can improve their harvest. If they are not aware of the difference between grain, FS and CS, the adoption of the latter will be difficult. Education campaigns should address this issue. This effort can be canalized in several forms. For example, extension service agents can inform farmers; this can also be done through demonstrations or by handing out samples for a direct compared experience on the field. Countries with seed subsidy programs can introduce high-quality CS to farmers. This effort, additionally to increasing crop yields, advances the CS adoption by allowing the farmers to experience its benefits.

Countries which use subsidies programs have an instrument to introduce high-quality CS, enhancing the effect of the aid, by not only increasing the yields, but advancing the CS industry through experience.

The second element preventing CS adoption is its perceived value in comparison to the alternative, which is either farmers' own saved seed, or a saved seed from peers. If the farmer experiments one season with a CS and obtains results that are not better than the ones from previous harvests, he has no reason to pay for the seed in the future³¹. Clearly, there are many factors that interfere with harvest results; but seed quality, and its suitability to environmental conditions are key (other elements are discussed in the next subsection). It is precisely because of this, that quality and variety development has been emphasized vigorously in the previous subsection.

2.3.5.2 GOOD AGRICULTURAL PRACTICES

As mentioned in the previous subsection, harvest results are determined by several factors; not only seed variety and quality. While a major one is climate conditions, over which farmers have no control; good agricultural practices (GAPs) play an essential role in output and quality. Seed selection is one of these practices, but other GAPs are: timely planting, seeding patterns, adequate use of fertilizers and agrochemicals, and timely and correct harvesting (FAO, 2003). The use of GAPs will help the certified seed fulfill its potential, and maximize its value for the farmer.

2.3.5.3 EXTENSIVE OUTGROWER/NUCLEAR/COOPERATIVE FARMING SCHEMES

Outgrowers, nuclear, and cooperative farmers are a strong conduit in pushing the adoption of certified seeds. They are in the same position of outgrowers discussed the foundation seed component (subsection 2.3.2.3). Under these schemes, outgrowers benefit from high yields, and a grain of a uniformed quality.

³¹ The difference between price and value is better illustrated in this quote from the McKinsey Quarterly in 1997, "Customers do not buy solely on low price. They buy according to customer value, that is, the difference between the benefits a company gives customers and the price it charges. More precisely, customer value equals customer-perceived benefits minus customer-perceived price. So, the higher the perceived benefit and/or the lower the price of a product, the higher the customer value and the greater the likelihood that customers will choose that product" (Leszinski & Marn, 1997).

Requiring all their contractors to use CS is a crucial step towards this. On the other hand, the farmer also benefits from the selection made by the outgrower of a good variety and from the fact that they do not have to pay for the seeds upfront. Also, the outgrower has greater resources that can be destined to promoting the GAPs amongst their contractors, who take full advantage of the variety they picked.

2.3.5.4 STRONG EXTENSION SERVICE

As previously mentioned, a sturdy and ample team of extension agents³² can help in the uptake of certified seeds. The government should invest in developing agriculture extension services, providing continuous training, which should include updates on the use of seeds and newly released varieties. Agriculture extension services can also be provided by farm based organizations (FBOs) and even by seed trade associations, as a service to its members. For instance, MoFA with support from APSP has developed a FBO Strategy that seeks to strengthen the capacity of these organizations as the entry point for the delivery of agriculture extension services. As with the previous two subsections, these elements are beneficial for all the agricultural sector.

2.3.6 COMMODITIES MARKET COMPONENT

The commodities market is essential for the seed industry. Having a strong market for commodities motivates farmers to increase their production. In the absence of a strong market that can absorb continuously growing volumes, the increase in productivity will create a price contraction, impacting negatively on the incomes of the farm population and therefore, discouraging farmers from maximizing their output, ultimately dropping the use of CS. Clearly, the implications of having an unbalanced commodities trade, go beyond certified seed utilization. In an extreme case, smaller farmers may have to move away from agriculture³³. Strengthening and expanding the market, will improve the conditions of the entire agricultural sector. The main elements necessary to accomplish a strong commodities market, from the seed industry perspective, are presented in Table I I.

Table I I: Commodities Market Component Elements

Commodities Market	
Private Elements	
1.	Strong agro-industrial sector
2.	Agro-industry integration with farmers
3.	Active agro-exporter sector

2.3.6.1 STRONG AGRO-INDUSTRIAL SECTOR

Agro-industries are one of the largest clients in the commodities market³⁴. A strong agro-industrial sector assures a constant demand for the crops. A growing demand for commodities, releases the pressure on

³² As mentioned in section 2.3.3.12, these agents can double as certified inspection agents for their districts.
³³ There are positive aspects of falling prices for commodities, but only if they reach the final consumer. In any case, these aspects are beyond the scope of this analysis.
³⁴ Agro-industry includes various levels of processing, from packaging to full transformation (processed goods).

commodities prices placed by larger volumes³⁵. This situation benefits seed growers, since one of the main benefits of certified seed use is an increase in yields.

2.3.6.2 AGRO-INDUSTRY INTEGRATION WITH FARMERS

As agro-industry companies grow, and their processes become more sophisticated they tend to require a certain level of quality and uniformity in their raw material (i.e. commodities) to achieve better efficiency. One of the approaches to accomplish this uniformity is to procure their raw material from a specific variety. By integrating with farmers, and working as an aggregator, they provide certified seeds to the farmers. Combined with the element discussed in the previous subsection, this process highly benefits the whole seed industry.

2.3.6.3 ACTIVE AGRO-EXPORTER SECTOR

In line with the elements exposed above and in subsection 2.3.4.5 (Exporting capacity), exporting allows to reach a new level of demand only limited by the sector's competitiveness. This also works as an incentive to improve the efficiencies in the sector. As logistics operators develop and the industry gets more sophisticated, export opportunities emerge.

2.4 FRAMEWORK CONCLUSION

The framework defined above presents a set of elements and characteristics necessary in a healthy national seed industry. Conditions within different countries, may require including aspects not covered herein. Nevertheless, the forty-two traits included in the framework, along with the market size projection for a target benchmark industry are a robust base for the analysis of the industry's situation in Ghana. The next chapter describes the current industry conditions in Ghana for each of the framework characteristics.

³⁵ Although in the long run, prices can fall due to very high yields as in the case of the United States, in the short run it increases increase demand (Pollan, 2006).

3. INDUSTRY ANALYSIS

The previous chapter defined the seed industry framework. This chapter, will present the actual conditions of the seed industry in Ghana. First, it analyzes the current coverage and volume situation, compared with the benchmark shown in title 2.2. Then, it will analyze each one of the characteristics presented under title 2.3.

Prior to entering in further detail, there are two conditions in the country that have strong effect across the whole industry. These are the interest rates, and the current seed and fertilizer subsidy policies, namely MoFA's Fertilizer Subsidy Program and the "Planting for Foods and Jobs" (PFJ). High interest rates, are a burden on most sectors in the country³⁶. The World Economic Forum (WEF) considers the access to finance the most problematic factor for doing business in Ghana (World Economic Forum, 2017). In late 2016 a new government assumed power, and among one its flagship programs is the PJF. This program creates an artificial demand in the market with preset prices pushing specific varieties. While the immediate effect injects dynamism on the industry, in the long run, the results may be mixed. Throughout this analysis, these two issues will be examined, and further ahead, in Chapter 4. , some recommendations to address them will be included.

The current conditions of the seed industry present several problems. The most notable one is the low level of certified seed uptake. This low level of uptake is a consequence of deficiencies along many of the elements presented in the framework. In this chapter, the current conditions of these elements will be exposed.

The first area of our analysis focus on market size and the implied market size under PFJ. The second area refers to the seed industry legal framework. Finally, the last segment of this chapter is a detailed analysis that follows on the n the structure of the framework used previously.

3.1 MARKET SIZE ANALYSIS

The current certified seed volume is very low. The volume of seed production in 2016 had the potential to cover around 5% of planted areas (Table 12 shows the seed production and potential coverage by crop for 2017), (NASTAG, 2017). This falls far from the 54% of CS uptake identified as a target in Table 2. The details for seed production volumes in Ghana in 2016 are shown in Table 12.

³⁶ The main rate indicators as of June 2017 are: Government reference interest rate is 22.5%, the deposit interest rate is 12%, and the average lending interest rate is 38.3% (Trading Economics, 2017).

Table 12: Seed Production for 2016

Crop	Current Area (%)	Total Area * (Has)	Current Coverage (Has)	Breeder Seed Volume (MT)	Foundation Seed Volume (MT)	Certified Seed Volume (MT)
HybridMaize	0.60%	1,025,000	6,136	N/A	N/A	135
OPVMaize	6.86%	1,025,000	70,326	6.00	25	1,547
Rice	2.65%	224,000	5,943	9.00	55	594
Soya	6.60%	86,000	5,675	6.00	19	227
Cowpea	2.84%	166,000	4,723	1.30	30	94
Sorghum	0.00%	227,000.00	-	1.20	2	-
Total	5.37%	1,728,000	92,804	23.50	131.40	2,598

*For Maize both OPV and Hybrid the total area is the same as it treated as the same crop.

Source: Volumes are from NASTAG (NASTAG, 2017), the coverage areas are estimates from the author based on seeding rates from Table 1.

The current market size for the three components is \$4.7 MM as seen on Table 13.

Table 13: Estimated Market Size for 2017 (US\$)

Crop	Current Area (%)	Total Area (Has)*	Target Area (Has)	Breeder Seed Revenue (\$)	Foundation Seed Revenue (\$)	Certified Seed Revenue (\$)
HybridMaize	0.60%	1,025,000	6,136	\$ -	\$ -	\$ 376,744
Maize	6.86%	1,025,000	70,326	\$ 36,614	\$ 76,279	\$ 2,360,349
Rice	2.65%	224,000	5,943	\$ 41,860	\$ 128,605	\$ 906,699
Soya	6.60%	86,000	5,675	\$ 83,721	\$ 134,651	\$ 263,965
Cowpea	2.84%	166,000	4,723	\$ 6,772	\$ 78,921	\$ 329,477
Sorghum	0.00%	227,000.00	-	\$ 11,162.79	\$ 4,186.05	\$ -
Total	5.37%	1,728,000	92,804	\$ 180,130	\$ 422,642	\$ 3,860,490

*For Maize both OPV and Hybrid the total area is the same as it treated as the same crop.

Source: Volumes are from NASTAG (NASTAG, 2017), the coverage areas are estimates from the author based on seeding rates from Table 1.

The current market production in Ghana is not well balanced, meaning that the amount of breeder and foundation seeds does not relate to the amount of certified seed produced. Production in the earlier stages is much higher than required. Although this may be influenced by the specific varieties produced,

Table 14: Relationships between seed productions at earlier stages

Crop	Multiplication Factor for 1kg (kgs of new seed)*	Breeder to Foundation		Foundation to Certified		Usage	
		Breeder Seed Volume (MT)	Potential Foundation Seed Production (MT)	Actual Foundation Seed Production (MT)	Potential Certified Seed Production (MT)	% of Breeder Seed Used	% of Foundation Seed Used
Maize	77.27	N/A	0	-	-	0.0%	0%
Rice	77.27	9.00	695.4545455	55.30	4,273.18	8.0%	14%
Soya	26.00	6.00	156	19.30	501.80	12.4%	45%
Cowpea	40.00	1.30	52	30.30	1,212.00	58.3%	8%
Sorghum	60.00	1.20	72	1.50	90.00	2.1%	0%
Total	280.55	18	975	106	6,077	81%	67%

Multiplication rate defined at current production yields for all stages. If a higher yield is used the potential yield will be much higher, resulting in a lower utilization

Source: (Ama Ennin, History of Crop Varietal Development, 2017), (Nutsugah, New Varieties and the Advantages They Offer Over Older Varieties, 2017), (Nyamid-Clotey & Havor, 2017)

one may conclude that either the resources are not focused where they should be or they are being wasted. Table 14: Relationships between seed productions at earlier stages presents the volume of foundation seed that can be produced with the current volumes of breeder seed, and a similar exercise for foundation and certified seed volumes.

For some varieties of maize, there is a shortage of foundation seed (Iddrisu, 2017); while in some cases, the breeders cannot supply the demand for breeder seeds due to limited resources (Nutsugah, Breeder's situation and requirements - SARI, 2017; Ama Ennin, Breeder Licensing Potential - CRI, 2017). Having a surplus of seeds at earlier stages may be a normal situation, but the utilization rates shown in Table 14: Relationships between seed productions at earlier stages Table 14 appear to be low, especially on a resource stranded industry. This implies a lack of coordination between the actors at each stage. Two elements that can help prevent this situation are presented in the framework, namely the use of contracts and having a strong seed association to assist with demand planning and communication.

3.1.1 MARKET SIZE UNDER PFJ

One of the pillars of the subsidy program, PFJ, is to encourage the use of certified seeds. Under this program the GoG will subsidize 50% of the price of the seed to the farmer; with an additional credit of 50% of the payment due at the harvest. The result is that the farmer will only pay 25% of the market price upfront when planting, and the other 25% around four months later (at harvest). Nevertheless, previous subsidy programs have shown limited success.

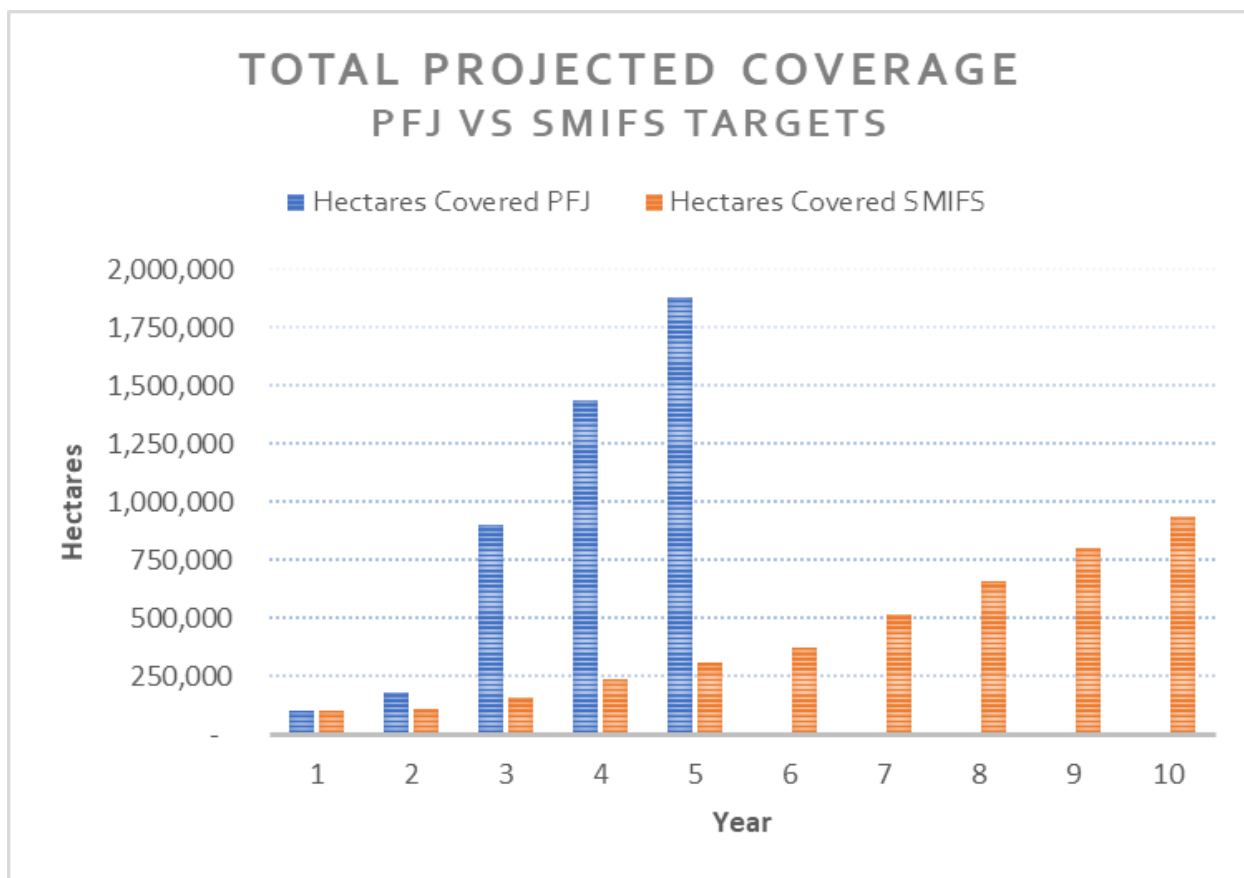
“The problem is that it is not clear that the seed subsidy accomplishes anything useful for farmers, or for anyone else. The majority of it, at least initially, will be spent on lowering the price of OPV maize seed to close to grain price and the vast majority of this will be spent on the most common variety in the seed system, Obatanpa, which is 20 years old and already the most common single variety in Ghana’s maize fields” (Tripp & Mensah-Bonsu, Ghana’s Commercial Seed Sector: New Incentives or Continued Complacency?, 2013).

It is important to consider, that from a technical stand point the plan shows a comprehensive strategy, including the private sector both in seed production and distribution. It also takes in account the effect of the higher yields on the commodities market. But overall, the PFJ needs to expand its scope to consider steering the seed industry towards a maturity stage³⁷, and avoid expectations that might be too high to fulfil.

The PFJ plan is bold, with a target of 100% CS uptake by 2020 (MoFA, 2017). Based on the regional experiences, these targets are considered very hard to reach. Furthermore, the six components of the industry need to mature together. As it will be discussed in chapter 4, with an industry-wide plan, following the necessary steps within a pre-conceived sector growth strategy, in five years seed uptake will reach 24% of acreage (40% of the target area presented in Table 2).

³⁷ It is understood that the objective of the PFJ goes beyond the seed industry, but implementing a holistic seed sector growth strategy is tantamount to the success and sustainability of the program itself.

Figure 6: Total Projected Coverage



Source: MoFA 2017 and Author

The implication behind this growth is the assumption that the low CS uptake is due to low availability and high price. While these two factors are very influential in the seed uptake, as is it will be shown along this chapter, there are plenty more factors affecting the industry.

Table 15 shows the volumes and prices paid to producers and importers. The overall coverage area expected from the plan is almost twice the current area originally expected from the 2016 certified seed production by itself. The main reason for this is the amount of imports planned for Hybrid Maize and Sorghum. Appendix I shows the tables with the projected coverages for PFJ and the targets proposed by the SMIFS.

Table 15: Original PFJ Plan: Prices, Volumes and Estimated Coverages

Crop	Price (US\$/kg)	Volume (MT)	Estimated Coverage (has) (4)	% of Total Area	Total Investment in Seed Purchasing (US\$)	% of Investment
HybridMaize (1)	\$ 5.81	1400	63,636	6%	\$ 8,139,535	66%
OPVMaize	\$ 1.53	1200	54,545	5%	\$ 1,830,698	15%
Rice	\$ 1.16	1100	11,000	5%	\$ 1,279,070	10%
Soya	\$ 3.49	110	2,750	3%	\$ 383,721	3%
Cowpea (2)	N/A	N/A	N/A	N/A	N/A	N/A
Sorghum (3)	\$ 5.81	130	26,000	11%	\$ 755,814	6%
Total		3940	157,932	10%	\$ 12,388,837	100%

(1) Imported PAM 53.

(2) Cowpea was not included in the program.

(3) Imported PAM 606.

(4) Total Maize Coverage is 118,000 has (12% of area)

Source: Prices and Volumes are official from PPRSD at MoFA (Osei-Akoto, 2017). Coverages are estimated by the author.

The experience for 2017 has shown mixed results. The OPV Maize was negotiated through the National Seed Trade Association of Ghana (NASTAG, please refer to subsection 3.3.3) to be purchased from local seed enterprisesⁱ (Nyamid-Clotey & Havor, 2017), while the Hybrid Maize was going to be imported by a local company, purchased which accounted for 65% of the seed budget. The seeds for the other three crops were negotiated independently with independent producers. The budget for the remaining four crops totals \$4.25MM, which is approximately the value of the entire production for 2016.

