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Ministry of Food & Agriculture

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SAVANNAH ZONE AGRICULTURAL PRODUCTIVITY IMPROVEMENT PROJECT



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AFRICAN DEVELOPMENT BANK



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A Planting for Food and Jobs Initiative

The Ghana Seed Industry: Advances and Prospects

Report of the Seed Sector Support Workshop Organized by the
Ministry of Food and Agriculture – Savannah Zone Agricultural
Productivity Improvement Project

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Abbreviations

ASP	Accredited Seed Producers
AfDB	African Development Bank
AGRA	Alliance for Green Revolution in Africa
CBOs	Community-based Organizations
CSIR	Council for Scientific and Industrial Research
CRI	Crops Research Institute
DAES	Directorate of Agricultural Extension Services
DCS	Directorate of Crop Services
DEP	Development Projects
FAO	Food and Agriculture Organization
FBOs	Farmer-based Organizations
GAIDA	Ghana Agricultural Input Dealers Association
GSID	Ghana Seed Inspection Division
IFDC	International Fertilizer Development Centre
MoFA	Ministry of Food and Agriculture
NAFCO	National Buffer Stock Company
NASTAG	National Seed Trade Association of Ghana
NSC	National Seed Council
NVRRC	National Variety Release and Registration Committee
PFJ	Planting for Food and Jobs
PPMED	Policy, Planning, Monitoring and Evaluation Directorate
PPRSD	Plant Protection and Regulatory Services Directorate
PSI	Private Sector Investors
SAPIP	Savannah Zone Agricultural Productivity Improvement Project
SARI	Savanna Agricultural Research Institute
SEEDPAG	Seed Producers Association of Ghana
USAID	United States Agency for International Development

Preface



Ghana's agricultural development agenda is guided by the Ghana Food and Agricultural Sector Development Policy (FASDEP II) to achieve: (i) food security and emergency preparedness, (ii) improved growth in incomes, (iii) increased competitiveness and enhanced integration into domestic and international markets, (iv) sustainable management of land and environment, (v) science and technology applied in food and agriculture development and (vi) improve institutional coordination. Ghana's agricultural strategy synthesizes the government 's policy framework and action plan for attaining self-sustained growth in all agricultural sub-sectors by annualizing the Medium-Term Agricultural Sector Development Plan (METASIP), thus providing the tool for optimizing agriculture and integrated rural development for the structural transformation for the socio-economic development of Ghana.

The "Planting for Food and Jobs" campaign, (PFJ), under the Nana Addo Dankwa Akufo-Addo-led Government provides a vehicle to achieve the goals of FASDEP and METASIP in an accelerated way through five pillars, as follows: (1) seed access and development,

(2) fertilizer access and fertilizer systems development, (3) extension services, (4) marketing and (5) e-agriculture, to improve the productivity of maize, rice, soybean and cowpea and some vegetables. Through the PFJ, the supply of subsidized quality seeds and new fertilizer blends to farmers has been stepped up. Thus, since 2017, the Ministry of Food and Agriculture (MOFA) has demonstrated the impact of the use of quality certified seeds and new fertilizer blends along with good agricultural practices, which has resulted in increased yields of the major cereals and legumes by 50 to 100%. This year, 2019, MOFA is poised to reach out to 1 million farm families, coming from 202,000 and 677,000 in 2017 and 2018 respectively. To boost the PFJ, MOFA is implementing the Savannah Zone Agricultural Productivity Improvement Project (SAPIP), a collaborative project between MOFA and the Africa Development Bank (AfDB) with a goal to transforming agricultural value chains for food and nutrition security, job and wealth creation within the Savannah zone.

It is within this context that the Seed Sector Support Workshop, which brought together key stakeholders and partners, was organized in Tamale from 15th to 17th January, 2019. The workshop led to: (i) stock taking of the current status of the seed industry, (ii) the identification of priority interventions and resources for stepping up seed supply in 2019 and beyond and (iii) the outlining of a five-year roadmap for the implementation of the priority actions. It is expected that through the implementation of the roadmap with the support of our traditional partners such as AGRA, USAID, FAO, etc., the objectives of FASDEP and PFJ will be realized.

The Report of the Seed Sector Support Workshop for which I have the honour, on behalf of the National Seed Council, to preface, succinctly captures the wide range of seed sector dimensions which were addressed in Tamale. I fervently appeal to all stakeholders to earnestly commit themselves to the recommendations of the Workshop and thoroughly conduct their collaborative roles along the road map which has been adopted.



Mr. Josiah Wobil, Chairman, National Seed Council.

Executive Summary

The Government of the Republic of Ghana puts agricultural development in the forefront of the socio-economic development of the country. The Government's agricultural development policy aims at reforming the agriculture sector to transform the economy in order to reduce food insecurity, unemployment and poverty. The Planting for Food and Jobs (PFJ) Campaign which was introduced by the Government to achieve the policy objective has helped farmers to gain access to inputs that could increase their crop yields, especially fertilizer and seed.

To meet the increasing demand for certified seeds, the Savannah Zone Agricultural Productivity Improvement Project (SAPIP) of the Ministry for Food and Agriculture (MoFA) organized the Seed Sector Support Workshop to enhance seed sector development. The objectives of the workshop were to: 1) ensure that key seed sector stakeholders understand the SAPIP concept, 2) identify priority interventions and resources for stepping up seed supply, 3) develop mechanisms and approaches for scaling the production and supply of seeds, and 4) outline a five-year roadmap for the implementation of priority activities. High-level personnel from key seed sector stakeholder organizations participated in the workshop. The Keynote address was delivered by the Honorable Deputy Minister of Food and Agriculture in-charge of Annual Crops, Dr. Sagre Bambangi on behalf of the Honorable Minister for Food and Agriculture, Dr. Owusu-Afriyie Akoto. The presentations and discussions in group and plenary focused on advances, challenges and perspectives relating to: 1) Production and marketing of breeder, foundation and certified seeds; 2) Seed quality control and assurance; and 4) National Seed Policy and Coordination.