3.2 REGULATORY FRAMEWORK

Today's legal seed system is based on the Plants and Fertilizer Act 2010 (Act 803). Ghana's current regulatory seed framework needs to be complemented with other laws and regulations. Some of these have been approved by the GoG, while others are pending approval. Act 803 has five parts and the second one is dedicated exclusively to seeds. It regulates seed imports and exports, production, registration, inspection, and quality control, among other matters³⁸. Also, it establishes several councils and committees related to the seed industry³⁹. Below some of the most important components of the regulatory framework are presented.

3.2.1 BODIES REGULATING THE SEED INDUSTRY

The general surveillance of the seed industry falls under the Ministry of Food and Agriculture. The MoFA is conformed of several directorates, councils and committees directly involved in several aspects of the seed sector. Act 803 creates the Plant Protection and Regulatory Services Directorate (PPRSD), the National Seed Council (NSC), and the Technical Variety Release Committee (TVRC) (Plants and Fertilization Act 803, 2010). Additionally, the Directorate of Crop services is also one of MoFA's administrative bodies.

³⁸ Please see the Plants and Fertilizer Act 803 for further detail.

³⁹ Act 803 also establishes other bodies related to plant protection and fertilizers.

The PPRSD's main tasks are related to phytosanitary aspects and plant security. "The PPRSD was created to organize, regulate, implement and coordinate plant protection services needed to support sustainable growth and agricultural development in Ghana" (Kuhlmann & Zhou, 2016). One of the four divisions that make up the PPRSD is the Ghana Seed Inspection and Certification Division (GSID), which oversees seed certification and accreditation. The director of the PPRSD is a member of the NSC.

The mandate of the NSC is to rule over all aspects of the seed industry, including the approval of policies, development of procedures, and establishment of rates for services provided by entities related to seed stakeholders. The NSC is integrated by ten members of both the public and the private sector.

The main responsibilities of the TVRC are: advising the council on standards and procedures, recommending the release of new varieties and the withdrawal of older ones, and the publication of lists of commercial and industrial varieties of crops grown in the country.

The Directorate of Crop Services (DCS) is responsible for assisting in the development and distribution of improved agricultural materials in the field along with extensions services (Kuhlmann & Zhou, 2016). The director of the DCS is also a member of the NSC.

3.2.2 LAWS, POLICIES AND REGULATIONS

Act 803 defines the general framework for the regulation of seed production and trade, but other key policies, laws and regulations include, 2013 Ghana National Seed Policy, 2012 Plant Protection Regulations, Seed (Certification and Standards) Act of 1972, 2011 Ghana Biosafety Act, and 2015 National Seed Plan (Kuhlmann & Zhou, 2016). Additionally, there are various law and regulations, regarding seeds, pending approval at the Parliament or the NSC. Their approval is fundamental for the development of the industry. The most important ones are mentioned below:

- The Plants Breeder Rights.
- The Seed Regulations harmonized in ECOWAS.
- Guidelines for Breeder Seed Licensing or expressed NSC approval on the seed licensing process between NARIs and private seed producers.
- The Guidelines for Foundation Seed Growers.
- The Regulation for seed Inspection and Accreditations.
- The Guidelines for Variety Release.
- The Regulations for Seed Certification (The regulations currently in use are from 1972).

Each one of these regulations has different effects throughout the industry components. Nevertheless, the National Seed Policy and the National Seed Plan are of particular interest since these documents provide a vision for the whole industry.

3.2.3 NATIONAL SEED POLICY AND NATIONAL SEED PLAN

After the approval of Act 803, the MoFA developed and submitted for approval the National Seed Policy in 2013. This policy was put into action by the National Seed Plan of 2015. The main objective of the National Seed Policy is:

“.. to support the development and establishment of a well-coordinated, comprehensive and sustainable private sector-driven seed industry through systematic and strategic approaches which would continuously create and supply new improved varieties for use by farmers and, further, support successful seed production, certification, marketing and seed security systems which will form the basis for food security and support the overall development of the agricultural sector.” (National Seed Policy, 2013, p. 33)

As stated, this policy defines the seed industry around the private sector⁴⁰. Furthermore, it covers all the components of the primary value chain, including twelve specific elements of the industry, setting policy objectives for each one. The seed plan was developed to implement these objectives, under the following two pillars:

- i. The GoG is committed to not only relegating the responsibility for leadership in the commercial components of the seed industry to the private sector, but also in diverse ways facilitating it to assume that role expeditiously.
- ii. Recognizing that several support services which do not hold immediate prospects for commercialization are nevertheless imperative for the overall effective conduct of the seed industry, Government is pledged to assume supportive responsibility for such service areas. (National Seed Plan, 2015, p. 1)

The National Seed Plan is composed of ten projects throughout five years. These projects are government projects which in most cases are designed to support the private sector, as stated by (Kuhlmann & Zhou, 2016, p. 5).

“The implementation strategy envisioned by the National Seed Plan highlights the importance of facilitating a shift in leadership in the commercial aspects of the seed industry to the private sector and the need for a strong government role in the provision of support services important for the effective development of the seed industry”.

The estimated cost for the projects is around \$41 million. Although, some of the initiatives of the plan can be managed by the current bodies, its full execution plan depends on securing these funds.

3.3 INDUSTRY ELEMENTS ANALYSIS

This title will analyze the current situation of each of the elements presented in the framework in the previous chapter. Several of the industry problems affect various elements; therefore, these issues are discussed in more than one of the elements, but the analysis will be undertaken from a different perspective.

⁴⁰ This statement is aligned with the framework developed in this document.

3.3.1 RESEARCH AND BREEDER SEED COMPONENT ANALYSIS

The research and breeder component is mostly composed by the Council for Scientific and Industrial Research (CSIR) through two of its member institutes, the Crop Research Institute (CRI) and the Savanna Agricultural Research Institute; the University of Ghana (UG), through the West Africa Center for Crop Improvement (WACCI), while other universities play a minor role. The CSIR responds to the Ministry of the Environment, Science and Technology, and Innovation (MESTI); while UG and the other universities are public entities that comprise the Ghanaian public university system.

One of the crucial issues regarding this component is the dearth of funding for new varieties; in what refers to CRI and SARI, most of the funds are invested in their payrolls (Ama Ennin, Breeder Licensing Potential - CRI, 2017) (Nutsugah, Breeder's situation and requirements - SARI, 2017). According to Etwire, et al., most varieties are developed with funds from international cooperation.

Below each of the elements of the research and breeder component for Ghana is analyzed.

<p>1. Properly Funded Institutions</p>	<ul style="list-style-type: none"> • As mentioned before, these institutes lack funding for research, with a dependence on international cooperation. They have limited equipment hindering their capacity to expand their breeder seed growing, which also compromises the quality of their research. Over the last years. The Feed the Future Agriculture Technology Transfer project, funded through USAID (ATT) has provided SARI with laboratory and irrigation equipment (Mullins & Taylor, 2017). The lack of equipment also limits their ability to produce and sell foundation seed. • Nevertheless, NARIs do have qualified researchers. In 2005, there were 70 breeders and biotechnologists at a MSc or PhD level (Bennett-Lartey & Oteng-Yeboah, 2008); but, they have limited resources for continuous training (Marno, 2017). • As will be described below, the capacity to generate other sources of funding has been limited by the resistance of the National Seed Council (NSC) to openly support licensing contracts (Nutsugah, Breeder's situation and requirements - SARI, 2017). • The NARIs are in a very tight financial situation. This has two direct effects, first the constant search for funds distracts them from their mandate; second, the level of research and quality is compromised.
<p>2. Releasing a Regular Quantity of Varieties Per Year</p>	<ul style="list-style-type: none"> • Despite operating under limited resources, the NARIs had developed and released 55 varieties of the crops discussed in the report in the last five years. (Nutsugah, New Varieties and the Advantages They Offer Over Older Varieties, 2017) (Ama Ennin, History of Crop Varietal Development, 2017) • WACCI is in the process of releasing two new hybrid maize varieties pending approval from the National Seed Council (Danquah, 2017) • The overall situation regarding variety release is good, but it is important for breeders to secure their own funding to continue this work. • Though breeders may have released over 50 varieties, the diffusion of this information is limited; and few industry players are aware of their existence. Furthermore, there is limited follow up on the performance of the varieties.

<p>3. New varieties aligned with farmer, consumer, and industry requirements</p>	<ul style="list-style-type: none"> • Breeders are focused on the development of new varieties, but the uptake of these varieties by seed enterprises and farmers is limited⁴¹. As of 2016, close to 70% of the maize seeds produced were Obatanpa⁴² (Nyamid-Clotey & Havor, 2017) . • The evidence on adoption suggests that there is limited coordination between the industry stakeholders and breeders regarding their needs⁴³. • Limited funding prevents breeders from marketing and coordinating downstream the value chain (i.e. FS and CS growers, and farmers) and, since this also requires personnel with a specific set of competences for these functions. Researchers should be able to understand their stakeholders' requirements, and translate them into variety development terms.
<p>4. A specified agricultural package and GAPs to achieve the variety potential</p>	<ul style="list-style-type: none"> • The varieties that have been released are not accompanied by information regarding the agricultural package specifying general instructions on planting, inputs and practices required to achieve the performance the breeder claims the released seed can achieve. • The consequence of this situation, is that not even foundations seed growers can consistently reach the variety's full potential (with lower possibilities, as the variety goes downstream the value chain (i.e. CS growers and farmers). This degrades the industry players' confidence in the variety, and ultimately in the breeder (Kwabana, 2017) . • All new releases should include the information necessary to achieve the variety's full potential, and furthermore, even at the certified seed level, a certain degree of agricultural information should be included. Breeders should follow up on the results of the varieties for future releases.
<p>5. Quality-traceable breeder and foundation seed</p>	<ul style="list-style-type: none"> • Private foundation seed growers have had problems with the seed multiplication process (Kwabana, 2017) (Bokuma, 2017) (Iddrisu, 2017). • This is the combination of the seed quality and the lack of agricultural information on the variety, so both issues need to be tackled simultaneously.

⁴¹ The ATT project is promoting the adoption of hybrid seeds in North Ghana with a certain level of success (Mullins & Taylor, 2017).

⁴² Obatanpa is an OPV released by CRI and SARI in 1992. At the time of its release, it was highly marketed (Ama Ennin, Breeder Licensing Potential - CRI, 2017). As of today, it is considered outdated, with low yields (Cortes J. E., Seed Systems Overview in Ghana, 2017). and it is considered that with more than 25 years in the field it has deteriorated (Boateng & Anfu, 2017).

⁴³ There is one instance of a soy variety developed by CRI which was adopted by RMG seeds. The variety Tonadana has a big oily seed, with a 95-day maturity and resistance to shattering (Marno, 2017).

<p>6. Seed inventory to supply demand from foundation growers based on contracts</p>	<ul style="list-style-type: none"> • Breeders need to have breeder seed inventory on hand in order to supply foundation seed growers, which implies they also need proper cooling storage facilities to keep them. As breeders release more varieties, keeping up with inventories is more difficult. • The current funding situation at the NARIs, added to the lack of mechanisms available to forecast demand, have led to an undersupplied market (Iddrisu, 2017). This at the same time, discourages adopters of new varieties⁴⁴. • Nevertheless, between 2013 and 2016, SARI and CRI produced 42.9 Mt of breeder seeds (MoFA; USAID; AGRA, 2017)⁴⁵. It can be assumed that these seeds never reached to their full multiplication, since the resulting volume of this amount of seeds after foundation and certified seed multiplication would yield over 700,000 Mt (Table 13); hence, a high percentage of these seeds were used for other purposes or wasted.
<p>7. Plant Breeder Rights and Licensing System</p>	<ul style="list-style-type: none"> • The Plants and Breeder Rights (PBRs) bill is awaiting approval at the Parliament since 2016. In addition to a new parliament assuming power earlier in 2017; this bill has been closely related, by political operators, to Genetically Modified Varieties, which is a controversial topic in Ghana. Therefore, an estimated date of approval is not certain (MoFA; USAID; AGRA, 2017). • In 2016, the Agricultural Policy Support Project from USAID (APSP) presented a pilot program for the promotion of seed licensing contracts to NARIs. The presentation included a set of templates for preparation of the licensing contracts. According to APSP, the licensing program stalled unexpectedly when MoFA decided to stop the consideration and approval of the Guidelines for the Production of Foundation seeds by private actors. • WACCI is implementing a program on seed licensing through the UG's patent office (APSP, 2016). • APSP also assisted MoFA in preparing the guidelines to support these contracts, but these guidelines have not yet been approved by the National Seed Council (NSC). • PBRs are important for licensing, as they offer a legal framework that guarantees compliance of the contracts. Although PBRs and Licensing Guidelines are useful to support licensing contracts, their absence does not necessarily limit the implementation as the evidence shows. For instance, in early 2017, CRI signed a licensing contract with a certified seed enterprise for a Hybrid Maize Variety. Nonetheless, CRI now has issues following up on the contact terms with the licensee regarding collection of royalties, since CRI lacks the funding to monitor the contract. (Ama Ennin, Breeder Licensing Potential - CRI, 2017).

⁴⁴ In a specific case in the Northern Region during the 2017 planting season, a seed enterprise could not procure the parental material for 4 hectares (around 100 kg) of Tin-Tin hybrid maize (Iddrisu, 2017). This does not seem to be an isolated case for new varieties.

⁴⁵ The distribution of breeder seed is as follows: Maize: 17.62Mt, Rice: 16.29 Mt, Cowpea: 4.15 Mt. Sorghum: 4.84Mt.

	<ul style="list-style-type: none"> • The approval of PBR and the Licensing guidelines are fundamental to strengthen enforceability and financial health of all the parts involved in breeding activities through a contracting agreement. Without them, enforcing the contracts on court may prove difficult.
<p>8. An institutional and legal framework allowing for timely variety releases</p>	<ul style="list-style-type: none"> • As mentioned in section 3.2, Act 803 creates the National Seed Council and the Technical Varieties Release Committee. The main duties of the TVRC are to advise the NSC on matters related to the approval, release and manage varieties. The actual approval of the Variety Release Procedures is in the hands of the NSC (APSP, 2016). One of the main issues regarding the processes associated with the NSC and the TVRC is the lack of funds for logistics and allowances that prevent the council from convening⁴⁶. • One of the mandates the TVCR does not comply with, is publishing the list of the released varieties⁴⁷. This presents several problems, since the information on varieties is not accessible. In 2015, USAID and IFDC published a seed guide, but it is limited to some varieties of rice, soybean and maize available in Northern Ghana. This guide includes six varieties of maize, four soybeans, and eight varieties of maize (only two are hybrids: Mamaba and Sika Aburoo) (USAID; IFDC, 2015). CSIR has a catalogue but is limited only to the varieties they have registered (CSIR).

⁴⁶ During the first semester of 2017 the NSC did not convene, because as per the decision of the new administration, the NSC and other coordinating bodies were in the process of being reinstalled and new members were being designated by MoFA's Minister. .

⁴⁷ There are various references to catalogues of released varieties in documents and new, but none of the documents were reachable. The TASAI mentions the Catalogue of Crop Varieties Released and Registered in Ghana Volume No.1, 2015, but it was not accessible (TASAI, 2016). Also in 2008, the GoG announced the launching of a catalogue (Government of Ghana, 2016), which was not accessible either (Government of Ghana, 2016). Even if the catalogue is published, it does not circulate; which is the purpose of such document.

3.3.1.1 RESEARCH AND BREEDER SEED ANALYSIS CONCLUSION

The research and breeder component seeds have developed at an acceptable level, even with limited resources. The NARIs and Universities have released an average of 5.5 varieties per year, which based on the adoption rate of new varieties is a high number. On the other hand, the variety adoption rate is very low. As discussed above, around 70% of maize seeds produced are still Obatanpa (USAID; IFDC, 2015) (Nyamid-Clotey & Havor, 2017).

The main issues are an absence of a clear legal framework and the dearth of funds. The former exacerbates the latter. Breeders need to fund their research and releases, and this cannot depend on the aid of international donors. The approval of pending laws and regulations will help the NARIs support themselves via licensing contracts signed with private seed producers from the multiplication of breeder seeds into foundation seeds. On the other hand, breeders need to manage their finances, learning how to read the demand and requirements of the stakeholders downstream.

3.3.2 FOUNDATION SEED SITUATION ANALYSIS

Foundation seed production in Ghana was the sole responsibility of the Grains and Legume Development Board from 1989 until 2010. During this period, the GLDB had a monopoly over the production of foundation seed, with sporadic production from the NARIs (Tripp & Mensah-Bonsu, Ghana's Commercial Seed Sector: New Incentives or Continued Complacency?, 2013). The Plants and Fertilizers Act (803) of 2010, opens the door to private producers; but as discussed below, regulations for these producers have not yet been approved. Even though limitations on the production of foundation seeds have been eased by default, interested stakeholders require the legal and technical framework to back up any investments they undertake in this specific segment of the seed industry. Otherwise, the seed system will not develop as expected.

The challenges faced by breeders, cascade downstream to the foundation seed components, and further ahead. A stable supply of breeder seed, the absence of a demand forecasting process and lack of information on new varieties are all factors that impact positively or negatively on the multiplication efforts. Below, is greater detail on the analysis of each of the components discussed in section 2.3.2.

<p>9. Stable and high-quality breeder seed supply</p>	<ul style="list-style-type: none"> • The basis to produce foundation seed sector is breeder seed. As mentioned in the previous section, breeders have not been reliable in the past. In some cases, they have not been able to deliver the required volume of parental material for a certain variety (Iddrisu, 2017), or the seed quality has been perceived as subpar (Bokuma, 2017)⁴⁸. • However, there is little coordination between breeders and foundation seed growers. The absence of a solid contract system is one of the elements aggravating the situation (Kuhlmann & Zhou, 2016). • Coordination between both parts is essential to improve the reliability of the breeders, this will also apply downstream the value chain.
<p>10. Private companies involved in production</p>	<ul style="list-style-type: none"> • Currently there are less than five companies involved in the multiplication of foundation seeds (Boateng & Anfu, 2017) (Nyamid-Clotey & Havor, 2017). There might be several reasons for this; four of them are: <ul style="list-style-type: none"> ○ The previous monopoly held by the GLDB has limited the growth of the sector in the last 20 years (National Seed Plan, 2015). During this period, this institution was the sole promoter of varieties, since it was pushing the supply downstream. Arguably, the GLDB is responsible for the lack of diversity of maize varieties in Ghana by favoring Obatanpa over new releases (Cortes J. E., Seed Systems Overview in Ghana, 2017). According to Tirpp and Mansah-Bonsu (2013), “almost everyone in the seed sector has been dissatisfied with the performance of the GLDB in producing and delivering foundation seed”. ○ Currently, the GLDB does not have the funds to produce foundation seed (Aboagye, 2017). ○ Foundation seed has a limited market. As shown in Table 12, the foundation seed volume for 2016 was 137 Mt, but based on multiplication ratios, there is no evidence that it was sold. That volume would produce over 6,000 Mt of certified seed at the current yield levels shown for grain production. ○ The multiplication of foundation seed requires a higher level of skills and, in some cases, specific conditions (e.g. 300 meters minimum isolation from other maize fields in the case of hybrid maize, which requires a large plot (Cortes J. E., Seed Systems Overview in Ghana, 2017)). ○ The lack of regulations for foundation seed growers creates uncertainty. • Several of the companies involved in the production of foundation seed are certified seed enterprises that have an integrated upstream (Iddrisu, 2017). This guarantees their supply of BS, while they are able

⁴⁸ Although these specific situations are anecdotal, the general perception among owners of the seed enterprises interviewed is that breeders are not always reliable.

	<p>to lower the cost of inputs. Since 2012 the volume of public foundation seed production has dropped, in favor of private companies and NARIs. (USAID; IFDC, 2015).</p> <ul style="list-style-type: none"> • As the industry grows, this segment of the industry will become more interesting for private enterprises.
11. Outgrower model for NARIs	<ul style="list-style-type: none"> • NARIs currently produce foundation seed for certain crops (Nutsugah, Breeder's situation and requirements - SARI, 2017), but since they have limited resources, integrating forward into foundation seed multiplication can place stress in their finances. Using an outgrower model is an option that should be considered. Breeders can supply personnel to supervise the agricultural practices, without compromising financial resources during the growing season, and creating additional revenue. • The new guidelines that govern the activity of foundations seed growers, which is pending approval by the NSC, does not prevent NARIs from engaging in foundation seed production, but they will need to apply for permits, which should cover their outgrowers.
12. Estimated demand	<ul style="list-style-type: none"> • Estimation of the demand is a major issue across the seed value chain (Boateng & Anfu, 2017). As seen in Table 12, the total foundation seed production for 2016 was 140 Mt. The economics of production cost vs. storage in a cold room determine the feasibility of overproducing for future seasons. The current issue is the dearth of cold rooms for seed storage, which may imply that these seeds are being wasted. • Focusing on demand forecasting is essential for the entire industry, since estimating the demand will assure the financial feasibility of new players in the market. As the industry grows, errors in demand forecasting place a heavier economic burden on the companies.
13. Equipment for farming, processing and storage	<ul style="list-style-type: none"> • Equipment and infrastructure availability is very limited. Most of the labor in the field is done manually. Some certified seed companies have limited cleaning and packing equipment, which is also used in their foundation seed (Iddrisu, 2017). In Northern Ghana, the ATT project helped three enterprises in the acquisition of processing equipment, two of these companies produce foundation seed (Mullins & Taylor, 2017). ATT assists the enterprises with up to 30% of the investment. • The availability of cold rooms is very limited, and some of those available are in bad condition⁴⁹. CRI and SARI have cold rooms, but they offer limited storage for their breeder and foundation seed (Ama Ennin, Breeder Licensing Potential - CRI, 2017).

⁴⁹ In the case of GLDB's cold storage room in Kumasi, the equipment is old and cannot maintain a constant humidity. Additionally, the GLDB does not have the funds necessary to cover maintenance costs. (Kotey, 2017)

	<ul style="list-style-type: none"> • The current situation regarding equipment and infrastructure in Ghana is poor. Capital investments have a very high cost, which, in most cases, makes them financially unfeasible (Antwi, 2017). The matter of financial cost will be analyzed in further detail.
<p>I4. Legal framework for private companies</p>	<ul style="list-style-type: none"> • Foundation seed producers are operating under an uncertain legal situation. Regulations for this enterprise should have been approved along with Act 803. This uncertainty prevents new companies from entering the foundation seed production. • The regulations that are being considered for approval present some restrictions. These entry barriers have the effect of limiting the number of producers, since the cost of complying with all requirements may be high.

3.3.2.1 FOUNDATION SEED COMPONENT ANALYSIS CONCLUSION

The foundation seed component has many deficiencies. Being a small market, compared to the certified seed one, and requiring skilled labor and a higher investment in land, it poses natural entry barriers. Given the brief period since the activity was opened, this is the industry's least developed component. In addition, the lack of regulations creates an uncertain environment for developing a new company. As the industry grows, and the legal framework offers reassurance to investments, more enterprises will access the market. Under these circumstances, the role of the GLDB will be relayed to either less commercial crops or redefined with new responsibilities.

Nevertheless, it is important to disclose that the foundation seed component will hardly grow over ten companies. The NARIs will have an advantage, since they control the supply of breeder seed and have the technical skills. Also, larger certified seed producers will have an interest in producing their own foundation seed to secure their multiplication process. This opens a small window of opportunity for a group of specialized enterprises to enter the market with very high-quality foundation seed, specially hybrid maize. Under the target volumes, hybrid maize will have the highest demand, while requiring the most skilled labor.

3.3.3 CERTIFIED SEED COMPONENT ANALYSIS

The certified seed component is the largest component of the core value chain. It has the highest volume and value. The volume for 2016 was 2,600 Mt, and the estimated market value \$4.7 million, which is more than ten times higher than the potential foundation seed market value (see subsection 3.1 for details). Therefore, it has more players involved in it than the previous two components, making it more complex.

Despite the efforts by the GoG and the international cooperation agencies, the performance of the formal seed sector has not lived up to its expectations in terms of ensuring an effective delivery of certified seeds to small farmers (Etwire, Ariyawardana, & Mortlock, 2016). There are approximately 200 certified seed growers in Ghana⁵⁰. There are around 25 formal certified seed enterprises operating in the industry (Nyamid-Clotey & Havor, 2017), with nearly 175 of the growers being small scale farmers (Etwire, et al., 2013), Table 8 the classification of the different type of producer. These smaller seed growers are scattered apart, with less access to technology; and in some cases, these smaller growers are outgrowers themselves to the formal seed enterprises. The seed growers are distributed throughout the entire country (see Figure 8 for details).

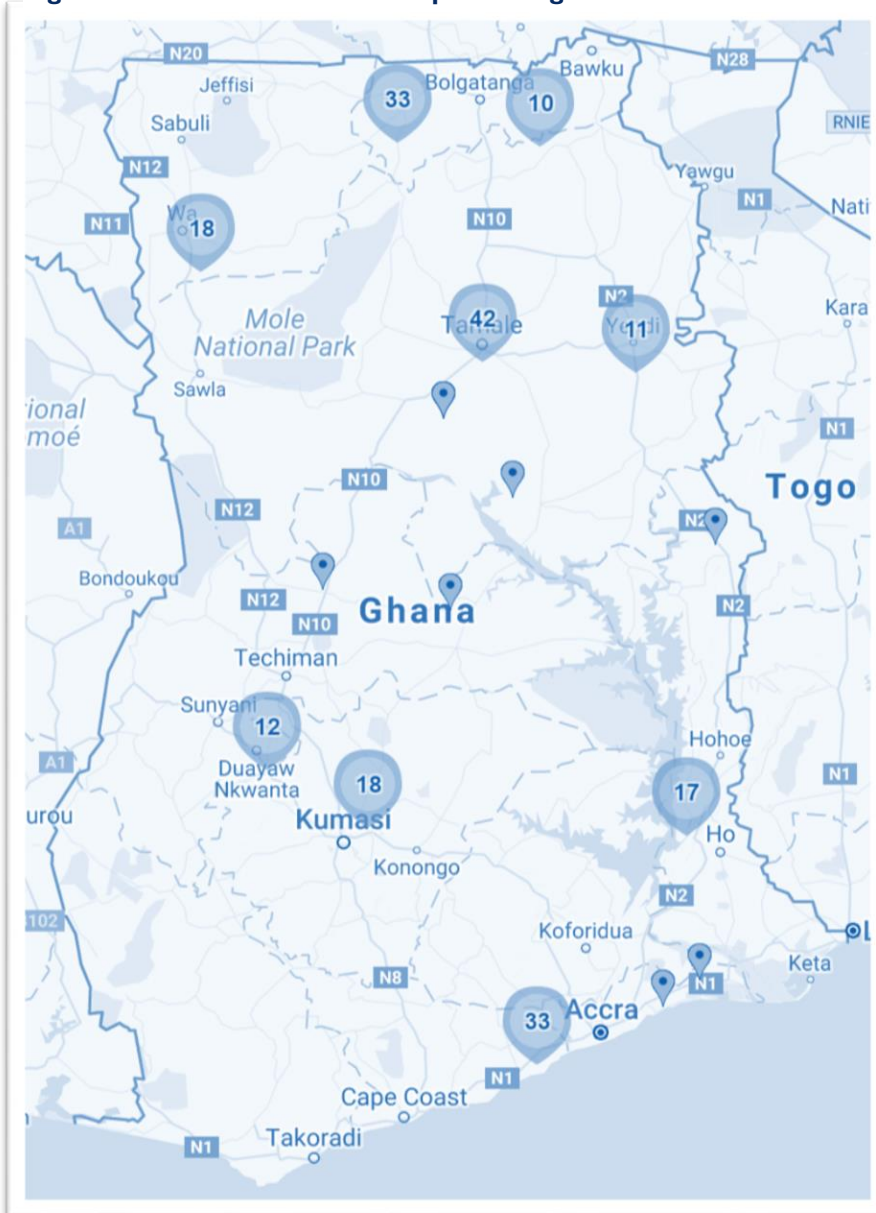
⁵⁰ NASTAG has close to 200 members listed as growers (Nyamid-Clotey & Havor, 2017), while the GSID has around 250 seed growers registered (TASAI, 2016), and Kuhlmann & Zhou reported in 2016 that SeedPAG had between 600 and 1500 members (SeedPAG will evolve into NASTAG in late 2016). For the purpose of this analysis, NASTAG's official members' number will be used, acknowledging that the total amount may be higher.

Figure 7: Classification of Seed Producers. Source: Author

Informal Seed Growers	Semi-formal Certified Seed Growers	Formal Certified Seed Enterprises
<ul style="list-style-type: none">• Not Certified Seed Producers• Not registiered• Produce traditional varieties• Trade with close-by farmers• Supply more than 90% of the market (including farmer saved seeds)	<ul style="list-style-type: none">• Certified Seed Producers• Micro Growers• Registered at GSID• Not an established company• NASTAG member through SeedPAG*• Small Scale• No access to technology and new varieties• Poor quality control process• Limited access to credit• Trade directly or through local dealers• May be supplier within an outgrower network	<ul style="list-style-type: none">• Certified Seed Producers• Registered at GSID• Members of NASTAG• Usally Small and Medium Enterprises (SMEs)• Larger Scale, more than 10 hectares• Have equipment and produce improved varieties and hybrids• Qualified personnel with quality control proceeses• Some access to credit• Trade directly through distribution networks

* SeedPAG is the predecessor of NASTAG, which is now a member itself and groups about 200 small scale growers.

Figure 8: Cluster distribution map of seed grower.



Source: NASTAG

producers increase their volume sold, decrementing the sales of informal producers. The analysis of this component shows, among other things, the underlying dynamics of these interactions.

Below is an analysis of the current situation of all the elements of the certified seed component.

The industry’s challenges are more tangible in this component. Some of the aspects deepening the issues in this component are geographical separation, the scale and quantity of producers, the interaction with MoFA, and more importantly the interaction with farmers. As mentioned in the introduction, the low uptake of certified seeds by the farmers is the biggest issue affecting the industry.

The participant’s seed growing sector is defined in three categories: informal seed growers, semi-formal certified seed growers, and formal certified seed enterprises. Figure 7 shows the characteristics of each of these types of seed growers. The focus of the analysis is not the informal seed growers, but the semi-formal seed growers and formal seed enterprises. The interaction between these types of producers at market level defines the maturity of the industry. The formal and semi-formal

15. Competitive market

- The certified seed market has a dynamic of its own. On one hand, there are around 25 formal enterprises with a defined company structure and business processes, plus more than 175 semi-formal CS growers, operating in a semi-formal condition. On the other hand, there is an undetermined number of informal seed producers, with limited access to improved varieties and no quality control processes. The lack of information on the non-CS producers is a characteristic of informal markets⁵¹. This situation makes for a very competitive market, under unequal conditions. Below, is an analysis for CS seeds producers based on Porter’s five forces framework described in subsection 2.3.3.1.

- **Bargaining Power of Suppliers**

The main strategic input for CS growers is foundation seed. The cost of foundation seed for one hectare is estimated between \$14 and \$280 depending on the crop. This cost is relatively low, compared to the estimated revenue from CS production. Table 16 below, shows the estimated costs and revenues for each crop.

As analyzed in the previous section, the private foundation seed component lacks maturity. Prior to Act 803 in 2010, the GLDB had a legal monopoly on foundation seed production and commercialization, therefore restraining all bargaining power from CS growers when purchasing FS, which resulted in the pushing of certain varieties (e.g. Obatanpa) (Cortes J. E., Seed Systems Overview in Ghana, 2017). The elimination of the GLDB monopoly has resulted in a more open, but still limited market. Currently, the CF growers can procure their foundation seed from more suppliers, but still many of the CF growers are buying their foundation seed from the GLDB (Etwire, Ariyawardana, & Mortlock, 2016).

Table 16: Estimated Cost and Revenues of one hectares of CS (US\$)

Crop	Cost of CS for 1 Ha (\$)	Estimated Revenue (\$)	CS Cost as % of Revenue
HybridMaize	\$ 122.79	\$ 11,163	1.10%
OPVMaize	\$ 67.13	\$ 3,814	1.76%
Rice	\$ 116.28	\$ 3,837	3.03%
Soya	\$ 279.07	\$ 6,279	4.44%
Cowpea	\$ 52.09	\$ 2,344	2.22%
Sorghum	\$ 13.95	\$ 2,288	0.61%

Source: Author based on Table 1

The bargaining power of CS enterprises with FS producers is low, since there are less than five of them, who in most cases have exclusive rights over their varieties. Nevertheless, some CS enterprises have integrated backwards, producing their own FS, and dealing directly with the breeders. In this case the bargaining power depends more on the market value of exclusive varieties.

⁵¹ Among the literature consulted and interviews conducted, information regarding the quantity of producers and volumes from informal seed producers is normally estimated or omitted.

Regarding other inputs (e.g. pesticides, fertilizer, etc.), given the estimated sizes of the CS growers their bargaining power is low, since the agro-input dealers cater to a market of more than 1.7 million hectares; and the CS growers cover less than 800 hectares (data based 2015 and 2016 information on the five crops). In general, overall negotiating leverage is low.

- **Threat of New Entrants**

The entry barriers for growing CS are low. For small scale, semi-formal CS growers, besides the basic needs for any agricultural activity, the only additional requirement to enter the activity is the GSID accreditation. Formal enterprises have more requirements, and a higher investment⁵². In the past years, several semi-formal growers turned into formal enterprises, looking for better opportunities with creditors and aid agencies (Acquaye, 2017).

The threat of new entrants is high. Given the low level of maturity of the industry and its growth potential, the entrance of new strong CS enterprises will benefit the industry. The expansion of the activity will result in higher standards and a more dynamic market, while promoting the creation of outgrower schemes.

- **Threat of Substitute Products**

The low penetration of certified seeds among farmers (less than 7% for 2017 regarding this report's reviewed crops, see Table 12), defines a very susceptible industry; that is, an activity which could react to even small changes in seed demand. Historic certified productions dropped significantly in the last years, with more than 6,000 Mt in 2010 (The World Bank, 2012) to 2,500 Mt in 2016 (NASTAG, 2017), while the total farmed area has remained constant (MoFA, 2016). This situation results in interchangeability between certified seed and non-certified seed being a normal practice. A low agricultural productivity, even for CS, produces indifference amongst farmers (Bokuma, 2017).

- **Bargaining Power of Buyers**

Under normal circumstances, CS growers sell directly to farmers and through agro-input dealers; but given the current conditions with the execution of the PFJ program, in 2016 the GoG is the biggest CS buyer. Therefore, this requires a two-tier analysis: one for the private market and another for PFJ.

Agriculture in Ghana is an atomized activity. About 90% of farm holdings are less than 2 hectares. Larger scaled farms are scarce, and mostly for cocoa, coconut, and rubber; and to a lesser extent for maize and rice (MoFA, 2016). Under these market circumstances, with relation to direct sales to farmers, the buyer of CS has very little bargaining power.

⁵² According to the World Bank and other sources, the average cost of starting a business in Ghana is around \$350 (GHC 1,500) and takes nine days (The World Bank; INRD-IDA, 2017) (Ghana Investment Promotion Centre, 2017).

	<p>Agro-input dealers have high bargaining power on the more generic varieties given their size; but buyers of improved varieties and hybrids have limited options for suppliers, resulting in a decrease of purchasing power.</p> <p>On the other hand, the GoG under PFJ has a very high bargaining power. In the case of maize, they offered to purchase more than 100% of the available inventory for OPV; and there was no local supply for their hybrid demand. The CS growers negotiated as an association, under NASTAG. This allowed for them to achieve a competitive price, 13% better than the 2015 recommended price (MoFA, 2015) (MoFA, 2017)⁵³; but payment conditions are unfavorable since MoFA will pay them back in tranches, without any adjustments as per the opportunity cost. Therefore, that cost will be subsumed by the seed producer themselves. (Nyamid-Clotey & Havor, 2017)⁵⁴.</p> <ul style="list-style-type: none"> ○ Rivalry Among Competitors <p>The rivalry among competitors is low. The vulnerable situation of the entire industry limits the aggressiveness of its players. The low level of sophistication of semi-formal growers producing with older varieties, creates a low intensity market dynamic at a local level. Formal enterprises are starting to compete with differentiation strategies, based on quality and diversity of varieties (Mullins & Taylor, 2017), but they are still falling behind in their marketing strategies (Idrissu, 2017).</p>
<p>16. Participation of formal enterprises</p>	<ul style="list-style-type: none"> ● An incipient formal sector is playing a significant role in the seed industry. Currently there are around 20 formal seed enterprises. These seed enterprises produce around 30% of the total seed volume (Cortes & Idrissu, Formal Seed Enterprises in Ghana Quality Control Training Process, 2017)⁵⁵. Different donor programs are supporting these companies to improve their skills and capacity. ● All these enterprises are receiving technical quality control training from APSP (see details below) (Cortes J. E., Seed Systems Overview in Ghana, 2017). The enterprises located in Northern Ghana have received technical and marketing support from ATT (USAID; IFDC, 2015), and FinGAP has provided financial advice to other enterprises so they may access credit (Antwi, 2017). Finally, AGRA, via ECoSIB, offers them a business and marketing incubator to improve their productivity and profitability (Acquaye, 2017). ● These actions rise the technical and business level of the whole seed industry, not only formal enterprises. <ul style="list-style-type: none"> ○ Upstream: Formal enterprises have the technical skills to demand better quality foundation and breeder seeds, as well as new improved varieties for which they can foresee the demand.

⁵³ The 2015 recommended price was GHC 6.00/kg, and the purchase price for PFJ was GHC 6.80/kg

⁵⁴ The payment conditions for the Government's original offer were 12 months, but NASTAG closed the negotiation at 6 months.

⁵⁵ This is the best estimate since there are no producer statistics.

	<ul style="list-style-type: none"> ○ Within the component: They rise the overall standards and expectations of farmers. Also, their new technology trickles down to semi-formal growers, either through informal communication or within outgrower schemes. Additionally, their credit experience can help financial institutions understand the industry, and provide credit to smaller players. ○ Downstream: Formal CS enterprises are in a better position to negotiate with input suppliers, and agricultural and agro-industrial companies. In collaboration with other companies and institutions, they can enable marketing and educational campaigns. ● Formal enterprises are playing a vital role in the industry, but they are still weak. They need more training, equipment, and access to credit to grow and push a better and bigger offer of certified seeds to the farmers.
<p>17. Quality control</p>	<ul style="list-style-type: none"> ● Seed quality is key in developing a solid seed industry. According to Cortes and Harries, seed quality is a challenge in developing countries. “Most seed enterprises, whether small, medium or large, are commonly striving to produce and market high-quality seed to farmers” (Cortes & Harries, 2015, p. 4). Ghana is no exception. ● Semi-formal seed enterprises have limited knowledge regarding quality control, and their requirements are operational. They rely on GSID for their limited quality control in the field (Arroyo, 2017). ● Formal seed enterprises have access to quality control practices. Over the last year, APSP with its subcontractor Iowa State University, have developed and implemented a seed quality outreach training program designed for these companies. The program is based on process management, developing quality manuals for each enterprise (Cortes & Harries, 2015). ● Delivering quality seeds is fundamental to improving uptake. While formal companies have improved their quality control management, semi-formal growers require additional support.
<p>18. Distinctive and appropriate packaging</p>	<ul style="list-style-type: none"> ● Certified seed packaging is controlled, to a great extent, by GSID. All bags are currently printed by GSID, and each grower writes or posts a sticker on it with their information, crop and variety. Act 803 has clear indications for tagging and labeling CS packages (Plants and Fertilization Act 803, 2010, p. 21). There is no prohibition for individual companies to print their own bags, but printing costs are too high for the volumes of most growers. ● Packaging could be used as a marketing tool. The generic package currently used prevents differentiation between companies. Differentiation is part of a company’s competitive strategies. Without a strategy, enterprises will not be able to capitalize on their investments on quality and innovation, and generic low-price strategies will reign (Porter, What is a strategy? , 1996). The company selling at lower prices will have an advantage, regardless of quality; at the expense of growing the market.