Variety Development and Breeder Seed: Success stories from AGRA-PASS seed value chain, Scaling Seeds and Technologies Partnership (SSTP) and 3) Micro Reform for African Agribusiness (MIRA) projects funded by AGRA in Ghana were highlighted. Through the projects, AGRA had trained 18 PhDs, 31 MSc, 34 Laboratory Technicians, and 104 Extension Agents; released 45

new crop varieties; and set-up of 11 seed enterprises and developed agro-dealer networks. The production of certified seeds of maize, rice, cowpea and cassava were scaled-up. The Crop Improvement Program of CSIR-SARI released several varieties of maize (17), cowpea (5), soybean (4), groundnut (2) and rice (2) over the past 10 years; and supplied increasing quantities of early generation seed to accredited seed producers. The CSIR-CRI also released several varieties of cereals (hybrid maize, open-pollinated maize and rice), legumes (e.g., soybean, cowpea and groundnut), root and tubers (cassava, yam, sweet potato and cocoyam), and vegetables (pepper) over the past two decades. Breeder seed requirements of the major food crops, especially maize, rice and sorghum were projected to increase from now till 2020. Challenges facing the production and marketing of breeder seeds were highlighted.

Foundation Seed Production and Marketing: The GLDB was the main source of foundation seed in the country until recently. There are currently nine foundation seed producers in the country, including the private sector who produce foundation seeds of maize, rice, sorghum, cowpea, soybean and groundnut. Production of foundation seeds of maize, rice, sorghum, cowpea, soybean and groundnut by GLDB generally declined from 2010-2017. For example, within this period, foundation seed of maize declined from 84 MT to 15 MT whereas cowpea declined from 10 MT to 2 MT. In contrast, foundation seed requirements of maize, rice and sorghum in Ghana were projected to increase from 2017-2020. The other producers complimented the effort of GLDB, which resulted in increased supply of foundation seeds in the country. Constraints to foundation seed production and marketing were highlighted and recommendations provided to improve the production and marketing.

Certified Seed Production and Marketing: Advances made by NASTAG in the production and marketing of certified seeds include: improved production capacities of members in terms of quantity, quality and marketing of seeds as private seed sector players; developed 5-year Strategic Plan that is guiding

the association's operations, trained 20 of its members in Seed Enterprise Quality Management, and eight members in Quality Rice Foundation Seed Production; coordinated the supply of certified seeds under the government flagship PFJ for its members for 2017 and 2018; facilitated the first ever National Seed Business Networking Forum. Between 2017 and 2019 seed production of the major cereals and legumes increased from 6,942 MT to 16,344 MT. Requirements for certified seeds of the major cereal and legume crops were projected from 2016-2020. Challenges faced by NASTAG in the production and marketing of certified seeds include: low adoption of certified seed by farmers; inadequate development and commercialization of quality foundation seeds; inadequate seed market and industry data; non-existence of seed market intelligence and demand forecasting system among others. Recommendations to address the challenges were provided.

Seed Quality Control and Certification: Seed Quality Assurance and Certification (SQAC) covers crops such as cereals (e.g., maize, rice, sorghum, and millet), legumes (e.g., cowpea, groundnuts, Bambara groundnuts, and soybean), vegetables (e.g., garden egg, onion, tomato, pepper and okra), root and tuber crops (e.g., cassava, yam, sweet potato and cocoyam), and fruit and perennial crops (e.g., mango, citrus and pineapples). Advances made in SQAC by GSID included: membership of the International Seed Testing Association; establishment of a functional National Seed Laboratory and three satellite laboratories; increase in the number of qualified trained staff; piloting accrediting private seed inspectors; developed guidelines for Seed Quality Assurance; certification and accreditation for seed inspectors, and establishing a National Seed Regulation scheme. Challenges were highlighted as: inability to handle the increasing number of seed fields and locations of registered seed producers; flouting of quality assurance procedures by seed producers of all classes; unprofessional conduct by seed inspectors; faking and adulteration of seeds offered for sale; limited funding for seed inspection, sampling and laboratory analysis, post certification monitoring, and supervisory visit; inadequate quality assurance training for inspectors and producers/dealer and inadequate certification kits for inspectors.

Recommendations to overcome the challenges were provided.

3.5. Seed Policy and Coordination: The National Seed Policy (NSP) is a statement of intent by Government and its partners regarding short, medium and long term development and management of the position and intentions related to the seed sector. The NSP aims to support the establishment of a well-coordinated, comprehensive and private sector-driven sustainable seed industry. This would be achieved through approaches which would continuously create and supply new improved varieties for use by farmers and support successful seed production, certification, marketing and seed security systems. Under the current legislative framework, the NSC coordinates the National Seed System. The Seed and Adaptive Research Unit of the DCS under MoFA is responsible for the promotion and provision of services for the development of the seed industry. It also supervises the five national agriculture research stations which provide support for testing and dissemination of technologies.