	<ul style="list-style-type: none"> • Another important factor regarding packaging is material and size. Currently GSID uses plastic bags (polyethylene), that are not optimal for all crops under warmer humid weather conditions (Cortes J. E., Seed Systems Overview in Ghana, 2017); bags made of an alternative material should be explored to maintain the quality of the seed⁵⁶. Small bags allow small scale farmer to buy CS. “Seed companies in Ghana provide maize and cowpea seeds mostly in 1 kilogram packages (81.4% and 83.6%) respectively to smallholder farmers as indicated in Table 24. Maize is also sold in 9 kilogram packages though a few quantities may be sold in 45 kilogram packages. Rice is normally sold in 40 kilogram packages (95%). Soybean however, is mainly sold in 50 kilogram packages. The small packages are affordable to smallholder farmers and also minimize seed wastage. Rice and soybean are considered as cash crops and normally patronized by commercial farmers who prefer larger packages (40kg and 50kg) respectively” (TASAI, 2016, p. 19). • Formal seed companies have the resources to seek other alternatives to personalize their bag in more suitable materials; semi-formal growers will depend on GSID until the industry grows.
<p>19. Wide offer of varieties</p>	<ul style="list-style-type: none"> • Breeders have released a wide assortment of varieties, more than 50 in the last 3 years (please see section 3.4.2). Still the diversity of varieties in the market is limited. In the case of maize around 70% is Obatanpa, and in the case of rice, it is mostly AGRA Rice or Jasmin 85 (Nyamid-Clotey & Havor, 2017). • Formal enterprises in the last years have been promoting newer varieties (USAID; IFDC, 2015), but the effort should involve semi-formal growers as well. The availability of more varieties of foundation seeds, and the improvement on yields of newer varieties will drive the market.
<p>20. Operation of outgrower models for certified seed</p>	<ul style="list-style-type: none"> • The outgrower nucleus and farmer scheme have shown positive results in commodity agriculture (Issaka, 2017). Masara N’Arzik in Tamale, had more than 10,000 associated famers (Ibrahim, 2014), with maize yields almost 10% higher than the country’s average (The World Bank, 2012). The Feed the Future Agricultural Development and Value Chain Enhancement II project (ADVANCE I & II) project has assisted in the development of a nucleus farming model all across the country benefitting more than 120,000 farmers (Issaka, 2017). • Currently, the outgrower and association models are also present in the northern region. “Seed companies recruit farmers as outgrowers for the certified seed production. It is bought by the seed companies and resold to farmers. Community seed production in this sense can be

⁵⁶ More suitable materials are paper, coated paper, jute, polypropylene, or woven polypropylene. These materials may be more expensive.

	<p>viewed as a seed company having large tracts of land and recruiting farmers as growers” (Etwire, Ariyawardana, & Mortlock, 2016).</p> <ul style="list-style-type: none"> • Furthermore, some of these formal enterprises produce their own foundation seeds to be used by their contractors. These companies, have the quality control procedures, processing equipment, and sales network necessary to reach the market in better conditions. (Iddrisu, 2017). • Business models clustering producers around certified seeds are a key growth motor for the industry.
<p>21. Availability of processing equipment and agricultural machinery</p>	<ul style="list-style-type: none"> • The industry’s atomized structure, with approximately 180 semi-formal growers, demands the availability of shared processing equipment. Farmers have very limited access to machinery and equipment making agriculture a labor-intensive activity (The World Bank, 2012). • Investments in agricultural machinery, even for most outgrowers, is financially unfeasible. The alternative is to use tractor services, which are currently available. These services are not exclusive to seed growing activities, but the use of tractor and harvesting equipment benefits the integrity of the seed, especially for rice. Even though formal seed enterprises understand these benefits, they hardly use them because they are not provided at the optimal time (Iddrisu, 2017). In the past, the Government has promoted the mechanization of agriculture with positive results; between 2004 and 2010 the number of tractors almost tripled, to 2855 units (The World Bank, 2012). • Processing equipment is scarce. Some of the formal enterprises have their own equipment (Mullins & Taylor, 2017), and may offer them as a service for smaller growers (Iddrisu, 2017). Growers located in the Ashanti region use the equipment at the GLDB facility in Kumasi. This equipment is old and in bad shape (Arroyo, 2017). In other regions, most of the seed is processed manually. • Availability of machinery and equipment is made difficult because of the cost of credit. Shared equipment facilities will improve seed quality and facilitate the activities of growers.
<p>22. Shared storage facilities</p>	<ul style="list-style-type: none"> • There are very few cold rooms available for seed storage. NARIs have some for their breeder and foundation seeds, but none of the seed enterprises have their own facilities⁵⁷. The GLDB facility in Kumasi has a cold storage facility of around 400 square meters (Arroyo, 2017), but the cooling equipment is old, and the GLDB has difficulties covering its operational costs (Kotey, 2017). The electric supply in Ghana is deficient and the cost is high compared to other economies (World Economic Forum, 2017).

⁵⁷ RMG has access to cold rooms for their imported seed.

	<ul style="list-style-type: none"> • Offering shared storage facilities at a competitive cost for growers is another factor that will increase the quality of the seeds offered and will allow growers to store seeds for more than one season.
<p>23. Access to competitive credit</p>	<ul style="list-style-type: none"> • As mentioned at the beginning of this chapter, access to credit is considered the most problematic factor for developing businesses in Ghana (World Economic Forum, 2017). Capital investments were rare in the agricultural sector. The recent effort by FinGAP has produced positive results (Antwi, 2017), expanding the credit to more farmers. But this assistance is limited to accessing credit institutions, the creditors must still deal with high interest rates and fees. Ghana is ranked 110th out of 138 economies in the affordability of financial services in the World Economic Forum (WEF) index. • The interest rate situation in Ghana affects the whole country, and the GoG has to address this as one of its priorities. If the issue of the cost of money is not properly addressed, capital investments will hardly grow. In the case of farming, mechanization, irrigation projects and new equipment purchases involve a high financial risk. In the agricultural sector, the work carried out by FinGAP must be continued, assisting farmers in reaching out to credit institutions.

<p>24. Strong producer's association</p>	<ul style="list-style-type: none"> • In 2005, the Seed Producers Association of Ghana (SeedPAG) the first seed growers' association was created with 600 members (The World Bank; INRD-IDA, 2017). Eleven years later, a new certified seed growers' association was born, the National Seed Trade Association of Ghana (NASTAG). SeedPAG was one of the seed associations in Ghana that participated in the establishment of NASTAG and now it has become a member, with its president now being NASTAG's recently elected President. NASTAG has over 30 members, including SeedPAG, seed companies, breeders and other related associations (Nyamid-Clotey & Havor, 2017). • NASTAG has two main functional roles, one internal to deal with its membership and the other external, to engage with the GoG and other institutions. NASTAG's strategic plan contemplates projects to be executed accordingly (NASTAG, 2017). Nevertheless, one of the main challenge facing NASTAG is funding. The association is currently funded by USAID via APSP, who collaborated in its conception, but it should be an association funded by its own members based on the services it provides and other institutional activities. Currently, APSP and ATT are working together with NASTAG to assist the organization in the implementation of its strategic plan, which among other areas, should incorporate offering services to its members and therefore enable the association to generate its own income towards building up sustainability and mutual accountability. • NASTAG has the responsibility of being the seed industry's representative before the GoG. During the PFJ's initial campaign, in early 2017, NASTAG was instrumental in negotiating with MoFA the purchase of around 1,400 Mt of maize seed from its members. Nevertheless, the association's main function must be to advocate for constant improvements in the business enabling environment that will support the growth of the industry, which includes lobbying for the approval of seed-related pending regulations, as well as championing and defending the industry's interests. • The industry has a shortage of information. There are limited statistics and general information from the members that can assist them in crafting new policies and their internal decision-making processes. • The association requires experienced political operators to interact with the government, as well as an information gathering and management plan to consolidate an industry database.
<p>25. Training and education programs</p>	<ul style="list-style-type: none"> • There are several training and education plans been imparted throughout the country. These educational projects cover plenty of the industry's needs, and are not only limited to the private sector. They vary from in the field training with seed samples in the northern regions (Mullins & Taylor, 2017), to Masters in Science programs in seed systems with a continental scope at the Kwame Nkrumah University of Science and Technology (KNUST) (Akronah, 2017)ⁱⁱ.

	<ul style="list-style-type: none"> • Most the programs are funded through international cooperation, either directly or through scholarships. The industry requires a central institution that will act as a centralized database of the programs that are being imparted. This role should be assumed by NASTAG. • Training and educational programs designed for semi-formal growers are required. The objective of this type of programs is to assist their growth, by increasing their capacity to supply high-quality seeds. The programs should focus mainly on quality control, adoption of new varieties, good agricultural practices, and basic business concepts for SMEs.
<p>26. Reliable certification system</p>	<ul style="list-style-type: none"> • The role of GSID is fundamental for the industry’s credibility. Currently, GSID is underfunded. Fees paid for inspection tasks are appropriated by the Government’s central financial system. Therefore, GSID is understaffed and does not have the funds to cover field inspections (MoFA; USAID; AGRA, 2017). Additionally, GSID has an inadequate analysis infrastructure throughout most of the country. • Within the regulations pending approval, there is a proposal for GSID to accredit private inspectors, but it seems that MoFA has not taken a definite position on transitioning to a private-led seed certification process (Nuñez-Rodriguez, 2017). If GSID’s accreditation process is implemented, private seed inspectors would be responsible before the GSID for their certification activities and would pay fees to keep their accreditation credentials. In this case, MoFA’s PPRSD would play more of a regulator role, which is exactly what is needed to leave the private sector to take on more roles as mandated by Ghana’s Seed Policy. Expanding the role of the private sector in the seed certification process would eliminate the hurdles currently faced by seed growers confronted with GSID’s current limited operational capacities. Also, there is limited information on the total cost of accreditation (IFPRI, AGRA, ATT, & APSP, 2015).
<p>27. Strong legal framework for seed companies</p>	<ul style="list-style-type: none"> • As discussed in section 3.2, the legal framework is incomplete. The dearth of clear regulations prevents new formal enterprises from entering the industry. This situation creates legal insecurity, increasing the risk of the activity. • Another factor that requires attention is the implementation of a national seed policy, through the national seed plan. As discussed before, the operationalization of the plan will promote the growth of the industry, but given the budget limitations, it may create false expectations • MoFA with the implementation of the PFJ, can promote the growth and modernization of the seed industry as a driver for the program’s own success. The approval of all pending laws and regulations is required to attract new players to the industry, and to allow the current ones to grow.

<p>28. Clear land ownership laws</p>	<ul style="list-style-type: none"> • Ghana ownership laws vary from one region to another, based on the traditional chieftaincy customs. The ownership structure does not follow a written code. Around 80% of the country is under this regime⁵⁸. Lands are owned by the traditional chiefs, and leased for a 99-year period⁵⁹, although in some situations the land is sold. The lease cost is determined at the time of the claim before the chieftaincy (Adiaba, 2017). Often the lease cost is determined by the lessee on a yearly basis⁶⁰. • Access to land through chieftaincy structures for women is not equal. While in the southern regions the chieftaincy is matrilineal, giving more overall rights to women; the northern regions are patrilineal, with a high level of discrimination (Issaka, 2017). • According to Adiaba (2017) lessees have the option to register the land before the lands commission; but it is neither required, nor the customary practice. This system is unreliable, since the lands can be claimed back by the chiefs without due diligence or legal justification, but instead, based on arbitrary decisions. The overall system is complex, and few people fully understand it. • Land ownership is a critical issue in Ghana. It adds an additional risk factor to agriculture, preventing farmers from investing more on their farms. While this certainly is an issue, the bright side, especially under the difficult credit conditions discussed above, is that land is accessible at a relatively low cost to develop a new farm.
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⁵⁸ Of the rest, 1 under the supervision of the Commission of Public and Vested Lands. Around 18% is state owned public lands and 2% is community vested lands.

⁵⁹ The periods are 99 years for Ghana nationals and 50 years for foreigners.

⁶⁰ One of the owners of a formal seed enterprise commented that “he was claiming new land, and he was in good terms to the chief because he offered good gifts to him every year” (Iddrisu, 2017).

3.3.3.1 CERTIFIED SEED COMPONENT ANALYSIS CONCLUSION

The certified seed component is underdeveloped and faces many challenges. The overall structure of the industry, with the low level of rivalry between players in a very small portion of the seed industry, shows a very immature industry. This is reflected in the vicious circle derived from the lack of demand/lack of supply cycle. The inability to increase the uptake of improved seeds by farmers, while being an actual issue, turned into an excuse for not pushing the market and this eventually led to a decrease in seed production during the last seven years (The World Bank, 2012) (NASTAG, 2017).

Over the last years there have been some important advances in several fronts:

- The first, is the presence of formal seed enterprises, raising the quality standards, and introducing new varieties, focused on hybrid maize.
- Another factor, is the variety of training and educational programs on seed-related issues, catering to the interest of all stakeholders in the seed industry.
- The creation of NASTAG has the possibility of varying the industry's dynamics, by channeling and championing the needs of the growers, and coordinating the activities of all stakeholders. These efforts must be combined with a reliable information management system.
- The interest shown by MoFA—especially now that one of the PFJ's pillars is the supply of certified seeds—provides a unique opportunity to advance a seed sector growth strategy, fund the national seed plan, establish the Seed Fund as envisioned by Act 803 and fundamentally to improve the business enabling environment to promote and enhance private sector investments in the seed industry.

3.3.4 LOGISTICS AND DISTRIBUTION COMPONENT ANALYSIS

The logistics and distribution component is responsible for delivering the seeds to the commodities farmers. The dealers' network is organized, but still presents challenges in various fronts. For international seed trade, the limitations are even deeper, with seed regulations—which could help in its development—pending approval. Below, is the analysis of the elements and characteristics of this component.

29. Countrywide distribution network

- Agri-input dealers in Ghana are represented by the Ghana Agro Input Dealers Association (GAIDA) which was founded in 2004. This association groups more the 3,000 agri-input dealers. GAIDA is supported by the Ghana Agro-Dealer Development Project (GADDP) (GAIDA, 2012). The network is composed of, wholesalers, and tabletop dealers. Dealers mostly sell chemicals and fertilizers (Krausova & Branoah Banful, 2009).
- Only 61% of agri-input dealers sell certified seeds, but this percentage hides high variations amongst regions. In some regions, like the Northern and Upper East ones, coverage is as low as 30% and 45%, respectively. This includes not only the crops covered in this study, but a wider variety. While the coverage for maize is 53%, for rice it is only 3% (Krausova & Branoah Banful, 2009).
- Although, the overall network is large and present in most districts of the country (GAIDA, 2012), their sales of seeds at the dealer level is low, as one might presume with seed uptake as low as it is currently in Ghana. A direct consequence of low seed demand is the low volumes of certified seeds produced. Based on the 2016 production of 2,600 Mt, coverage per dealer would be 0.87 Mt.
- Dealers are mostly family owned and their owners have limited technical knowledge. Access to credit is scarce, implying that many facilities do not have the conditions for seed storage. Recently, AGRA and IFDS have started training programs in several business areas (Boateng & Anfu, 2017). The inclusion of CS management and marketing in the programs' curricula will improve the quality delivered to the farmer and the overall uptake.
- Transportation plays a major role in the distribution network. According to the World Bank (2012), Ghana has a relatively well-developed road system when compared with other low-income countries road networks (but poor compared to medium income countries). Nevertheless, transportation cost is still considered high due to low traffic and availability, and it is still a constraint for agricultural development. The rural access index for Ghana is 61%⁶¹. Overall, the road network presents challenges for agricultural development, but it should not be considered a limitation for the industry's growth.
- Seed growers and enterprises also have direct sales and distributions through different channels. ATT supplied several seed growers with vans outfitted with loudspeakers and painted distinctively to reach farmers (Mullins & Taylor, 2017). Also, other formal seed enterprises have contracts to sell their production directly to large scale farmers (Akronah, 2017).
- The inclusion of the agro-input dealers into the PFJ program for the next three years is key for the development of the industry, and the growth of the network (MoFA, 2017).

⁶¹ Rural Access Index measures the percentage of rural people living within 2 km of an all-season road. This data was generated based on the Ghana Living Standards Measurement Survey conducted in 2006 (The World Bank, 2012).

	<ul style="list-style-type: none"> • The PFJ program, while offering immediate benefits for various stakeholders of the industry, should be used by all seed actors from the public and private sector, to put in place permanent mechanisms to support the development and modernization of the industry. • On the one hand, the GoG through the PFJ is looking to increase availability of improved seeds to attain huge impacts on production, reduce the food import bill, increase incomes and generate thousands of jobs. This should be harnessed by MoFA to tackle once and for all the structural limitations that as indicated in the present report, hinder seed development in Ghana. • On the other, the private sector should grab the opportunity of such important public program being a major purchaser of certified seeds, to improve and increase production and quality of seeds, work with agro-input dealers and breeders on promoting new varieties and promoting among farmers the virtues of improved seeds and engage with all parties concerned on a collective and coordinated effort to push forward the implementation of the National Seed Plan, including the execution of the recommendations stemming from the SMIFS.
<p>30. Available credit from CS enterprises to agro-input dealers</p>	<ul style="list-style-type: none"> • Purchasing goods on credit is not a customary practice among agri-input dealers, in fact it is under 40%. In certified seed purchases the percentage is even lower, with an average of 8% (Krausova & Branoah Banful, 2009). Clearly, the cost of capital and low access to financing is a burden on commercial credit. • Although purchase credit availability is low, on average around 64% of dealers sell on credit to their clients. Nevertheless, the percentage of seeds sold on credit is estimated at less than 5%. • Commercial credit will improve the reach and uptake of CS. New models are required to increase the availability of commercial credit, even under the country's tight capital restrictions. • The first purchase of OPV maize by MoFA for PFJ was on a six-month commercial credit for more than \$1.3M (Nyamid-Clotey & Havor, 2017). This presents a challenge for the whole CS component, since seed producers need to buy supplies for the next season before the payment is due.
<p>31. Reliable and constant seed supply</p>	<ul style="list-style-type: none"> • The seed volume produced in 2016 is not enough to properly supply the more than 3,000 dealers associated to GAIDA⁶². During the planting season, dealers have problems procuring certified seeds (Issahaku, 2017). To reach an expanded number of the dealers' network, production must increase in line with the demand. • During the 2017 planting season the situation with PFJ worsened. MoFA committed to purchasing more than 75% of the certified seed inventory. This created a shortage of CS in the market, rising prices (Issahaku,

⁶² In the 2016 planting season less than 50% of the maize seed production reached the farmers directly, since the government purchased around 800 Mt for PFJ.

	<p>2017), but the full implications of the situation require further assessment as subsidized seeds at a lower price still had to reach the market⁶³.</p> <ul style="list-style-type: none"> • The market’s lack of maturity presents a difficult scenario in which to evaluate the reliability of the supply. The market is not balanced, as in some instances there is lack of supply from growers, but the low uptake shows a lack of demand from farmers as well. As the market matures and tools used to forecast the demand are implemented, the market will balance out.
<p>32. Availability of local and imported seed</p>	<ul style="list-style-type: none"> • Local seed supply is limited as shown in section 3.3.3, but imported seed availability is also limited. There is only one company actively importing seeds into Ghana, RMG-WIENCO; most of the imported seed is for hybrid maize. (Kotey, 2017). • Importing seeds into Ghana requires authorization from the Minister (Plants and Fertilization Act 803, 2010), and the average time to acquire permits is around 90 days (TASAI, 2016). The authorization from the minister is considered a non-tariff barrier to support local industry (Tripp & Ragasa, Hybrid Maize Seed Supply in Ghana, 2015). The time-period for permits in Ghana contrasts with other countries in the continent with more developed seed markets, where the average time is around 60 days (TASAI, 2015). Additionally, the seed ECOWAS harmonized regulations, which will facilitate imports, are still pending approval (as discussed in section 3.3.2). • Ghana is not an attractive market for international seed traders, due to seed uptake and the periods required to acquire the permits. <ul style="list-style-type: none"> “... Ghana’s current seed law contains a provision (Plants and Fertilizers Act of 2010, Act 803, Section 39 (3) tying the commercialization of seed to importation and the approval of import licenses, which is not common in countries’ seed laws. While this provision, which also appears in a slightly less prescribed form in Ghana’s National Seed Policy (Section 13.2.3), is clearly designed to encourage development of the local seed industry, capturing the benefits as the ECOWAS market opens up, it will rely upon a more balanced approach in this area” (Kuhlmann & Zhou, 2016, p. 3). • For PFJ, MoFA was contemplating the possibility to import OPV maize seeds (Obatanpa) from Burkina Faso to adjust the volumes originally established in the plan, which the local producers did not fulfill (Aboagye, 2017).

⁶³ The visit to the agro-input supplier was done in the first days of the planting season in Tamale, prior to the seed distribution of PFJ.

33. Exporting capacity	<ul style="list-style-type: none"> • The current regulations allow for the export of seeds (Plants and Fertilization Act 803, 2010), but without the ECOWAS harmonized regulations the process is difficult (Kuhlmann & Zhou, 2016). • A restricted market for imports, as discussed in the previous element, usually limits the exporting access of the country. Under the actual production conditions, exporting certified seeds is not a feasible project due to small volumes; but it is an element to consider for the industry’s future. • Logistics for exports presents several handicaps. As discussed above, internal transportation costs are high. Ghana has a rating of 2.47 out of 5, on the Logistics Performance Index (LPI) ⁶⁴. On most LPI indicators, Ghana is ahead of the other countries in the region.
34. Inspection system for counterfeit product	<ul style="list-style-type: none"> • Counterfeit certified seeds are identified as an issue by TASAI (2016). The source of the product is identified as either seed companies packing grains as seeds, or dealers (TASAI, 2016). As in most underground activities, estimating the full extent of the effect of fake seeds is challenging. Nevertheless, it requires attention from the government. Measures need to be taken to prevent fake seeds from reaching the market, and these may vary from controlling packaging material, to following up GSID registered areas and volume projections by producer. • Although, GSID has the authority to enter warehouses, inspect and confiscate fake seeds (Plants and Fertilization Act 803, 2010), the Division does not have the resources to do so (Aboagye, 2017). Furthermore, there is a lack of understanding of the law and regulations regarding this topic (TASAI, 2016). • Counterfeit seeds have a deep impact on the industry. Farmers that buy counterfeit seeds may experience a range of consequences, from very low yields to no germination. Such experiences lead farmers to reject the benefits and use of certified seeds in the future. • One factor that requires further analysis is that even with a low demand for certified seeds, there is market for fake seeds; and given that counterfeit items tend to exist in markets with high demands, this could reflect the lack of supply from seed growers.
35. Regional seed harmonization	<ul style="list-style-type: none"> • Approval of seed regulations harmonized per ECOWAS is pending approval from the parliament. The approval requires that the <i>Food, Agriculture and Cocoa Affair Committee</i> convene, but for the members to convene, seating fees need to be paid (MoFA; USAID; AGRA, 2017).

⁶⁴ The LPI is the weighted average of the country scores on the six key dimensions: (i) Efficiency of the clearance process (i.e., speed, simplicity, and predictability of formalities) by border control agencies, including Customs; (ii) Quality of trade and transport related infrastructure (e.g., ports, railroads, roads, information technology); (iii) Ease of arranging competitively priced shipments; (iv) Competence and quality of logistics services (e.g., transport operators, customs brokers); (v) Ability to track and trace consignments; and (vi) Timeliness of shipments in reaching destination within the scheduled or expected delivery time.

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| | <ul style="list-style-type: none">• A harmonized seed regulation environment will ease regional trade, opening opportunities for a growing industry and rising the level of competitiveness. |
|--|--|

Expanding input markets across borders, therefore, could be of significant benefit in achieving the economies of scale and savings on transport costs needed to bring input prices down and improve choice and availability. Particularly as governments look to maximize the returns from input subsidies, efforts to save on trade costs and promote intra-regional trade are fundamentally important (Keyser, Eilittä, Dimithe, Ayoola, & Sène, 2015).

3.3.4.1 LOGISTICS AND DISTRIBUTION COMPONENT ANALYSIS CONCLUSION

The agro-input dealer network reaches most of the country with more than 3,000 locations; but logistically it presents operational constraints. Supply from growers is limited, which restricts the availability of certified seeds on site. Transportation costs are high, increasing the cost of seeds at the dealer-end. Additionally, storage is not optimal, thus compromising quality. These factors combined limit the opportunities to leverage high volume transportation to lower costs, since there is not appropriate storage. Finally, control of counterfeit seeds at the dealer is required; otherwise as the demand grows, its effect will multiply, since more fake seed traders (either local suppliers or smugglers) will be attracted to the market.

International trade presents its complications as well. Import permits require more than 90 days, as well as approval from the Minister of Food and Agriculture. While approval of harmonized regulations may help in reducing this time-period, the law has the intention to discourage imports, since the Minister has the final approval. Although, the industry is currently not ready to export, in the future the high-level of institutional approvals may trigger international retaliation in destination countries.

3.3.5 COMMODITIES FARMING COMPONENT ANALYSIS

All the previous components of the seed industry cater to the commodities farmers. Commodities markets drive the demand, which for Ghana is very low. The analysis of the commodities market presents a quandary: is the low CS production driving the uptake level, or is the low demand, driving the CS production. The incentive behind developing a strong CS industry is to improve the socioeconomic conditions of farmers via an increase in quality and productivity.

The following analysis will cover the elements of this component.

36. Farmer Demand for CS

- Certified seed uptake for the five crops covered in this study is under 6%. As seen Table 12, the highest uptake was for maize with 7.6%, and the lowest one was for sorghum, which in 2016 has reported no CS production. The total production volume is 2,600 Mt, and under such a small volume, the demand seems to be higher than the supply. Still, some producers struggle to sell their seed (Kwabana, 2017).
- Maize is the crop with the highest uptake and farming area. According to Etwire, Ariyawardana, & Mortlock (2016), the ten factors influencing the farmer's decision to use certified maize seed are (most relevant first):
 - ▶ Seed availability
 - ▶ Affordability
 - ▶ Available grain market
 - ▶ Pest and disease resistance
 - ▶ Grain price/profitability
 - ▶ Packaging
 - ▶ Taste and nutrition
 - ▶ Grain size
 - ▶ Fertilizer requirement
 - ▶ Early maturity
- Seed availability is a challenge that needs to be addressed by the core components. The cost of seeds is around 14% of the total farming input costs; the second highest behind hired labor (The World Bank, 2012), but affordability should be relative to yield. The fact that yield is not an aspect farmers consider when purchasing CS, raises some questions.
- Yields are very low when compared to the breeders' claims. In the case of Maize, yield is 1.7 Mt/ha, with a potential yield from 3.5 Mt/ha to 7 Mt/ha; and in the case of rice, yield is 2.6 Mt/ha, with a potential of 4 Mt/ha to 8 Mt/ha (MoFA, 2016)⁶⁵. The situation with other crops is similar. While yield is affected by several elements, the current low yields create a lack of trust in the claims of varieties (Bokuma, 2017). Farmers who have a good experience with CS tend to keep using them (Bernard, Hellin, Nyikal, & Mburu, 2010).
- Rice consumption patterns demand a higher percentage of premium rice. Currently, most of this rice is imported, and sold at a higher price (MoFA, 2016). Furthermore, two released varieties

⁶⁵ In the case of Obatampa maize, which is most of the seed cultivated, the claimed yield is 4 Mt/ha to 5 Mt/ha. For Agra and Jasmine 85 rice, which are the more popular varieties, the potential yield is 5 Mt/ha to 6 Mt/ha (USAID; IFDC, 2015).

	<p>available on the market have a high potential to produce rice with these characteristics, AGRA and Jasmine 85.</p> <ul style="list-style-type: none"> • Hybrid maize adoption requires additional efforts. The hybrid maize CS production for 2016 was just 137 Mt (less than 10% of total production) (Nyamid-Clotey & Havor, 2017), plus an import of 50 Mt⁶⁶ (MoFA; USAID; AGRA, 2017). <ul style="list-style-type: none"> • There is extensive literature on hybrid maize adoption and recommendations for Ghana and West Africa, which dates back to the mid 1990's, but adoption is still very low. In the same period, other African countries reached adoption rates of around 70% (Tripp & Mensah-Bonsu, Ghana's Commercial Seed Sector: New Incentives or Continued Complacency?, 2013) (Cortes J. E., Seed Systems Overview in Ghana, 2017). Tripp and Ragasa (2015) expose the low level of farmer awareness of hybrids; out of 630 farmers surveyed, less than 10% have heard the term hybrid and only one-fifth of those knew that hybrid seeds should not be recycled. Furthermore, most confuse the OPV and Hybrid varieties. • As expected, yields of hybrid maize have shown better results consistently when compared with OPVs, (Ragasa, Chapoto, & Kolavalli, Maize Productivity in Ghana, 2014); but the results vary between different experiments. The most influential variable is fertilizer use. • The evidence shows that there is demand for certified seed at the current volumes, and that the market will absorb small increases in supply under the current market conditions. For higher increases in supply, the issues exposed above need to be systematically addressed. • Hybrid maize adoption, besides seed availability, may require specific nationwide programs. These might include, the implementation of a specific subsidy (which may work with PFJ), education and training campaigns, and extension agents versed in hybrids.
<p>37. Good agricultural practices</p>	<ul style="list-style-type: none"> • The adoption of GAPs among farmers is key for the development of the certified seed industry. The underperforming harvests in Ghana, even with certified seed respond in part to the lack of GAPs (Ragasa, Chapoto, & Kolavalli, Maize Productivity in Ghana, 2014). These below-average results affect the industry in two ways: first, it reduces farmers' revenue limiting their financial capacity to purchase CS, and, it creates a mistrust in the breeders' claims about potential yields. • Fertilizer use in Ghana is subpar. On one hand, the composition of fertilizers used does not change depending on the soil's characteristics in different regions (AGRA & MoFA, 2017). On the other, application rates are lower than recommended (Ragasa, et al., 2013) (The World Bank, 2012). In the last 20 years fertilizer use has increased, but is still low (Ragasa, Chapoto, & Kolavalli, Maize

⁶⁶ Imported hybrid maize seed statistics are not readily available, but Tripp and Ragasa (2015) reported 760 Mt imported in 2014.

	<p>Productivity in Ghana, 2014); this has been influenced by different subsidy campaign throughout this period. As mentioned above, PFJ includes fertilizer subsidies.</p> <ul style="list-style-type: none"> • Recent studies by Ragasa et al. (2013) show that row planting and correct seeding rates have been adopted by maize farmers. Also, the use and availability of cheap insecticides from China have increased. Mullins and Taylor (2017) report that in the northern region there is an adoption rate of over 90% of at least one of the GAPs they promote (row planting and seeding rates, use of fertilizer or use of certified seed). Furthermore, postharvest and storage practices need further adoption. • Although the use of GAPs seems to have improved in recent years, the need for further adoption is imperative, not only to impulse the certified seed industry, but to raise farming population's socioeconomic conditions.
<p>38. Extensive outgrower/nuclear/cooperative farming schemes</p>	<ul style="list-style-type: none"> • Outgrower models work as distribution networks for agriculture input supplies, including certified seeds. The ADVANCE II project has worked with more than 113,000 small scale (around 2 hectares) farmers through 400 outgrowers. While farmer cooperatives have not developed well, aside from the one created for cocoa producers, three different types of models have been successful in the staple crops (Issaka, 2017). <ul style="list-style-type: none"> • Nucleus farmers, which are farmers who provide services to smaller farmer, and buy back their production, and then sell on the open market Around 80% of the outgrowers supported by ADVANCE II are nucleus farmers. • Aggregators, who work as nucleus farmers, but are not farmers themselves • Farmer Based Organizations, which are conglomerations of farmers leveraging on the benefits of volume to procure supplies, share equipment and sell their production. • The ADVANCE II team, as discussed by Issaka (2017), observes that the local seed industry has not developed a solid base. The perception of ADVANCED's stakeholders is that both seed quality and availability are low. This is reflected in the planting season, where farmers, even with access to certified seeds, do not plant a 100% of the plot with purchased seeds, but instead only a percentage, using saved seeds for the rest. • A successful maize outgrower model based in Tamale is Masara N'Azarik (Hausa language phrase for prosperity), a farmers' association. This association covers the three regions of northern Ghana and is the result of a program promoted by Wienco⁶⁷. The association has increased from 1,5000

⁶⁷ Wienco is the leading importer and supplier of agricultural inputs in Ghana, associate with RMG Concept Ltd, a regional distributor of crop protection products (RMG Concepts, 2011)

	<p>members at its creation in 2005, to over 10,000 in 2014 (Ibrahim, 2014). Wienco has supplied its members with imported Pannar seed. In 2014, Ragasa, Chapoto and Kalavalli, found that the yields of the Pannar variety are in average 60% higher than those of Obatanpa, 95% higher than local varieties and 40% higher than Mamaba (local hybrid). Wienco, also has a similar program in the Volta Region, Copa Connect, but this one is focused on rice catering to the Global Agri-Development Company (GADCO) (Bill and Melinda Gates Foundation, 2012). The replication of this successful model in other regions and with other crops, will boost the demand for certified seed and the well-being of the farmers.</p>
<p>39. Strong extension service</p>	<ul style="list-style-type: none"> • Ghana extension services are scarce, due to budget limitations and the current freeze in public employment. The current ratio of extension agents to farms is 1 to 5,000. (Osei-Akoto, 2017). • The existing extension system is not knowledgeable of the benefits of certified seeds. These systems are unable to disseminate the benefits of improved varieties (Ragasa, et al., 2013). • MoFA is planning to increase the extension agents by 1,000 a year during the next four years as part of PFJ. Leveraging in the program importance for the current Government, they are requesting the unfreezing of the public employment hiring ban, and handling the recruitment of new graduates. (Osei-Akoto, 2017). If successful, the training program will include the adoption of certified seeds and maize hybrids.

3.3.5.1 COMMODITIES FARMING COMPONENT ANALYSIS CONCLUSION

The commodities farmers are suffering the consequences of the dearth of good agricultural practices. The scarce yields affect their overall socioeconomic conditions. These yields respond to several reasons, but clearly the low adoption of modified varieties is one of the determining factors. Unfortunately, with low yields, comes low revenue; limiting the capacity to purchase certified seeds. Additionally, even when CS are used, the lack of other GAPs influences the harvest outcomes, resulting in a distrust of the seed⁶⁸.

There are superior results for certified seed adoption through outgrowers schemes, but the most successful one relies on imported hybrid maize seeds (i.e. Masara N' Ariziki). The outgrower schemes, among other things, assume part of the responsibility of extension services, which achieves a better technology transfer. The success of the certified seed industry falls upon the acceptance and adoption of the improved varieties; but the independent progress of each farmer also depends, in part, on their adoption.

3.3.6 COMMODITIES MARKET COMPONENT ANALYSIS

Increases in productivity from the use of certified seeds or any other adoption of GAPs will require a market able to absorb this new volume. While maize consumption has not increased, rice has grown by more than 100% in the last 10 years. Even though, rice has doubled in the same period, local farmers still produce only 50% of the annual requirement (see Table 17 below for reference). This deficit is balanced with imports of premium rice, mostly from Thailand and Vietnam (MoFA, 2016). Consumers are willing to pay a premium of over 100% for this rice. This higher price is in part due to an import tax on milled rice of 36% (Bill and Melinda Gates Foundation, 2012).

Rice and soya beans require an industrial component for large-scaled processing. The production of soya beans has also increased more than 90% in the last ten years (MoFA, 2016). Processing capacity has increased in recent years for both rice and soya (Bill and Melinda Gates Foundation, 2012) (Ghana News Agency, 2012). The connection between agricultural industries and farmers goes beyond the mere existence of a market necessary to absorb production, and evolves into a symbiotic relationship. All crops presented have the potential to duplicate their output, without extending their acreage. The elements involved in this component are analyzed below.

Table 17: Estimated Production, Exports and Imports for 2013/2014

Crop	Production (MT)	Imports (MT)	Exports (MT)	Estimated Net Consumption
Maize	1,764,477	1,200	10,000	1,189,350
Rice	392,972	644,334	144	845,760
Soya	138,673	-	84	52,860
Cowpea	200,405	-	-	132,150
Sorghum	256,736	-	-	132,150

Source: MoFA 2016

⁶⁸ As seen in subsection 3.3.3, other aspects may influence yield, like counterfeit seeds. This happens with less frequency, but the result on the perception of certified seeds is the same.

<p>40. Strong agro-industrial sector</p>	<ul style="list-style-type: none"> • Ghana does not have a strong agro-industrial sector for the five crops covered in this study. Only 10% of the maize production is processed, of which more than 95% is for the poultry industry. This is a trait of an embryonic market, and to modernize and grow, it must add value to the crop. Urban supermarkets offer different presentations of imported maize products, but they are hard to penetrate since they are dominated by multinational brands such as Nestle and Unilever (The World Bank, 2012). • Rice and soya have a more developed industrial sector. Around 70% of the rice production is milled (MoFA, 2016). Investment in the last five years has increased the milling capacity. According to the Bill and Melissa Gates Foundation (2012), these facilities are undersupplied. Soya has also seen an increase in processing capacity, mostly for oil (Ghana News Agency, 2012). • Further development of industries to process higher volumes is required as the yields increase. In the case of rice, the product quality must also increase to compete with imported premium rice. Soya production is still low, but offers high potential, for which processing plants will be required.
<p>41. Agro-industry integration with farmers</p>	<ul style="list-style-type: none"> • The integration between industry and farmers shares similarities with the relationship between integrators and farmers covered in the previous section. The rice processing industry shows a level of integration. Avnash in the northern region and GADCO with Copa Connect in the Volta Region. In both models, the company provides certified seed (Jasmine 85), optimized fertilizers, and they even offer irrigation programs (Bill and Melinda Gates Foundation, 2012). • The maize industry is underdeveloped, and most of the industrialized milling is for poultry feed. In the last two years, ADVANCE II has focused on a program for integration, based on their aggregation model. Nevertheless, the certified seed uptake from the ADVANCE II farmer is still low due to mistrust regarding the quality of the seeds (Issaka, 2017). • Although soya beans require industrialization processes, there is little evidence of integration with farmers. Sorghum farming seems to be on dire straits, with the aggravating factor that only 10% of the production is procured by institutional buyers (Ghana News Agency, 2016). In the case of cowpea, little industrialization is required for its consumption. Most the market moves through traders and wholesalers (Quaye, et al., 2011).
<p>42. Active agro-exporter sector</p>	<ul style="list-style-type: none"> • As shown in Table 17, the five crops studied in this analysis have almost no exports (less than 0.4% of production). Current production levels do not offer a surplus for export, but it also implies that export expertise and logistical requirements for these crops are limited. Nevertheless, Ghana does have a relevant cocoa export operation from which several skills could be learned. Developing these skills and opening markets as productivity rises is essential in placing additional production.

3.3.6.1 COMMODITIES FARMING COMPONENT ANALYSIS CONCLUSION

The actual commodities market will not be able to absorb a significant growth in productivity. On one hand, in all but one of the crops, the demand is satisfied. Rice will require a significant increase in quality to reach the market as a premium product, and compete with imported varieties; however, there is idle capacity for its processing, and there should be an intent to invest in expanding capacity if required. In the case of soya, additional investments in processing facilities will be required, but synergies can be found with the palm oil industry to develop the market. Maize and sorghum will require alternative markets and investments for the additional volumes to be absorbed.

The other alternative is to export the surplus production. This alternative will apply to all crops, but requires different logistics, infrastructure and expertise for each one. Looking ahead, boosting export capacity should be a priority for the GoG. Efforts in improving yields to benefit farmers will not prove fruitful if they cannot sell their harvest and the prices fall. A decrease in prices will affect all farmers, not only those with higher yields. While these farmers may compensate revenue with a higher volume, the overall revenue might not increase.

3.4 INDUSTRY ANALYSIS CONCLUSION

The certified seed industry in Ghana is underperforming, while it has great potential. When compared with other regional economies seed uptake is extremely low (TASAI, 2016). This is clearly reflected in the certified seed volume and uptake. Even though numerous efforts have been realized to improve the situation, the issues persist. There is ample research, efforts and recommendations documented and most of them are guided in the same direction. However, pointing out one specific problem responsible for the state of the industry proves to be difficult.

Throughout the analysis, issues are exposed regarding most of the elements of the industry. However, some are in a better position than others. The process of balancing the whole industry towards the target, requires coordination among all actors with specific objectives at each level. Policies and regulations must be consistent with subsidies programs, which need to be tied to the market and industry requirements, while aligned with the characteristics and availability of specific varieties. This coordination makes the market more attractive for potential CS growers, which is necessary for the expansion in the industry's production.

In order to reach the target industry level, several programs are required. An industry-wide strategy should be deployed, considering that some of the elements are not exclusive to the industry. The following chapter will focus on this strategy weighting on solutions that will show results in the short term, building up the industry from different approaches.