General recommendations: Participants unanimously showed their commitment to support the government's seed sector policy and other initiatives, particularly the PFJ. They made recommendations relating to the following aspects of the seed industry: 1) urgency to respond to seed sector constraints; 2) implementation of the national seed policy and plan; 3) sustainable plant breeding and breeder seed production; 4) rehabilitation of seed processing and storage centers; 5) prioritization of the rehabilitation exercise; 6) addressing farmers' hesitation to purchase certified seeds; 7) strengthening the quality control system; 8) creating demand for certified seeds; 9) enforcement of best practices in seed production and marketing; 10) addressing challenges associated with climate change; 11) stepping up seed sector human capacity development, and 12) institutionalization of annual seed sector support workshop. A major out come of the workshop, whose relevance was rated high by over 95% of participants, was a five-year roadmap for seed sector development, comprising actions, resources, budget and timeline.

1. Introduction

The Government of the Republic of Ghana puts agricultural development in the forefront of the socio-economic development of the country. Agricultural development in Ghana is guided by the the Food and Agriculture Sector Development Policy (FASDEP II) and the Medium Term Agriculture Sector Investment Plan (METASIP) for modernized agriculture culminating in a structurally transformed economy and evident in food security, employment opportunities and reduced poverty. To achieve the policy objective faster, the Nana Addo Dankwa Akufo Addo-led government introduced the Planting for Food and Jobs (PFJ) Campaign which has helped farmers to have increased access to inputs, especially fertilizer and seed, to increase their crop yields. In spite of the importance of the seed industry to achieving the Government of Ghana's targets for the PFJ and other food and nutrition security related programs, it is under-developed and under-funded. Some progress has been made in the seed industry over the past couple of years with the development of the National Seed Policy and National Seed Plan and other regulatory frameworks. However, there is a wide and growing gap between demand and supply of quality seeds in the country. As a result, few farmers in Ghana use certified seed, averaging 5 to 25% of total seed used for legumes and cereals respectively.

The shortfall in the supply of certified seeds is attributed to major weaknesses in the seed sector that had persisted over the years. These challenges include the weak technical and agri-business capacities of the Small and Medium Enterprises (SMEs) in the production and marketing of seed, particularly the hybrid; weak financing of the sector and limited access to loans and high interest rate; unstructured markets; weak extension system; inadequate demonstration of new varieties and quality seeds; weak coordination of the seed system and lack of seed demand forecasting mechanism to facilitate the estimation of breeder, foundation and certified seeds. Moreover, inadequate irrigation facilities in Northern Ghana where the long dry season hinders all year round production. This condition is aggravated by climate change, whereas insufficient cold storage makes it challenging to maintain the viability of carry-over seeds.

Additional challenges are the weaknesses in the seed sector data management and quality control and regulatory systems.

To support government's efforts to meet the objective of the PFJ program by making quality seed available, accessible and affordable to farmers, the Seed Sector Support workshop was organized to: (i) identify priority interventions and resources for stepping up seed supply, (ii) develop mechanisms and approaches for scaling the production and supply of seeds, and (iii) outline a five-year roadmap for the implementation of priority activities. This report presents a summary of presentations and discussions (group and plenary) at the workshop. The first session presents an overview of the SAPIP project, followed by sessions on the production and marketing of breeder, foundation and certified seeds; seed quality assurance and certification; and the national seed policy and coordination.

In the immediate aftermath of the Workshop, based on the workshop outputs and recommendations, a five-year action plan with recommendations that will guide the implementation of seed sector activities in line with the National Seed Policy and National Seed Plan was outlined.

2. Opening and Participation



The workshop was chaired by the Chairman of the National Seed Council (NSC), Mr. Josiah Wobil, and facilitated by the Head of the Ghana Seed Inspection Division (GSID) of the Plant Protection and Regulatory Services (PPRS) of MoFA, Mr. Eric Quaye:

The Keynote address was delivered by the Honorable Deputy Minister of Food and Agriculture in-charge of Annual Crops, Dr. Sagre Bambangi on behalf of the Honorable Minister for Food and Agriculture, Dr. Owusu-Afriyie Akoto and in attendance were the Chief Executive Officer of the Northern Development Authority (NDA) and his deputies. The Northern Regional Director of Agriculture gave the welcome address on behalf of the Regional Coordinating Director. Opening remarks were then given in turns by the Chairman of the NSC, Director of CSD, PPRSD, SAPIP Coordinator, AGRA Country Director, GASIP Coordinator, GLDB Executive Director, SARI Director and NASTAG President.

High-level personnel from key seed sector stakeholder organizations participated in the workshop, including: members of the NSC, Directors of the Crops Services Directorate (CSD) and PPRSD, the Executive Director of Grains and Legumes Development Board (GLDB), the Regional and District Directors of Agriculture, the President of the National Seed Trade Association of Ghana (NASTAG), the President of the Seed Producers Association of Ghana (SEEDPAG), Seed Companies, Farmer Groups and Organizations, the Country Director of Alliance for Green Revolution in Africa (AGRA), Directors of the Crops Research Institute (CRI) and the Savannah Agricultural Research Institute (SARI), and the Coordinator and staff of SAPIP Coordinating and Management Unit. There were representatives from the Ghana Agricultural Sector Investment Program (GASIP), the West Africa Centre for Crop Improvement (WACCI) at the University of Ghana, Colleague of Agriculture of the Kwame Nkrumah University of Science and Technology (KNUST), and the press.



The workshop background and context, objectives and expected outcomes; and SAPIP's general concept and areas of intervention in the seed sector were discussed in the second session. The third session focused on the advances, challenges and perspectives relating to AGRA's support to seed industry development, and the supply of breeder, foundation and certified by the research institutions, GLDB and the private sector. The fourth session focused on seed quality assurance, policy and coordination. The fifth and sixth sessions were devoted to group work on four thematic working areas, and plenary presentations of the outcomes of the group work. The four thematic areas were: 1) Sustainable breeder and foundation seed production and marketing; 2) Certified seed production, marketing, dissemination and use; 3) Quality control and certification; and 4) Seed Policy and coordination.