4. STRATEGY AND RECOMMENDATIONS

The second chapter presented an analysis framework with 42 elements required to achieve a target level of development for a mature industry. In the previous chapter (Chapter 3), these elements were used as the basis of an analysis of the current state to the industry. Now this chapter will bring together the framework and the current state of the industry and based on their content, undertake an analysis of the gaps that are hindering the growth and modernization of the Ghanaian seed industry and produce specific and actionable recommendations. In turn the recommendations will derive into a set of strategies being proposed to bridge the gaps towards achieving a target industry and reaching the proposed characteristics and volumes.

4.1 GAP ANALYSIS

The gap analysis is based on the 42 elements presented in chapter 2 (Table 2). The matrix has 5 columns which represent the following information:

Element: The name of the industry's element on the framework and developed in the analysis.

Score: A grading system that goes from 1 to 5 and represents how close each element is to the industry's target. 5 is the highest score representing that the element is closest to the industry's target.

Critical level: A critical level determines how important each action required is.

Critical Level 1: requires actions to be completed within the next year.

Critical Level 2: are longer processes and require actions to be completed in the next 3 to 4 years.

Critical Level 3: the recommendations for these elements are important but not urgent, and will either be required as the industry grows, or they represent wider issues that need to be addressed adequately by the Government of Ghana.

Gap: Based on the analysis, the gap represents the most important issues affecting the proper development of the element.

Recommendations: A set of specific actions required to start closing the gap.

Responsible and Cooperating Parties: The parties which are considered either responsible for or competent and with the necessary resources to assist in the implementation of the recommendations.

The objective of the recommendations in the analysis is to diminish the gaps between the current state of the industry and the target industry. The experience of other African countries (Table 18) shows that once the industry starts developing under the proper conditions (i.e. the elements of the framework are all working smoothly), the market self-propels its own growth.

The implementation of the recommendations has a proposed 5-year timeframe. By the end of year five, the expectation will be that all the Critical Level 1 & 2 elements have been addressed, enabling seed industry stakeholders to reach at least 40% of the target area (Table 19) with certified seed uptake as per the coverage targets set out in Table 2.

Table 18: A comparison of African countries' seed sales for 2006

Country	Maize Area	Maize seed sale as % maize area	Hybrids as % of maize seed sale
Zambia	750,000	73%	93%
Zimbabwe	1,713,000	80%	92%
Malawi	1,762,840	22%	32%
Kenya	1,888,190	72%	94%
Tanzania	2,570,150	18%	65%
Uganda	819,000	35%	39%
Ghana	793,000	6%	4%

Source: (Tripp & Mensah-Bonsu, Ghana's Commercial Seed Sector: New Incentives or Continued Complacency?, 2013)

Table 19: Estimated CS uptake at the end of year 5

Crop*	Target Area (%)	Total Area (Has)*	Target Area (Has)	Breeder Seed Revenue (\$)	Foundation Seed Revenue (\$)	Certified Seed Revenue (\$)
HybridMaize	24%	1,025,000	246,000	\$ 2,031	\$ 124,602	\$ 15,103,256
OPVMaize	4%	1,025,000	41,000	\$ 812	\$ 33,227	\$ 1,376,074
Rice	16%	224,000	35,840	\$ 3,608	\$ 63,143	\$ 2,083,721
Soya	16%	86,000	13,760	\$ 3,793	\$ 85,333	\$ 1,920,000
Cowpea	10%	166,000	16,600	\$ 343	\$ 10,295	\$ 432,372
Sorghum	10%	227,000.00	22,700.00	\$ 11.00	\$ 1,055.81	\$ 173,153.49
Total	22%	1,728,000	375,900	\$ 10,598	\$ 317,656	\$ 21,088,577

*For Maize both OPV and Hybrid the total area is the same as it treated as the same crop.

Figure 9 and Figure 10 below show the progression of the coverage and the volumes for the proposed targets.

Figure 9: Proposed CS Coverage Progression

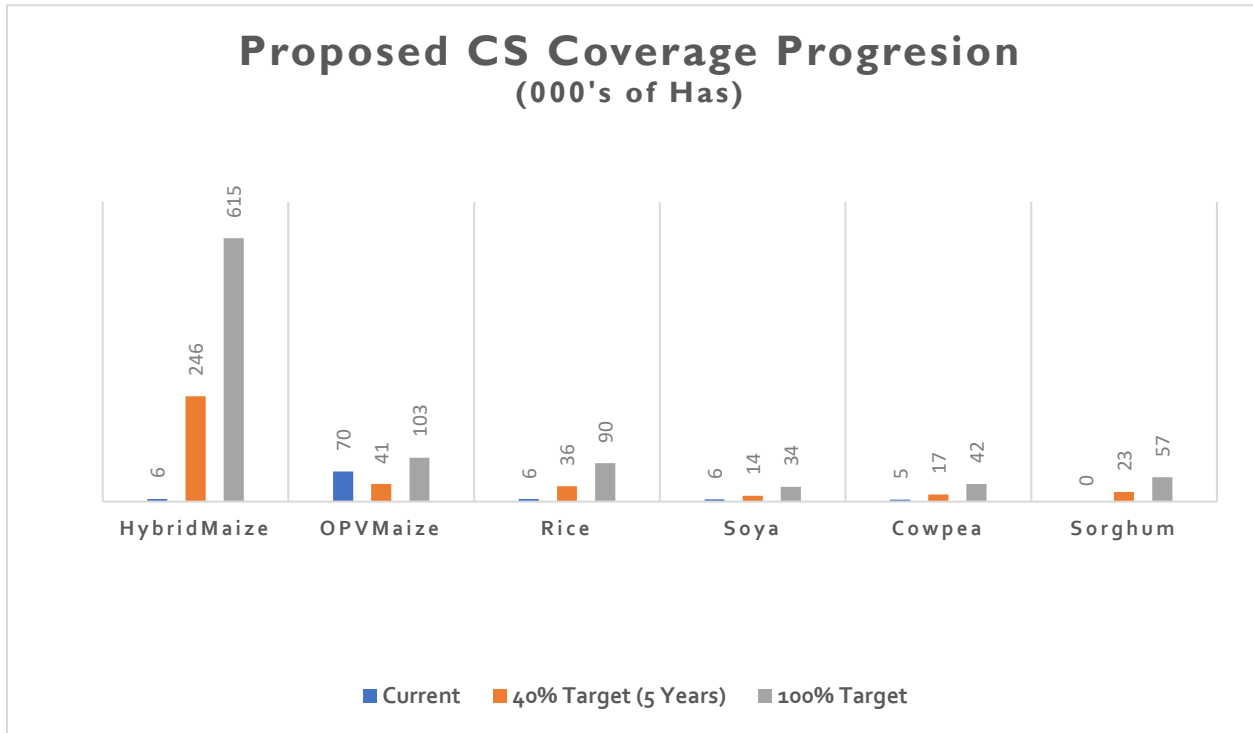


Figure 10: Proposed CS Volume Progression

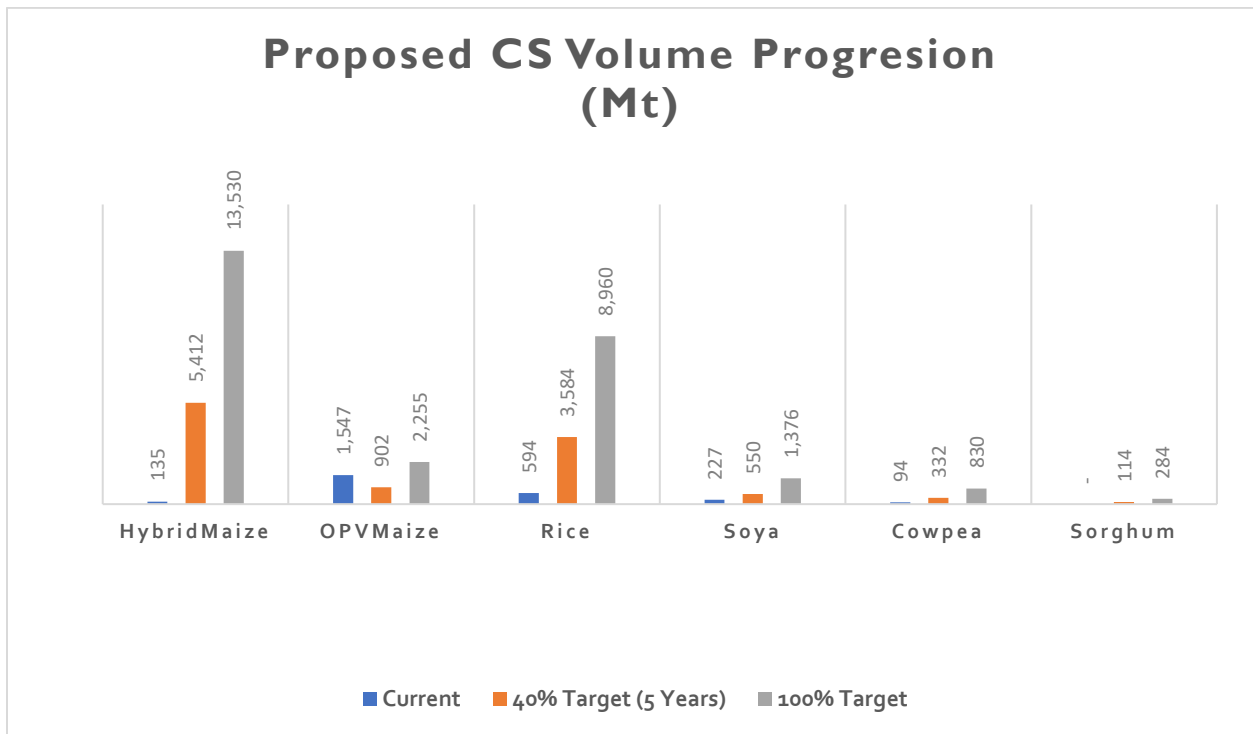


Table 20: List of Gap Elements Score, Critical Level Identification and Recommendations

Element	Score	Critical Level	Gap Identification	Recommendations	Responsible & Cooperating Parties
1. Properly Funded Institutions	2	I	<ul style="list-style-type: none"> NARIs depend on government funding and donor contributions. Only one licensing contract has been signed. 	<ul style="list-style-type: none"> Develop a yearly plan and budget for breeder seed production. Secure complementary funding for the budget through licensing contracts and royalties. Provide capital for seed production startups. Sign contracts to supply breeder seed to FS growers. 	<ul style="list-style-type: none"> APSP NARIs ATT
2. Releasing a Regular Quantity of Varieties Per Year	4	I	<ul style="list-style-type: none"> The amount of varieties is acceptable, but the process is difficult due to the lack of funds and government approvals. 	<ul style="list-style-type: none"> NSC should approve the procedures for variety release and hold variety release meetings at least twice a year. Straggling of planting to reduce and therefore, manage better visits to research plots. 	<ul style="list-style-type: none"> NARIs APSP/ATT NSC
3. New varieties aligned with farmers, consumers and industry requirements	3	2	<ul style="list-style-type: none"> There is limited evidence that any coordination has improved new variety adoption, except for the development of the Tonadana soya bean variety. 	<ul style="list-style-type: none"> Breeders need to reach down the value chain to the final consumer or industry, to understand their different requirements and follow up on adoption and performance of new varieties. NASTAG and CSRI should be the coordinating bodies. Follow up on the performance of varieties from CS enterprises. 	<ul style="list-style-type: none"> NARIs NASTAG CS Growers
4. A specified agricultural package to achieve the variety's potential	2	I	<ul style="list-style-type: none"> There is no written technology package accompanying the seeds sold. The variety catalog is not accessible. 	<ul style="list-style-type: none"> Mandate an internal policy at the NARIs to provide the agricultural recommendation with each release. NASTAG should establish a guideline for all members so they attach technical recommendation to seed packages as part of its seed industry corporate ethics 	<ul style="list-style-type: none"> NARIs NASTAG CS Growers APSP/ATT

				<ul style="list-style-type: none"> • Publish the information on a shared platform on the Internet, which will be managed by NASTAG. • Publish the variety catalog physically and digitally. 	
5. Quality-traceable breeder and foundation seeds	3	I	<ul style="list-style-type: none"> • CS growers are not satisfied with genetics and the physical quality of the seeds. 	<ul style="list-style-type: none"> • Develop a rigorous quality management program at NARIs similar to the one prepared by Cortes and Harries (2015) for the private sector, and implement it. 	<ul style="list-style-type: none"> • ATT • NARIs
6. Seed inventory to satisfy demand from foundation growers based on contracts	2	I	<ul style="list-style-type: none"> • There is no demand forecast at any point of the value chain. • Limited storage facilities. • There is evidence that breeders are overproducing or underproducing seeds of certain varieties. • Only one contract has been signed. 	<ul style="list-style-type: none"> • Survey the foundation seed growers for their plans at least one season ahead • Implement a seed contract system to expand and secure production of FS. • Secure funding to expand and enhance storage facilities. 	<ul style="list-style-type: none"> • NARIs • NASTAG
7. Plant Breeder Rights and Licensing System	3	I	<ul style="list-style-type: none"> • The PBR Bill is awaiting approval in Parliament and may be a lengthy process due to the popular confusion with GMOs. • The Licensing Regulations are pending approval from the NSC although they are not required. • The NSC has no funds to host the meetings, and some members have not been appointed. • NARIs have not embraced licensing contracts. 	<ul style="list-style-type: none"> • MoFA ought to lobby for the approval of the PBR Bill. • NSC should convene at least four times a year. • The NSC should approve the licensing guidelines in their next meeting. • MoFA needs to secure funding for the NSC to host their meetings. • Establishment of Act 803's Seed Fund is imperative to achieve this purpose. • NARIs need mandate for licensing agreements to provide breeder or foundation seeds. 	<ul style="list-style-type: none"> • NASTAG • Parliament • NSC/MoFA • NARIs
8. An institutional and legal framework allowing for the timely release of varieties	4	I	<ul style="list-style-type: none"> • The framework has been ready for approval, but has not been approved by the NSC. 	<ul style="list-style-type: none"> • The NSC need to approve the framework as assisted by APSP. 	<ul style="list-style-type: none"> • APSP • NSC/MoFA

9. Stable and high-quality breeder seed supply	2	1	<ul style="list-style-type: none"> • NARIs do not have enough quality seed of the varieties demanded by the foundation seed growers. • Inconsistency between the production of breeder seed and its utilization. 	<ul style="list-style-type: none"> • This point relates to element 5, but the foundation seed growers also need to assume their responsibility communicating with breeders. • NSC should approve and publish the guidelines for private sector FS production. 	<ul style="list-style-type: none"> • NARIs • FS Growers/NASTAG • MoFA
10. Private companies involved in production of FS	4	2	<ul style="list-style-type: none"> • There are between 3 and 5 companies producing foundation seeds. 	<ul style="list-style-type: none"> • Continue support for these companies with technical and business training. • Motivate other certified seed producers to develop the necessary skills to enter the market. 	<ul style="list-style-type: none"> • NARIs • Educational Programs • ATT
11. Outgrower model for NARIs	2	3	<ul style="list-style-type: none"> • NARIs have some contracted growers, but this is not a common practice. 	<ul style="list-style-type: none"> • NARIs need to contract outgrowers under their supervision. • NARIs will require management training and start up resources in order to be successful. 	<ul style="list-style-type: none"> • NARIs • EcoSIB/AGRA
12. Estimated demand	1	1	<ul style="list-style-type: none"> • The dearth of demand forecasting throughout the industry and the absence of contracts create uncertain requirements for FS. 	<ul style="list-style-type: none"> • A contract system for the production of FS needs to be established. • FS growers need to reach out to CS growers to assess market needs. • Ensure that NASTAG members are using procedures for seed market determination 	<ul style="list-style-type: none"> • FS Growers • NARIs • AGRA • NASTAG
13. Equipment for farming, processing and storage	3	1	<ul style="list-style-type: none"> • Few CS growers have some cleaning equipment, and no storage facilities. • NARIs have small storage facilities. • Limited access to small-scale production equipment. 	<ul style="list-style-type: none"> • There is a need to share equipment and storage facilities that can be used by FS and CS growers. • The GLDB has facilities in several locations with the potential to be refurbished with new equipment (via donors), and managed by a third party like NASTAG; more facilities in other regions will be required. • Include mobile diesel-powered cleaning and processing equipment. • Clear PPP guidelines stemming from the GoG to promote this and other partnerships in the seed industry. 	<ul style="list-style-type: none"> • NASTAG • MoFA • APSP/ATT • MoTI

14. Legal framework for private FS companies	3	2	<ul style="list-style-type: none"> • Pending approval from NSC. 	<ul style="list-style-type: none"> • The NSC should approve the guidelines for FS production in its next meeting. • MoFA needs to secure funding for the permanent operation of the NSC. 	<ul style="list-style-type: none"> • NSC/MoFA • APSP • AGRA
15. Competitive market	2	2	<ul style="list-style-type: none"> • Most of the market is supplied by non-certified seeds. • Only 10% of the CS growers are organized as Seed Enterprises. • The other 90% is small and atomized. • The CS growers are not trusted by farmers. • Seed value chain actors are perceived as not trusting each other, which increases general distrust on the industry as a whole • In the absence of marketing strategy, the dominant strategy is low prices, with almost no quality differentiation. 	<ul style="list-style-type: none"> • Develop an industry-wide marketing campaign focused on the benefits of CS and improved varieties. • Assist CS enterprises to expand and improve their operation developing new competitive strategies. • Develop marketing training programs for NASTAG members. • Identify potential players in the CS industry and motivate them. • GoG guarantees a certain percentage of PFJ seed purchases to NASTAG. • NASTAG needs to provide technical and institutional support to members when these engage in contractual relationship with public entities when supplying. 	<ul style="list-style-type: none"> • NASTAG • EcoSIB/AGRA • KNUST • WACCI • MoTI
16. Participation of formal enterprises	3	2	<ul style="list-style-type: none"> • Only 10% of producers are formal enterprises (around 22 companies). 	<ul style="list-style-type: none"> • Identify the next 10 to 15 seed growers with potential to develop them into formal enterprises. • Assist the existing and the additional 10-15 potential seed enterprises. 	<ul style="list-style-type: none"> • NASTAG • APSP • ATT
17. Quality control	3	1	<ul style="list-style-type: none"> • Seed quality is perceived as poor by farmers. • Semi-formal farmers have limited knowledge of quality management. • There is no information on the seed's performance for the different varieties. • Quality of breeder seed and CS perceived as poor. 	<ul style="list-style-type: none"> • Continue investing in training seed enterprises in quality management. • Develop short courses on technical issues for semi-formal growers. • Increase the amount and capacity of quality control labs. • CS growers need to follow up with farmers on the varieties' performance and report back to the breeder. 	<ul style="list-style-type: none"> • NASTAG • CS Growers • GSID • APSP/ATT

			<ul style="list-style-type: none"> • Semi-formal seed growers have limited knowledge of quality control management. 		
18. Distinctive and appropriate packaging	2	1	<ul style="list-style-type: none"> • Most packing bags are still produced and sold by GSID. • Bags are generic and do not have brand or variety information. • Bags are made of plastic which may not be the best material to maintain the quality. 	<ul style="list-style-type: none"> • NASTAG should produce the bags and distribute them. This will also help to fund them. • NASTAG should determine the most appropriate type of bags for Ghana. • Seed enterprises should use stickers for branding/logo and identifying the variety. • A variety's information and agricultural package leaflet should be included inside the bag. 	<ul style="list-style-type: none"> • NASTAG • MoFA (PPRSD/GSID) • AGRA • ATT
19. Wide offer of varieties	1	1	<ul style="list-style-type: none"> • More than 80% of the maize seeds are Obatanpa, and less than 8% are hybrids. • There is limited technical knowledge amongst growers on hybrid development. • In rice, there are two dominant varieties: Jasmine 85 and AGRA. • The information for soya, sorghum and cowpea is limited. 	<ul style="list-style-type: none"> • The marketing campaigns should emphasize the benefits of new improved varieties. • Offer technical training for hybrid seed development. • Donor programs should focus on diversifying the varieties as ATT has done. • PFJ purchase program should move away from Obatanpa, and create awareness of improved newer varieties. 	<ul style="list-style-type: none"> • MoFA • NASTAG (APSP/ATT) • ADVANCE II • CS Growers • NARIs
20. Operation of outgrower models for certified seeds	3	2	<ul style="list-style-type: none"> • Around 15 seed enterprises are operating outgrower schemes. • CS Enterprises do not have the administrative skills to expand their programs. • CS Enterprises face financial difficulties to grow their operations. 	<ul style="list-style-type: none"> • Successful experiences from current growers and ADVANCE stakeholders should be transferred to enterprises with the potential to run outgrower schemes. • Development of administrative skills must be included along with the other training programs. • GIRSAL should include a window facility to promote the development of the seed industry and seed uptake. 	<ul style="list-style-type: none"> • NASTAG • CS Growers • ADVANCE II
21. Availability of processing equipment and	2	1	<ul style="list-style-type: none"> • ATT assisted three enterprises in the purchasing of equipment, but this is not enough. 	<ul style="list-style-type: none"> • Turn the GLDB facilities into a new processing compound, managed by NASTAG and using donor funds to update the equipment. 	<ul style="list-style-type: none"> • NASTAG • MoFA • APSP • ATT

agricultural machinery			<ul style="list-style-type: none"> • The majority of growers process their seeds by hand. • Growers near Kumasi use GLDB's processing facility, but the equipment is outdated and in poor condition. • Agricultural equipment availability is limited. 	<ul style="list-style-type: none"> • MoFA and NASTAG/APSP need to find a legal figure to continue as a PPP. • Modify and expand ATT assistance model to other regions. 	<ul style="list-style-type: none"> • GLDB
22. Shared storage facilities	2	1	<ul style="list-style-type: none"> • There are limited storage facilities besides those owned by GLDB, but these are not reliable. • Cost of electricity to run cold storage facilities is high. 	<ul style="list-style-type: none"> • Hand over the GLDB storage facilities to NASTAG, using donor funds to update the equipment (see element 21) • Estimate the real cost of carrying over inventory to these facilities, and evaluate business feasibility. 	<ul style="list-style-type: none"> • NASTAG • MoFA
23. Access to competitive credit	1	3	<ul style="list-style-type: none"> • Interest rates are too high. • Access to credit is difficult due to the historic banks' reluctance to finance agricultural projects. 	<ul style="list-style-type: none"> • Leverage the FinGAP experiences with training and a common knowledge information system with advisors and banks that cater to agriculture 	<ul style="list-style-type: none"> • EcoSIB/AGRA • FinGAP
24. Strong producer's association	3	1	<ul style="list-style-type: none"> • NASTAG's staff does not have a policy advisor with the competences to deal with high-level government issues. • NASTAG does not have a full database of its members' statistics. • NASTAG is a young organization and it is only starting to be recognized as the main coordinator within the sector. • Current funding is dependent on APSP and ATT support. • NASTAG does not have enough staff to assume all the new responsibilities deriving from this study. • Not active offering training. 	<ul style="list-style-type: none"> • Hire a policy advisor that can lobby at the legislative and executive level. • Expand the database to collect production volumes, crops, varieties, areas and additional information. • Secure revenue incomes from other activities like packaging, seminars, and processing/storage services. • Review the current strategic plan to address the new responsibilities resulting from these recommendations and start rolling out its activities. • Identify and implement training programs with follow up in different technical and business areas. • Executive board should establish a strong quarterly evaluation of their strategic plan. 	<ul style="list-style-type: none"> • NASTAG • APSP/ATT

25. Training and education programs	4	3	<ul style="list-style-type: none"> Lack of sufficient training in technical, business and marketing areas. 	<ul style="list-style-type: none"> Expand training programs. 	<ul style="list-style-type: none"> NASTAG NARIs EcoSIB/AGRA KNUST WACCI
26. Reliable certification system	1	1	<ul style="list-style-type: none"> GSID is underfunded and the fees paid for inspection services go to the central government's financial system. The accreditation regulations and manual for private entities have not been approved. Inspectors visit the fields less times than required. 	<ul style="list-style-type: none"> NSC should approve and implement the accreditation regulations and manuals to improve inspection regimes by private entities, under the supervision of GSID. MoFA to start transitioning into a private-led certification process, based on GSID's Accreditation Manual. GSID to receive technical assistance to strengthen this regulatory role and its capacity to monitor private seed certification suppliers MoFA needs to work along with Parliament to secure that GSID internal generated funds from seed certification and accreditation services are kept under the Division's budget to strengthened the certification system. Seed value chain stakeholders need to strengthen their communication on seed production and markets, so everyone concerned with seed development have access to information on new releases, varieties, and on seed production and market demand. 	<ul style="list-style-type: none"> MoFA/ NSC GSID APSP
27. Strong institutional framework for seed industry development	3	1	<ul style="list-style-type: none"> MoFA cannot fund by itself the implementation of the National Seed Plan. The National Seed Plan budget is too high compared to the current size of the industry (\$42M for 5 years in a \$4.7M industry) Laws and regulations are pending approval regarding various industry 	<ul style="list-style-type: none"> Review the National Seed Plan to cater to the industry's most urgent requirements. Use the National Seed Policy as a guide to align Parliament and all MoFA departments to develop the seed industry. NASTAG should lead the discussions on seed industry priorities Develop a roadmap and implementation strategy for the National Seed Plan 	<ul style="list-style-type: none"> MoFA Development Partners at the Agriculture Sector Working Group NASTAG

			components (as mentioned in this analysis).	<ul style="list-style-type: none"> Seed industry development should be a national high priority for the GoG? Commitment of government through budgetary allocation. 	
28. Clear land ownership laws	2	3	<ul style="list-style-type: none"> Land ownership laws dependent on the chieftaincy system, which creates uncertainty for further investments. Few farmers register their lands with the National Lands Commission, since it is not encouraged by the chieftaincy system. There is no land registration guide. 	<ul style="list-style-type: none"> This is a nationwide issue. One of the few options is to motivate the CS Enterprises to register their lands with the National Lands Commission. Prepare a land registration guideline for farmers and CS enterprises. 	<ul style="list-style-type: none"> Ministry of Lands and Natural Resources National Lands Commission NSC
29. Countrywide distribution network	4	1	<ul style="list-style-type: none"> While the network has more than 3000 outlets, its personnel lacks the technical knowledge regarding CS and varieties. 	<ul style="list-style-type: none"> Develop short CS training seminars for agro-input dealers. 	<ul style="list-style-type: none"> NASTAG GAIDA GADDP
30. Available credit from CS enterprises to agro-input dealers	2	2	<ul style="list-style-type: none"> Less than 10% of agro-input dealers purchase their seeds on credit. 	<ul style="list-style-type: none"> The implementation of contracts along the industry will help the credit system. While an advance may be required at the signing of the contract, the liquidation of the balance can be done on credit. Explore consignment options. 	<ul style="list-style-type: none"> CS Growers Agro-input dealers GAIDA GIRSAL
31. Reliable and constant seed supply	2	1	<ul style="list-style-type: none"> Current seed supply is not enough to reach all outlets. PFJ left agro-input dealers short of CS during the 2017 major season. 	<ul style="list-style-type: none"> Implementation of contract systems and the industry's growth will change this situation. For the 2018 PFJ CS distribution, dealers should be included using a voucher system placing seeds at dealers site. 	<ul style="list-style-type: none"> NASTAG ATT MoFA GAIDA
32. Availability of local and imported seed	2	1	<ul style="list-style-type: none"> The market has a small supply of imported seeds due to the complicated importing requirements. 	<ul style="list-style-type: none"> Full implementation of the regional harmonization system, and clear import regulations. Streamline importation procedures. Develop manuals and leaflets on importation procedures to reduce disinformation and 	<ul style="list-style-type: none"> MoFA NASTAG Customs

				provide clear guidelines on seed importation requirements as per regulated and mandated by the law	
33. Exporting capacity	1	3	<ul style="list-style-type: none"> • There are no relevant exports of CS mostly because the local supply is limited. 	<ul style="list-style-type: none"> • With current volumes, this is not an issue, but in the future this capacity may be required through the regional harmonization system. 	<ul style="list-style-type: none"> • MoFA • CS Growers
34. Inspection system for counterfeit product	1	1	<ul style="list-style-type: none"> • GSID does not have enough capacity to inspect the seeds at the dealers' warehouses and outlets. 	<ul style="list-style-type: none"> • Establish mandatory random market control visits during the peak season of seed sales assuring offenders are fined according to the law. • By approving the accreditation manuals GSID will free up resources to conduct site inspections on counterfeit seeds. • Seed inspection must curtail and eventually eliminate supply of counterfeit seeds. 	<ul style="list-style-type: none"> • MoFA • GSID • APSP/ATT
35. Regional seed harmonization	4	1	<ul style="list-style-type: none"> • ECOWAS harmonized regulations are pending approval from Parliament. 	<ul style="list-style-type: none"> • Assist the Parliament Agricultural Commission in convening and discussing approval of the regulations. 	<ul style="list-style-type: none"> • MoFA • Parliament • NASTAG (APSP)
36. Farmer Demand for CS	2	1	<ul style="list-style-type: none"> • Less than 6% of the farmers of the analyzed crops use CS. • Farmers are not aware of the benefits of CS. 	<ul style="list-style-type: none"> • Increase the CS supply. • Leverage on PFJ to increase awareness of CS. • MoFA, NASTAG and NARIs to partner in national campaign to show to farmers impacts on the use of improved seeds • With the use of the voucher system the distribution of quality seed will be done directly by the CS enterprises. • PFJ should only include hybrids for maize to increase yields. 	<ul style="list-style-type: none"> • NASTAG • CS Growers • NARIs • MoFA • ADVANCE II
37. Good agricultural practices	2	2	<ul style="list-style-type: none"> • The use of fertilizer and other GAPs is deficient, preventing farmers from achieving potential variety yields. 	<ul style="list-style-type: none"> • Support efforts from all parties to increase GAPs use, emphasizing the impact on CS potential • Train farmers to follow variety package information. 	<ul style="list-style-type: none"> • NASTAG • MoFA • Ministry or Local Governments and Rural Development • ATT

38. Extensive outgrower/nuclear/cooperative farming schemes	3	1	<ul style="list-style-type: none"> • Outgrowers are not encouraging the use of CS because of doubts regarding their quality. When used, farmers only plant a percentage of their plots. • The Masara N'Arzik, farmers' association is using imported hybrid CS. 	<ul style="list-style-type: none"> • Develop a marketing campaign specific for nucleus and outgrowers' groups using sample plots and other complementary support. • Work with Masara N'Arzik to create a seed enterprise specialized in hybrid varieties. • Transfer the Masara N'Arzik experience to other farmer associations with their assistance. 	<ul style="list-style-type: none"> • NASTAG • ADVANCE • Masara N'Arzik
39. Strong extension service	2	3	<ul style="list-style-type: none"> • MoFA does not have the funds to implement a strong extension service. • Extension agents are not knowledgeable of CS and new improved varieties. 	<ul style="list-style-type: none"> • The PFJ program contemplates the increase of extension agents. • MoFA's own FBO Strategy should be implemented to promote the expansion and improvement of AES • Regional and District-level agriculture offices should allocate more resources to strengthen AES as part of their decentralized responsibilities 	<ul style="list-style-type: none"> • MoFA • Ministry or Local Governments and Rural Development (MLGRD) • FBOs
40. Strong agro-industrial sector	2	2	<ul style="list-style-type: none"> • There is no market to absorb an increase of commodities production when the yields increase. If the market does not expand, the prices will fall. • The maize and soya processing industry is weak. • More than 60% of rice sold in the country is imported. 	<ul style="list-style-type: none"> • Analyze the "One District, One Factory" policy within the context of agricultural development to promote the growth the of the soya, maize and rice industries. • Conduct a study to recommend what type of factory, where, how large and when. 	<ul style="list-style-type: none"> • MoFA • MoTI • Coordinating Unit for the "One District One Factory Program
41. Agro-industry integration with farmers	3	1	<ul style="list-style-type: none"> • Rice mills are not fully committed with the seed industry to improve grain quality. 	<ul style="list-style-type: none"> • Motivate the rice mills to invest in the CS industry. • Tie grain purchase to CS acquisition. 	<ul style="list-style-type: none"> • NASTAG • MoTI
42. Active agro-exporter sector	1	3	<ul style="list-style-type: none"> • Exports for the analyzed crops are almost nonexistent. 	<ul style="list-style-type: none"> • Start planning to prepare commodities traders for export. 	<ul style="list-style-type: none"> • MoFA

The gap analysis presented previously is the foundation for a strategy and implementation plan. As shown, the cooperation of at least 24 responsible parties and interested stakeholders is required in order to reach the desired level of industry maturity, and a coordination entity is required to follow through with the plan. The next section develops the plan and strategy.

4.2 STRATEGY AND IMPLEMENTATION PLAN

The current state of the industry calls for an aggressive strategy to reach the target volumes and industry characteristics for a mature market as described in title 2.3. The strategy is to use current programs and harness their experience, including Feed the Future initiatives, such as APSP, ATT, ADVANCE II, FinGAP, AGRA's SSTP, and MoFA's PFJ initiative, to fill the gaps previously presented. As the industry elements gain traction, seed production and uptake will gain momentum, turning seed production into an attractive endeavor, both in economic and financial terms. This will attract new players and generate a sustainable and longer-term growth of the seed market, with a higher supply of CS in response to a higher demand from farmers.

This development will require several elements for its successful deployment. Three components have been identified for the implementation strategy:

- First, the definition/description of an implementing entity that will follow up on the objectives of the seed sector growth strategy and will coordinate all responsible parties.
- Second, setting clear achievable objectives based on the gap analysis along four axes: regulations, education, marketing and complementary activities.
- Third, the definition of the path towards the coverage objectives (see Table 19).

4.2.1 COORDINATION/IMPLEMENTATION MECHANISM

The first step in implementing the recommendations is to define a deployment mechanism or entity as a coordination/implementation party for the execution of the proposed seed sector growth strategy. This coordination/implementing party is needed to deploy the strategy, administer the required resources, and follow up with all seed sector stakeholders pursuing the seed sector growth strategy. The coordination/implementing party should receive a clear mandate and resources to achieve the objectives assigned to it and assume the implementation of the seed sector growth strategy in partnership with relevant public and private seed sector stakeholders in Ghana. The staff of the coordination/implementing mechanism should have the managerial and technical competences and skills to develop the plans stemming from the seed sector growth strategy, reach and influence stakeholders, and follow up on the execution.

Considering that most Ghana Feed the Future programs are ending within the next year, the implementation plan consists of the following three phases:

- The first phase will comprise the next USFY 18, starting October 2017 and ending September 2018 and it might well be implemented by APSP.
- Afterwards, a new program should lead the implementation for the following 48 months.

- At the end of this period, NASTAG should be able to assume the responsibility to complete this program, and take over new projects created along the implementation of the seed sector growth strategy, to reach the target industry size. The plan is based on the objectives defined in the previous section, and the scope of the implementation entity.

Below a description of each phase is presented.

4.2.1.1 PHASE I - APSP

APSP is recommended for the first stage based on three main reasons: its area of policy related expertise, its involvement with NASTAG, and the implementation of various seed industry-related initiatives. The first objective of the strategy is to approve all pending regulations related to the seed industry, an area in which APSP is already collaborating with the MoFA. APSP's current personnel interact constantly with key GoG officials involved in the process, and has provided technical expertise to develop, adjust, review the pending set of regulations, procedures, manuals and guidelines. Also, APSP was instrumental in the creation of NASTAG, and one of its long-term employees' functions presently as embedded policy advisor at NASTAG's Secretariat. Finally, along with the regulations, APSP has promoted the Quality Management training program for seed enterprises, the licensing and contracts seminars for breeders, and other industry-related projects.

An immediate step is to engage with the GoG to approve pending regulations. One of the main issues delaying the approval of these regulations (at Parliament's Sub-committees) and other procedures, guidelines, etc. (at the National Seed Council) is the funding of the sitting fees that should be paid to the members of these bodies. This issue should be addressed urgently and MoFA should provide a rationale on the costs involved for NASTAG to find possible sources of funding outside USAID.

Additionally, a MoFA member must be identified to act as a liaison with the ministry, and expedite all the processes.

4.2.1.2 PHASE II – NEW PROGRAM

Once APSP has executed the first steps of the strategy, USAID may consider the implementation of a follow-up initiative to continue with the implementation of the seed sector growth strategy. The new initiative could have a profile like that of APSP in the policy area; but with an added and specific scope in the business and technical aspects of the seed industry. Some of the activities of the new initiative should deal with the following activities/mandates:

- Following-up on furthering improvements in the seed business enabling environment, including the approval of pending regulations and the modification of those that have been approved but require fine tuning;
- It should include a technical assistance component to provide seed-related training to public and private stakeholders and support an intensive educational campaign to promote among farmers about using improved seeds as the cornerstone of their farming activities.
- A grants/financing window that should have earmarked funds for setting a revolving fund to finance the upfront payments for seed purchase contract and support finance licensing agreements, refurbishing GLDB seed processing facilities to be handed over to NASTAG for its operation, and

to strengthen the productive, technical and marketing skills of around 15 to 20 Ghanaian “champion” seed companies.

- A capacity building component to further develop the institutional and organizational capacities of NASTAG as leader of Ghana’s seed industry, especially focusing on technical, information, and seed business enabling services to its members. Throughout the duration of the program period, NASTAG will assume further responsibilities working together with this new program, developing and enhancing its competences to lead the industry in this plan’s final phase.
- A mandate to enhance coordination and linkages of seed industry stakeholders to enable filling in the gaps that require the collaboration of multiple entities;

4.2.1.3 PHASE III – NASTAG TAKEOVER

As the new program ends, NASTAG will be ready to step up as the industry’s leading body. NASTAG is a young organization, which is still in the process of becoming fully organized and deploying its strategy. Currently, most of its funding comes from international cooperation. As the industry grows with the implementation of the objectives, the base for collecting fees will also increase. Also, new revenue streams will be created from other projects, such as the management of processing and storage facilities and the sales of packaging materials. Thus, the next four years are essential in strengthening NASTAG.

4.2.2 OBJECTIVES

The objectives below are key in setting milestones that can be traceable during the next five years. These objectives are set to address the recommendations given in the gap analysis. While Objectives A thru C deal with specific actions that are identified as gaps along all the industry’s components, Objective D will encompass the coordination actions required amongst different topics.

- A.** Approve all pending regulations and laws.
 - Regulations depending on NSC and MoFA within an 18-month period.
 - Laws and regulations on parliament within the next 36 months.
 - Priority to the ECOWAS harmonized regulations.
 - The Plants Breeders Rights Bill will require a longer discussion period.
- B.** Create a training and education coordination board.
 - Develop and deploy different training plans for key groups (18 months).
 - Management and quality for NARIs and CS Growers.
 - Marketing for CS Growers.
 - Hybrid maize seed production for FS and CS formal enterprises.
 - Basic seminars on CS for agri-input dealers.
 - Accreditation and regulatory roles in the certification process for PPRSD
- C.** Develop a countrywide seed information campaign with various levels of outreach (36 months)
 - NARIs will assist with new varieties information for CS growers.
 - Benefits of CS for farmers.

- Assist in the current campaigns to increase and improve fertilizer use
- D.** Coordinate, execute and follow up of all other action items pending from the gap analysis recommendations.
- Reinforce and support NASTAG to lead the SMIFS implementation agenda (12 months).
 - Leverage the implementation of seed coverage targets on PFJ (36months).
 - Define a specific plan for each one of the recommendations that are not within the first three axis, integrating all stakeholders.

4.2.3 PATH TO ATTAIN TARGET COVERAGE

As mentioned before, the coverage targets are ambitious and require an aggressive plan to reach them. The current CS penetration is low, which implies a low base on which to continue developing the industry. The objectives presented above are the foundation to closing the gaps; but to reach the targets an aggressive path is required.

The best path to reach the targets is to leverage this plan on PJF. The plan will require to boost PFJ to cover more of the industry's components, without increasing the expected budget. While PFJ is redesigned into a more comprehensive plan in the seed area all the other objectives are developed in parallel, to assure its success throughout its deployment. The plan to improve PFJ for maize is stated below:

- The first item to be addressed is the quality and variety of the seeds. As mentioned throughout this document, it is imperative to promote the adoption of hybrid maize among farmers. One of the risks of PFJ is that the adoption of Obatanpa will hardly assist in reaching higher yields. This situation may discourage the continuous use of CS in the next seasons. If MoFA can allocate 100% of the hybrid seed incentive for 2019 and forward; the whole maize CS industry will shift. Using local hybrids will make for a better use of funds.
- The CS volume for 2019 should be defined before the minor season of this year. The recommended volume for 2019 of maize seed should be higher than 3,600 Mt, which is an increase of 36% over the original volumes for 2017. This will allow for planting 163,000 hectares, about 16% of coverage. With a 2.5MT yield per hectare, the national production will increase around 130,000 Mt (7%).
- Based on this objective of at least 80% hybrid maize, it will be necessary to sign contracts in order to assure its supply, and these contracts will roll back to FS growers and breeders, who will need to start planting this year. While the breeder seed⁶⁹ and FS are grown, technical training programs for hybrid growing will be imparted.
- Breeders will commit to accompany the varieties with the agricultural package recommendations, which will be an input for MoFA on the developing fertilizer subsidies.