The SAPIP's support for the seed industry will complement efforts by Alliance for Green Revolution in Africa (AGRA), United States Agency for International Development (USAID), Food and Agriculture Organization (FAO) and others to improve seed production and delivery systems. It covers: 1) production and marketing of breeder, foundation and certified seeds and 2) rehabilitation of seed processing, seed testing and storage centers. The project will provide resources to establish model breeder seed fields at Savanna Agricultural Research Institute (SARI) for rice, soybeans and maize; two at Crops Research Institute (CRI) for maize and rice; and one at the West Africa Center for Crop Improvement (WACCI) for hybrid maize. The project will collaborate with the private sector to improve the production and supply of quality foundation seeds. SAPIP supported the procurement of certified seeds in support of the PFJ Campaign in 2019; these were 500 MT of rice; 255 MT of soybean; 375 MT of maize and 5 MT of vegetables. In terms of rehabilitation of seed infrastructure, 1) a quick assessment of the seed centers at Winneba, Ho, Kumasi and Tamale has been conducted; 2) the management of the centres based on sound business models have been proposed; and 3) rehabilitation of one or two identified centers has been recommended.

3.Orientation Provided by the Planting for Food and Jobs Campaign

The current government initiative “Planting for Food and Jobs Campaign” provides a framework to accelerate the improvements in food security and increase in incomes. The program is hinged on five pillars: (1) seed access and development, (2) fertilizer access and fertilizer systems development, (3) extension services, (4) marketing and (5) e-agriculture to improve the productivity of maize, rice, soybean, cowpea and some vegetables value chains. Since quality seeds contribute about 40% to agricultural productivity improvement, the PFJ focuses on actions that will lead to increased use of quality seeds by farmers in view of the current low use. With increased use of quality certified seeds and the new fertilizer blends along with good agricultural practices, it is possible to double crop yields. The PFJ Secretariat has therefore provided projections for the supply of Breeder, Foundation and Certified seeds of the major cereals, legumes requirements from 2017 to 2020 (Table 1a. 1b and 1c).

Table 1a: Quantity (Kg) of Breeder Seed Projections from 2017 to 2020 under PFJ

Seed Class	Crop/Year	Maize OPV	Maize Hybrid	Rice	Sorghum	Tomato	Onion	Chili Pepper	Soybean	Cowpea	Total
<i>Breeder Seed (kg)</i>	2017	351.6	NA	183.8	NA	0.013	0.069	0.034		3200	3735.516
	2018	2393.4	NA	1636.4	199.1	0.071	1.048	0.073	20.7	3520	7770.792
	2019	4662.1	NA	3250.4	420.4	0.137	2.137	0.117	43.7	3870	12248.991
	2020	4889.0	NA	3411.8	442.6	0.143	2.246	0.122	45.9	4260	15071.811

Source: PFJ Implementation Document

Table 1b: Quantity (MT) of Foundation Seed Projections from 2017 to 2020 under PFJ

Seed Class	Crop/Year	Maize OPV	Maize Hybrid	Rice	Sorghum	Tomato	Onion	Chili Pepper	Soybean	Cowpea	Total
<i>Foundation Seed (tons)</i>	2017	20	NA	10	NA	0.004	0.008	0.006	NA	64.00	94.018
	2018	134	NA	92	13.9	0.020	0.125	0.012	231.6	70.40	542.057
	2019	261	NA	182	29.4	0.038	0.256	0.020	489.0	77.44	1039.154
	2020	274	NA	191	31.0	0.040	0.269	0.020	514.7	85.18	1096.209

Source: PFJ Implementation Document

Table 1c: Quantity (MT) of Certified Seed Projections from 2017 to 2020 under PFJ

Seed Class	Crop/Year	Maize OPV	Maize Hybrid	Rice	Sorghum	Tomato	Onion	Chili Pepper	Soybean	Cowpea	
Certified Seeds (tons)	2017	1339	638	700	0.0	1.2	1.2	1.2	NA	1280	3960.6
	2018	9114	4340	6231	1184.9	6.8	18.2	2.5	3150	1408	25455.4
	2019	17753	8454	12377	2501.5	13.0	37.2	4.0	6650	1548.8	49338.5
	2020	18617	8865	12992	2633.2	13.6	39.1	4.2	7000	1703.68	51867.78

Source: PFJ Implementation Document

4. Advances, Challenges and Perspectives of the Ghana Seed Industry

This section covers five key components of the national seed industry as follows:

- Breeder Seed Production and Marketing
- Foundation Seed Production and Marketing
- Certified Seed Production and Marketing
- Seed Quality Assurance and Certification
- National Seed Policy and Coordination

4.1. Breeder Seed Production and Marketing

- Forster Boateng - Country Director, AGRA Ghana; Doris Kanvena - Seed Systems Specialist, CSIR-SARI; and Manfred Ewool - Senior Maize Breeder, CSIR-CRI

4.1.1 Advances

Success stories from three projects funded by the Alliance for Green Revolution in Africa (AGRA) in Ghana were presented. The projects were: 1) The PASS seed value chain; 2) The Scaling Seeds and Technologies Partnership (SSTP); and 3) Micro Reform for African Agribusiness (MIRA) projects in Ghana. The PASS project had two main components: 1) Research-for-Development (R&D), and 2) Delivery Systems. The R&D component trained 18 PhDs, 31 MSc, 34 Laboratory Technicians, and 104 Extension Agents; and released 45 new crop varieties. The delivery component supported the set-up of 11 seed enterprises and developed agro-dealer networks. The SSTP project scaled-up production of certified seeds of maize, rice, cowpea and cassava. It supported the development of the national seed plan in partnership with MoFA and IFDC through the USAID-funded Agricultural Technology Transfer (ATT) project.

AGRA supported the study and production of Early Generation Seeds and also the development of The African Seed Access Index (TASAI). The MIRA project supported the Government of Ghana’s efforts to reform regulations that limited private sector investment in smallholder value chains, seed policy, seed regulation and TASAI 2018.

The Crop Improvement Program of the Council for Scientific and Industrial Research - Savannah Agricultural Research Institute (CSIR-SARI) released several varieties of maize (17), cowpea (5), soybean (4), groundnut (2) and rice (2) over the past 10 years. The institute has also supplied early generation seeds to accredited seed producers. Figure 1 shows the trends in the supply of early generation seeds of maize, rice and soybean by CSIR-SARI during 2014-2017.

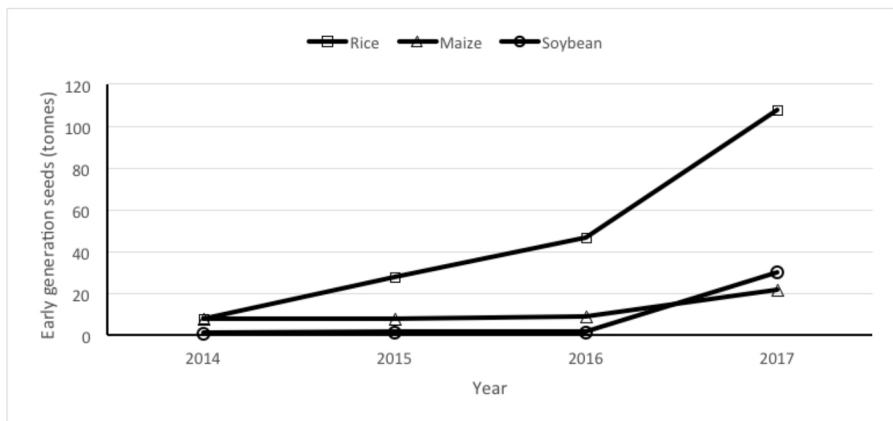


Fig. 1. Trends in annual Supply of Early Generation Seeds by the Savanna Agricultural Research Institute during 2010-2017. Source: CSIR-SARI, 2019.

The CSIR - Crop Research Institute (CSIR-CRI) has also released several varieties of cereals (hybrid maize, open-pollinated maize and rice), legumes (e.g., soybean, cowpea and groundnut), root and tubers (cassava, yam, sweet potato and cocoyam), and vegetables (pepper) over the past two decades. Breeder seed requirements of the major food crops in the country are projected to increase from now till 2020. Projections in the breeder seed requirements for maize, rice and sorghum in Ghana are shown in Fig. 2.

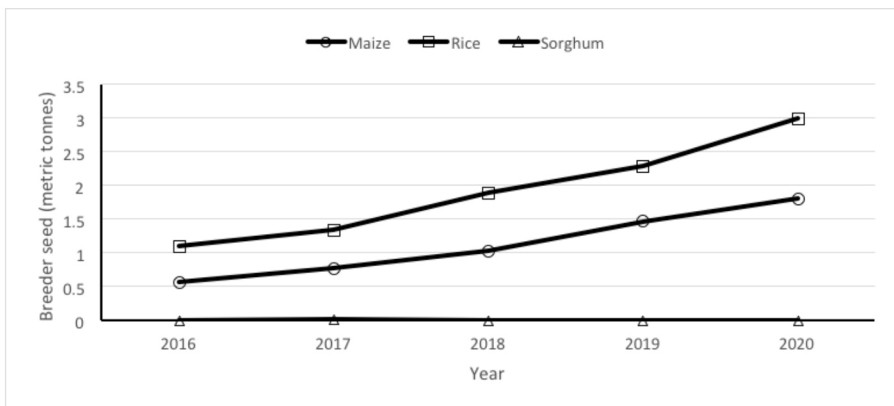


Fig. 2. Projected Requirements of Breeder Seeds of Maize, Rice and Sorghum in Ghana from 2016-2020. Source: MoFA, 2019.

4.1.2 Challenges

- Lack of information – poor demand forecasting and planning,
- Limited funding for research – low investment in production activities,
- Poor markets - unstable and unreliable, small and unstructured markets,
- Poor infrastructure - irrigation facilities, land, storage facilities and drying platforms,
- Insufficient mechanization support -field equipment, seed conditioning and packing machinery,
- Limited human resources - limited skilled labour and high cost of labour,
- Inadequate quality control and quality assurance - poorly resourced GSID and poorly equipped CSIR-SARI seed laboratory,

4.1.3. Perspectives

- Boost production of Early Generation Seed through public-private partnerships,
- Continue to work with partners to improve supply of high quality breeder seed,
- Improve communication with stakeholders,
- Improve mechanization (acquire field and processing/conditioning machinery),

- Establish a seed testing laboratory and institutionalize quality control and quality assurance,
- Adopt variety licensing to seed companies, and
- Implement winning seed marketing strategies

4.1.4 Recommendations

1. Promote Public-private sector partnerships to boost production of breeder seed,
2. Promote partnerships between local seed producers and multi-national companies to scale-up hybrid seeds production,
3. Make request for breeder seeds on time to enable the research institutions to plan,
4. Establish a system for better forecasting of demand for breeder seeds,
5. Establish a credible and strong seed market information system for seed system,
6. Establish a coordination system among the various breeder seed producers,
7. Support capacity development (e.g., human, infrastructure and financial) of the universities and research stations to produce and market quality breeder seeds,
8. Rehabilitate the existing infrastructure (e.g., irrigation, cooling, storage facilities and drying platforms) for the production of breeder seeds,
9. Provide adequate mechanization equipment (e.g., e.g., field equipment, seed conditioning and packing machinery, processing equipment) for breeder seed production.