⁶⁹ A revision of the NARI's inventories for immediate availability is necessary since this may accelerate the project.

- A fund will be established through a trust to support the upfront payments required by the contracts, thus assisting the breeders and the FS growers. This fund will be a revolving credit that will finance the upfront payments of the contracts during 2018. This fund should be managed by NASTAG and the coordinating entity (please refer to subsection 4.2.1.2 where the coordinating entity grant is discussed).
- CS growers will have a year to get ready, and will be assisted in their requirements through NASTAG. A two year will allow for the transferring and refurbishing of the GLDB facilities.
- Instead of distributing the seeds by district, a voucher system will be implemented. The CS seeds will be sold at the agro-input dealers. Agro-input dealers will be trained in hybrid seeds to assist the farmers when purchasing.
- During the next three years NASTAG, APSP and then the follow-up coordination/implementation party, should be able to communicate with the final market and the potential exporters of the increased expected yields for the 2019 season, so they can prepare.

While the National Seed Plan has some important initiatives, at the Government level its deployment needs to be reassessed. The five-year operating budget for the plan is over \$42 Million (funds which have not been appropriated), about 16% of the current core seed industry revenue for the most important crops. It appears that a more judicious use of the funds targeting specific gaps is required. Instead of executing programs that demand huge cash outlays, MoFA should take ownership of this strategy, leveraging its expertise with the competences developed by the international programs. Otherwise, the National Seed Plan would remain stalled until the funds are secured, which may take several years.

The reassessment of the National Seed Plan may be the most important challenge in growing the seed industry. Whereas the institutional approach is different, the coverage targets for the first five years are similar (National Seed Plan, 2015), and the long-term industry targets proposed in this document are more aggressive. Certainly, both approaches are aligned with the National Seed Policy in most of its positions. The engagement of MoFA is important, not only in providing institutional support and legitimacy, but in avoiding duplicity of implementation efforts.

The constitution of a specific program for the development of the seed industry from USAID, as well as the strengthening of NASTAG and the support of MoFA will create a robust implementation body, which will be able to close the gaps presented in section 4.1 within the estimated timeframe. Though the gap analysis presents specific recommendations a more specific approach with actions needs to be drafted, once these three phases are consolidated

5. CONCLUSION

This study presents the desired conditions of a mature seed industry *vis a vis* the current seed industry in Ghana. By developing and utilizing an analysis framework, the industry value chain was deconstructed into 6 components, conformed of 42 elements, which was used to parametrize the conditions under which the stakeholders of the seed industry operate. Based on these parameters, a gap analysis complemented with specific recommendations was built to address what are considered to be bottlenecks preventing the increase of seed uptake. Finally, a holistic plan and strategy was developed to implement the recommendations.

Throughout the study, the most important fact which justifies the entire analysis, is the subpar seed uptake, estimated at under 6% for 2016. This low seed uptake is the starting point of most of the issues affecting the industry. Various of these issues derive of unarticulated efforts, and policies carried out over the last decades without much consistency because of the lack of technical and financial resources. It can be observed, that since 2010 with the enactment of Act 803, the GoG has tried to jumpstart the industry, but with limited success. Even though the development of the National Seed Plan as the implementation path for the National Seed Policy is highly commendable, it is not being formally and structurally implemented. It appears that the efforts are focused on funding the plan, more than pushing the industry.

One of the fundamental pillars of the PFJ, MoFA's flagship program, is the availability of certified seed as a cornerstone to improve farm productivity and create substantial impacts on social and economic development in the country. This shows that the GoG understands the importance of the seed industry, and is willing to invest in it. While it is considered that the PFJ seed uptake goals need to be reconsidered to avoid creating unreachable expectations, most of its underpinnings and proposals are well supported, potentially steering the project towards an effective execution. It is considered that with the proper adjustment, the PFJ may not only reach its goals regarding agricultural yield increase, but it could propel the seed industry towards maturity.

Several of the recommendations made in the gap analysis may work to adjust the PFJ. The GoG will benefit from leveraging their efforts regarding the seed pillar of the PFJ on the proposed coordinating/implementing party and NASTAG. Based on the four objectives presented before (see 4.2.2), this party and NASTAG will have the mandate to assist on the development of the seed industry:

- A.** Approve all pending regulations and laws.
- B.** Create a training and education coordination board
- C.** Develop a countrywide seed information campaign with various levels of outreach (18 months)
- D.** Coordinate the execution and follow up of all other action items pending from the gap analysis recommendations.

Ghana has the potential not only to reach over 54% coverage of CS, but to become a regional supplier of high-quality seed based on locally developed improved varieties. While there are many challenges to overcome, there is a base of breeders and CS enterprises that can succeed if the new proposed program is implemented.

6. ENDNOTES

ⁱ The purchasing process for the Maize seed in the PFJ program has suffered a series of setbacks. Below is a compilation of the facts according to three of the parts involved: NASTAG (Nyamid-Clotey & Havor, 2017), MoFA Crop Services Department (Osei-Akoto, 2017), and Wienco/ RMG Seeds (Kotey, 2017).

1) OPV

- a) The original volume required of OPV Maize certified seed was 1,400 Mt.
- b) MoFA placed an ad in the newspaper to request offers for the seeds.
- c) NASTAG through various interventions at MoFA was granted the OPV maize seed.
- d) The price was set at GHC 6.80
- e) After reviewing the members seed inventories, NASTAG committed to 1,200 Mt
- f) During the first plan delivery of 800 Mt of seeds at the different districts, only around 500 MT were purchased, and 300 were returned.

2) Hybrid

- a) The original volume required of Hybrid Maize certified seed was 1,400 Mt
- b) There was not enough local seed inventory
- c) RMG was granted the total volume for PAM 53 from South Africa
- d) RMG had less than 10% of the required volume in stock in Ghana
- e) Since the order was placed in April, the seed shipment from South Africa was late for field delivery in mid June.

ⁱⁱ Identified Training and Education Programs in 2017

Program	Institution	Funds Source	Location
Quality Management	APSP	USAID	Countrywide
Seed Business Incubator	EcoSib	AGRA-USAI	Countrywide
Financial Training	FinGAP	USAID	Countrywide
MSc in Seed Systems	KNUST	Student funds – USAID Scholarship	Kumasi
Seed Systems	WACCI – UG	Internal Funding	Accra
Seed Introduction to Fields	ATT	USAID	Norther Ghana
Licensing Contracts for Breeders	APSP	USAID	Accra

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<https://1drv.ms/f/s!AsMgVBVpVFcg4hcmVKfAqq7FbWFA>

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APPENDIX I: TABLES FOR THE PFJ PROJECTED COVERAGE AND THE SMIFS TARGETS.

Hectares Covered PFJ

Crop	Current	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020
HybridMaize	6,136	48,407	162,320	271,890	355,189
OPVMaize	76,463	101,593	416,348	635,890	826,851
Rice	11,887	30,000	124,628	198,380	259,840
Soya	5,675	-	78,750	131,250	175,000
Sorghum	-	-	118,494	197,490	263,320
Total	104,883	180,000	900,540	1,434,900	1,880,200

Hectares Covered SMIFS

Crop	Current					40% of Target					100% of Target
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	
HybridMaize	6,136	73,800	104,550	153,750	202,950	246,000	338,250	430,500	522,750	615,000	
OPVMaize	70,326	12,300	17,425	25,625	33,825	41,000	56,375	71,750	87,125	102,500	
Rice	5,943	10,752	15,232	22,400	29,568	35,840	49,280	62,720	76,160	89,600	
Soya	5,675	4,128	5,848	8,600	11,352	13,760	18,920	24,080	29,240	34,400	
Cowpea	4,723	4,980	7,055	10,375	13,695	16,600	22,825	29,050	35,275	41,500	
Sorghum	-	6,810	9,648	14,188	18,728	22,700	31,213	39,725	48,238	56,750	
Total	92,804	112,770	159,758	234,938	310,118	375,900	516,863	657,825	798,788	939,750	

% Coverage PFJ

Crop	Current	Year 1 2017	Year 2 2018	Year 3 2019	Year 4 2020
HybridMaize	1%	5%	16%	27%	35%
OPVMaize	7%	10%	41%	62%	81%
Rice	5%	13%	56%	89%	116%
Soya	7%	0%	92%	153%	203%
Sorghum	0%	0%	52%	87%	116%
Total	6.1%	6.5%	9.2%	13.6%	17.9%

Hectares Covered SMIFS

Crop	Current					40% of Target					100% of Target
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	
HybridMaize	6,136	73,800	104,550	153,750	202,950	246,000	338,250	430,500	522,750	615,000	
OPVMaize	70,326	12,300	17,425	25,625	33,825	41,000	56,375	71,750	87,125	102,500	
Rice	5,943	10,752	15,232	22,400	29,568	35,840	49,280	62,720	76,160	89,600	
Soya	5,675	4,128	5,848	8,600	11,352	13,760	18,920	24,080	29,240	34,400	
Cowpea	4,723	4,980	7,055	10,375	13,695	16,600	22,825	29,050	35,275	41,500	
Sorghum	-	6,810	9,648	14,188	18,728	22,700	31,213	39,725	48,238	56,750	
Total	92,804	112,770	159,758	234,938	310,118	375,900	516,863	657,825	798,788	939,750	

APPENDIX II: SMIFS TERMS OF REFERENCE (TOR)

Feed the Future Agriculture Policy Support Project

TERMS OF REFERENCE

Development of a Seed Market Industry Framework and Strategy Study (SMIFS)

April 20, 2017

I. Background

The USAID/Ghana Feed the Future Agriculture Policy Support Project (APSP) supports the Government of Ghana in the formulation of assessments and strategies on the seed industry that contribute to the implementation of the National Seed Plan.

Based on the work already implemented by USAID-funded programs—APSP, ATT, AGRA/SSTP, etc.—there is now a need to undertake an assessment of the Ghanaian seed industry to help identify remaining market, institutional, regulatory, policy, and implementation challenges that must be addressed to enable the growth of the industry. In fact, the implementation of the National Seed Plan (NSP) must be linked to a thorough analysis of the Ghanaian seed industry and based on the NSP's overall objectives, in order to develop a seed sector growth strategy.

Therefore, APSP is proposing to conduct a Seed Market Industry Framework and Strategy Study (SMIFS), which involves a full consideration of both the actors and policies in the industry. As such, the study will consist of the following components:

- a. The first component will examine seed sector institutions, policies and guidelines. APSP, ATT, AGRA/SSTP and others have already completed various reviews, but the findings need to be analyzed and integrated alongside an understanding of the actual conditions and perspectives of the Ghanaian seed industry from a business point of view.
- b. The second component is an examination of the supply chain and transactional trade focusing on an analysis of the market itself. Taking into account that much of the seed trade in Ghana takes place informally, the absence of a formal seed market, inefficient and/or ineffective implementation of the legal and technical frameworks or lack of a national seed development strategy may deter new seed enterprises from entering into this trade.
- c. Based on the seed market analysis, the study will include a seed sector growth strategy with its concomitant short to medium term implementation guide.

2. Objectives of the Seed Market Industry Framework and Strategy Study (SMIFS)

The objectives of the study are:

- 2.1 Provide a holistic understanding of the seed trade industry in Ghana and recommend the best market model to accomplish proper seed utilization to maximize crop yields and land use. A market model provides an overview of how the market works. For example, it may include a governmental entity importing seeds, selling it to distributors with subsidized credit, or a full private supply chain, with the government playing a more regulatory role with an educational role, so market actors fully understand their respective functions and activities.
- 2.2 Develop base models for the different kinds of companies competing in this market. The base models show how companies are organized within the seed industry and in which parts of the supply chain they participate.
- 2.3 Present a plan to USAID/Ghana to grow the seed industry in Ghana combining governmental and private initiatives and an implementation guide with short and long-term objectives. In turn, this seed sector growth strategy and implementation guide, will enable the government of Ghana to achieve the objectives set out by its overall seed policy and in particular, contribute to implement the National Seed Plan.

The SMIFS will focus mainly in the staple crop seed system as part of the priorities stemming from the National Seed Policy and the National Seed Plan. Therefore, the study might include maize, rice, sorghum, soybean and cowpea seeds.

3. Specific deliverables of the assignment

APSP's proposal has a logistics and market approach, with a set of three specific deliverables:

- 3.1 The first deliverable consists of the development of a generic seed industry framework analyzing the institutional status, market forces and consumption patterns, including the identification of the market model to accomplish proper seed utilization to maximize crop yields and land use. Given the conditions of the seed industry, with its public and private components, and the complexity of the overall agricultural field, a specific framework is required to determine the interactions between variables, limit the scope, and maximize the resources.
- 3.2 The second deliverable is a market analysis of the current seed market situation in Ghana, based on the framework developed above, including the identification of the base models for the different type of companies within Ghana's seed industry.
- 3.3 The third deliverable is an implementation strategy that is based on the framework and the inputs that stem from the market analysis. This strategy will include specific activities that the private sector should implement along with policy recommendations and government interactions. However, the focus will be on the practical activities and policy reforms modifications that interested parties (seed enterprises, public sector entities, distributors) can accomplish in a short to medium timeframe.

4. Structure of the Study

- 4.1. Understanding the elements that identify Ghana's current Seed Industry. The absence of a formal seed market, regulations or a national strategy may deter new seed enterprises to

enter into this trade. The analysis will require understanding the following components, which are involved in this market:

- National strategy
- Institutional framework
- Supply Chain
- Market size and requirements
- Logistical Constraints
- Pricing Model
- Farm ownership and organization

The interactions among these parts creates the particular conditions in which the seed trade develops. The processes involved in this trade determine how the pricing, distribution and logistics behave. Aligning the private and public actors' interests with the specific seed policies and a deployment plan is crucial to develop the overall market. This alignment requires for the non-institutional actors to adapt their supply chain, prices and overall strategies to these conditions. This adaptation, combined with feasible short-term institutional changes, are the basis for the strategy.

4.2. Fundamental Tenets of the SMIFS. APSP's study has the following basic characteristics:

- a. It is focused on the front end of the market
- b. It is aimed at developing a specific, more operational framework
- c. Its recommendations are achievable in a short-to-medium timeframe
- d. It is set to develop specific recommendations to capitalize on simple solutions of the market failures
- e. It includes a political analysis of the policy recommendations

4.3. Information required to undertake the SMIFS. The consultant (s) should undertake desk-research and interview seed industry stakeholders (public sector representatives, seed value chain actors, etc.) to generate the set of data as required by the SMIFS:

- a. National agricultural policies involving the seed market.
- b. What is the profile (profiles) of the farmer.
- c. Which institutions are involved in the seed market.
- d. A list and classification (size, locations, etc.) of the companies currently producing, selling and distributing seeds.
- e. The logistical constraints (distances, infrastructure, transportation, etc.) and requirements (credit, facilities, technical assistance, etc.) that affect local seed companies participating in this industry.
- f. The market entry barriers that may exist in the country.
- g. The cost structure for producers, sellers and distributors of seeds in Ghana.

Once the consultant (s) collects and analyzes this information, he/she will be able to develop an industry model and determine the best market structure for the country. The industry model determines the current relationships, both at the institutional and geographical level. This allows

for the appreciation of the flow of the supply chain, and the understanding of the policies among different seed stakeholders. Based on this information, the study can suggest specific agricultural policies and/or reforms, specific assistance plans and market incentives to develop the Seed Industry in Ghana and contribute effectively to the implementation of the National Seed Plan.

5. Expected Output

The final product of the SMIFS is comprised of three parts: i) A seed industry analysis as a framework that will allow the conduct of the seed market analysis itself, which in turn will yield the inputs required to ii) developing a seed sector growth strategy with its corresponding iii) implementation plan.

Details of each part follows.

5.1. A seed industry analysis, as a framework, which sets the base for the executable stage for a national strategy leading to promote and effectively impact on the growth of the Ghanaian seed sector and industry. Hence the framework to conduct the assessment of Ghana's seed industry consist of:

- a. Volumes
 - a.1. Local Production
 - a.2. Imports
 - a.3. Sales by seed enterprise
 - a.4. Crop productions and yields

- b. Current production and utilization of seeds (regular and certified)
 - b.1. Local R&D
 - b.2. Availability of new seed varieties
 - b.3. Consumption patters

- c. Market penetration

- d. Distribution network
 - d.1. Geographic Localization
 - d.2. Physical seed distribution and transportation methods
 - d.2.1. Within the industry participants
 - d.2.2. To the farmer

- e. Marketing strategies
 - e.1. Branding
 - e.2. Promotion and communication
 - e.3. Education outreach

- f. Competition Analysis
 - f.1. How the different seed enterprises compete against each other

- g. Farmers profiles
 - g.1. Distribution by plot size
 - g.2. Socio economical level
 - g.3. Tribal background
 - g.4. Family structures / Gender roles
- h. Public Policy and Institutions
 - h.1. Agricultural seed policies/regulations
 - h.2. Seed Market
 - h.3. Institutions involved in the seed sector

5.2. The development of a seed sector growth strategy with a short to medium scope that should be focused on the following priority areas:

- a. Public Policies that support the growth of the private seed industry
- b. Specific assistance plans that should include small, medium and large seed enterprises to be able to reach all farmers
- c. Market incentives that motivate farmers to acquire improved seeds
- d. Education to farmers on the significance, value and use of new seed varieties

5.3. The seed sector growth strategy will include a five year implementation guide to determine:

- a. What are the feasible yearly growth goals within the five-year timeframe.
- b. Which markets should be reached first.
- c. What are the structural changes required within the market to deliver this growth.

6. Level of Effort (LOE) for undertaking the Consultancy

The consultant(s) will be assigned a total of 54 days or Level of Effort (LOE), as per the following detail:

No.	Activity	Location	LOE		Total LOE
			Work	Travel	
1	Preparation and Preliminary Desk Research	Home	5 days: May 01-05	1.5 Days: 6-7 May (Travel from consultant's home to Ghana)	6.5 days
2	Submission of Inception Report (Consultant's understanding of the assignment, his/her methodology to achieving study objectives and discussion on timeframe)	FO	1 day: 8-May		1 day
3	Initial Field Visit to Ghana: - Including trips to main agricultural zones	FO	19 days: 9-30 May		19 days

	<ul style="list-style-type: none"> - Visits to relevant institutions - Meetings with farmers - Meeting with seed market actors 				
4	Presentation of Preliminary Findings and Recommendations	FO	1 day: 31 May	1.5 days: 01-02 June (travel back to Consultant's Home)	2,5 days
5	Data Analysis and Framework Development	Home	15 days: 5-21 June	1.5 days: 24-25 June (Travel from consultant's home to Ghana)	16.5 days
6	Presentation of the Study in country <ul style="list-style-type: none"> - Stakeholder review workshop - Presentation to JSR 	FO	5 days: 26-30 June	1.5 days: 01-02 July (travel back to Consultant's Home)	6.5 days
7	Strategy Consolidation/Final Report	Home	3 days: 03-07 July		3 days
Total LOE					55 days

7. Required Expertise for the Consultant(s)

The ideal candidate(s) should have the following professional requisites and technical expertise:

- A Master's degree or higher, in Agricultural Economics, Business Administration and/or Industrial Engineering.
- Over 15 years of professional experience in the field, either as a business consultant or corporate manager in industry.
- Expertise in industry analysis, consulting with Small and Medium Enterprises (SMEs), conduct of political risk assessments and business project development.
- Professionally proficient and fluent in written and spoken English (FS levels 4/S-4/R) is required

8. Period and duration of the Assignment

The assignment is expected to start on/or about May 1 2017, and end no later than July 15, 2017.

9. Reporting

The consultant(s) will report to APSP's Chief of Party or to whom he may delegate.