4.2 Foundation Seed Production and Marketing

- *Robert Asuboah - Executive Director, GLDB*

4.2.1 Advances

Foundation seed was defined as the direct seed increase resulting from growing breeder seeds. Foundation seed is produced by a seed production expert or under an experimental station to ensure that varietal identity and genetic purity are maintained as closely as possible to those of the breeder seeds. An accredited seed production agency could also produce foundation seed with the assistance of a plant breeder.

Until recently, the Grains and Legumes Development Board (GLDB) was the main source of foundation seed in the country. This is because, there were fewer seed growers, fewer crop varieties under cultivation, and low demand for foundation seeds. Currently, the Plant Protection and Regulatory Services Division (PPRSD) puts the number of foundation seed producers in the country at nine. They include, beside GLDB, research institutes, universities, private seed companies and selected private seed growers who produce foundation seeds of maize, rice, sorghum, cowpea, soybean and groundnut.

Production of foundation seeds of maize, rice, sorghum, cowpea, soybean and groundnut by GLDB generally declined from 2010-2017. Trends in the production of foundation seeds of maize and cowpea by GLDB during 2010-2017 are presented in Fig. 3. In contrast, foundation seed requirements of maize, rice and sorghum in Ghana are projected to increase from 2017-2020 as shown in Fig. 4.

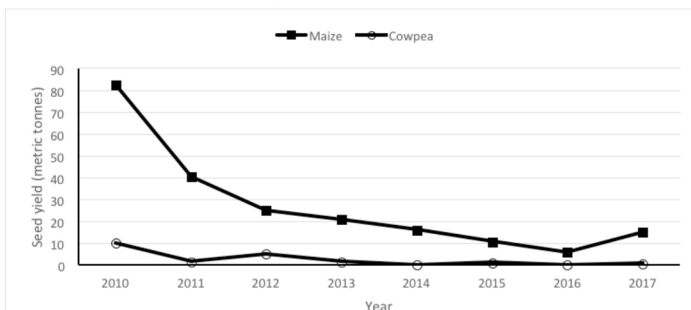


Fig. 3. Trends in the Production of Foundation Seeds of Maize and Cowpea by the Grains and Legumes Development Board during 2010-2017. Source: GLDB, 2019.

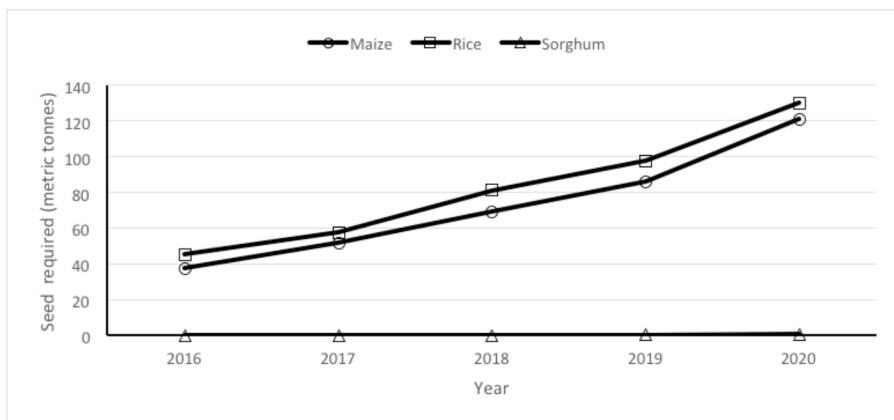


Fig. 4. Projected Requirements of Foundation Seeds of Maize, Rice and Sorghum in Ghana from 2016-2020. Source: MoFA, 2019.

Marketing of foundation seeds currently enjoys the most trouble-free atmosphere along the seed value chain in the country. The clientele is clear cut and indisputable. They include: NASTAG, SEEDPAG, private seed companies, universities and research institutes, and other recognized and registered seed producers.

4.2.2 Challenges

- Weak enforcement of the National Seed Policy and regulatory frame-works,
- Limited resources (human, funds and infrastructure) for the regulatory bodies, e.g., GSID of PPRSD,
- No institutional linkages among the various foundation seed producers,
- Limited forecasting to know the expected varieties and quantities to be produced,
- Limited seed and non-structured seed market,
- Lack of monitoring and evaluation of the various foundation seed producers,
- Difficulty in forecasting breeder and foundation seeds needs,
- Limited funding,
- Lack of storage and cooling facilities,
- Limited Irrigation facilities,
- Dilapidated seed processing equipment.

4.2.3 Perspectives

- Operationalizing the seed law, policy and plan,
- Identifying a lead institution to coordinate and oversee foundation seed production amongst stakeholders whilst PPRSD/GSID concentrate on basic certification and quality assurance only
- Holding seed industry stakeholder meetings to set 5-year production targets of all crops, classes to be produced in terms of quantities and who does what using the example in the national Seed Plan as a guide.

4.2.4 Recommendations

Predicting of foundation seed needs was discussed in group and plenary. It was agreed that the foundation seed needs can be forecasted from the knowledge of the amount of certified seed required. The PFJ policy document could also be a source of information for predicting foundation seed needs. The production and marketing of breeder and foundation seeds must be demand-driven to ensure that the supply meet the actual demand. In addition, there must be feedback mechanisms from clients/certified seed producers to ensure quality. The following recommendations were made:

1. Promote public-private sector partnerships to boost production of foundation seed.
2. Promote partnerships between local seed producers and multi-national companies to scale-up hybrid seed production.
3. Reform GLDB to train private sector seed actors in seed production and business management.
4. Request for foundation seeds should be made on time to enable the research institutions to plan.
5. Organize joint annual planning meetings for seed sector stakeholders.
6. Establish a system for better forecasting of demand for all classes of seed.
7. Establish a credible and strong seed market information system.
8. Establish a coordination system for foundation seed production.
9. Strengthen the capacity (e.g., human, infrastructure and financial) to produce and market seeds.
10. Train seed sector actors in crop improvement, seed production and business management (e.g., plant breeding, seed science and technology) – both short and long term courses.

4.3 Certified Seed Production and Marketing

- *Thomas Havor - President, NASTAG*

4.3.1 Advances

Total production of certified seeds of cereals (maize, rice and sorghum) and legumes (soybean, cowpea and groundnuts) increased by 135% from 6,942 MT in 2016/17 to 16,344 MT in 2018/19 (Table 2) as a result of increased investment by the Private Sector in response for demand for seed created by the PFJ.

The percentage production by region for 2018/19 stand as follow: Northern (51%); Upper West (27%); Ashanti (8%); Volta (4%); Upper East (4%), Brong Ahafo (3%); Eastern (2%); Central (1); Western (0%) and Greater Accra (0% (Fig. 5). Quantities of each crop produced per region for the 2018/19 cropping season is presented in Figure 6.

Table 2: Potential Demand and Actual Production of Certified Seed of Cereal and Legume Crops in Ghana in 2016/17 and 2019

Crop	Potential Demand, 2017	Production in 2016/17	Production in 2018/19
Maize	22,500	4,454	8,425
Rice	16,000	1,396	5,204
Sorghum	3,200	913	248
Cowpea	3,600	106	220
Groundnut	4,000	69	247
Soybean	1,500	4	58
Total	50,800	6,942	16,344

Source: NASTAG, 2019

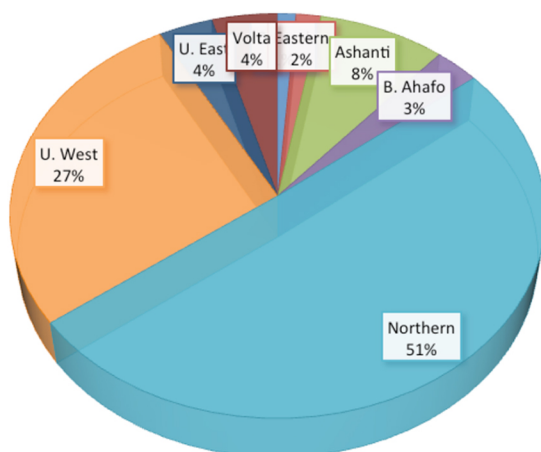
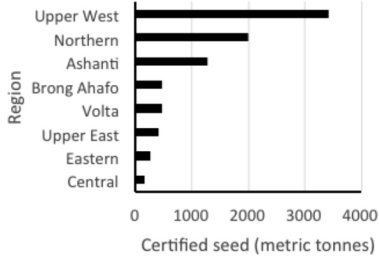
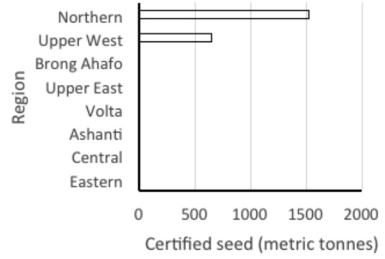


Fig. 5. Percentage Production of Certified Seeds (MT) Per Region in 2018/19

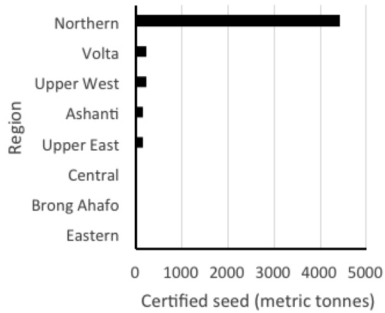
a) Maize



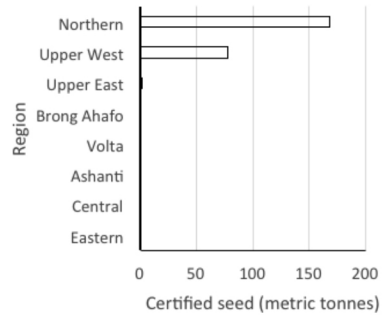
d) Soybean



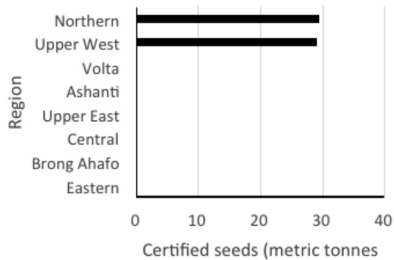
b) Rice



e) Groundnut



c) Sorghum



e) Cowpea

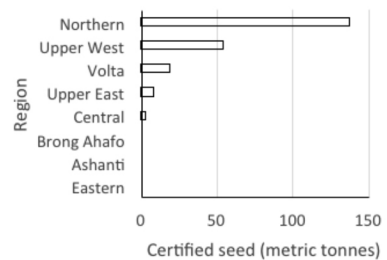


Fig. 6. Quantities of Certified Seeds (MT) of the Cereal and Legume Crops Produced Per Region for the 2018/19 Cropping Season

The following advances have also been made by NASTAG in the production and marketing of certified seeds:

- Strengthened the production capacities of members in terms of quantity, quality and marketing of seeds as private seed sector players,
- Developed a 5-year Strategic Plan that is guiding the association in developing annual work plan to meet the demands of the seed sector and its members,
- Twenty trained members in Seed Enterprise Quality Management, and eight members in Quality Rice Foundation Seed Production,
- Co-ordinated the supply of certified seeds under the government flagship program (PFJ Campaign) for its members for 2017 and 2018,
- Registered its membership with the African Seed Trade Association (AFSTA), and was thus represented at the 2017 and 2018 Annual Congress in Senegal and Egypt respectively.
- Finalized the development of the Seed Companies and Seed Producers Directory which will include the Catalogue of crop varieties and species released in Ghana , and
- Facilitated the first ever National Seed Business Networking Forum in Accra, Ghana that brought over 100 relevant seed sector players together.

4.3.2 Challenges

Challenges faced by NASTAG in the production and marketing of certified seeds included:

- Low adoption of certified seed by farmers,
- Inadequate private sector engagement in the commercialization of quality foundation seeds,
- Inadequate seed market and industry data,
- Non-existence of seed market intelligence and demand forecasting system, affecting seed production and marketing,
- Inadequate access and use of quality foundation seeds,
- Weak operational, technical and business capacities of the seed SMEs to produce quality certified seeds,
- Lack of sustainable funding to engage the public sector,
- Inadequate legal and policy environment for seed business,

- Very low participation of women and the youth in the seed industry,
- Over-dependency on open pollinated varieties,
- Difficulties in the production and marketing of hybrid seeds,
- Poor agronomic practices used by certified seed growers,
- Lack of irrigation facilities for dry season certified seed production,
- Inadequate supervision for seed quality assurance and certification - poorly resourced GSID ,
- Lack of harvesting, processing and storage facilities for certified seed production and marketing,
- Weak linkages between input dealers and seed growers,
- Lack of branding and packaging of certified seeds, and
- High prices of foundation seeds.

4.3.3 Perspectives

- Strengthening Policy and Regulatory Framework of Ghana's seed system,
- Scaling-up hybrid seed production through partnership between local seed producers and multinational companies,
- Strengthening private sector agro-input distribution to increase farmers' access beyond PFJ.
- Strengthening private seed sector institutions and actors,
- Projecting the production of certified seed based on national seed demand forecast.

4.3.4 Recommendations

1. Promote partnership between local seed producers and multi-national companies to produce, market and scale-up production of hybrid seeds,
2. Institute annual demand and supply forecast for certified seeds,
3. Organize joint annual planning sessions with seed sector stakeholders,
4. Establish a credible and strong seed market information system for certified seeds,
5. Organize short-term courses on seed production, quality control and certification, and seed business management for staff in the seed industry,

6. Promote participation of women and the youth in the seed industry,
7. Facilitate strong linkages between input dealers and certified seed producers,
8. Encourage certified seed producers to brand and package their seeds,
9. Encourage NASTAG to conduct periodic certified seed market surveys,
10. Promote use of good agronomic practices by certified seed producers,
11. Promote the use of mechanization by certified seed producers,
12. Promote dry season certified seed production under irrigation,
13. Ensure adequate supervision of certified seed producers for seed quality assurance and certification,
14. Organize periodic training on seed production techniques for the private sector,
15. Facilitate access to appropriate harvesting, processing and storage facilities for certified seed production,
16. Build the capacity of extension staff on seed extension,
17. Set-up field demonstrations to showcase the advantages of superior crop varieties, including hybrids,
18. Organize study tours to exchange knowledge on best practices in seed production and marketing,
19. Promote community-level certified seed sales points to facilitate farmers' access to certified seed,
20. Strengthen agro-input distribution network to increase farmers' access to quality seeds,
21. Intensify the use of novel approaches to improve certified seed adoption, using the PFJ platform.

4.4. Seed Quality Control and Certification

- Eric Bentsil Quaye - Head, PPRSD-GSID, MoFA

4.4.1 Advances

Seed Quality Assurance and Certification (SQAC) was defined as a system of seed quality monitoring, standards adherence and enforcement. It is a basic feature of an effective seed industry, which covers the entire spectrum from field production, processing, packaging, storage to marketing. It gives credibility to the seed as a specialized commodity since it empowers farmers to have confidence in the product.

Four quality assurance schemes were listed, namely, the: 1) minimum standards certification; 2) truth in labelling, quality declared seed system; 3) own internal quality control under general supervision; and 4) licensed or delegated seed quality control. Ghana operates the minimum standard of certification which covers crops such as cereals (e.g., maize, rice, sorghum, and millet), legumes (e.g., cowpea, groundnuts, Bambara groundnuts, and soybean), vegetables (e.g., garden egg, onion, tomato, pepper and okra), root and tuber crops (e.g., cassava, yam, sweet potato and cocoyam), and fruit and perennial crops (e.g., mango, citrus and pineapples).

Key SQAC stakeholders include: variety developers or plant breeders, variety release and registration committee, seed producers, seed certification agency, and seed dealers or sellers. Four key stages are involved in SQAC, namely: 1) administrative (e.g., registration of the seed grower, registration of the seed field - the location, size, cropping history, coordinates of the site should be supplied and the variety must have been registered); 2) verification of seed source; 3) field inspection (e.g., site selection, isolation requirements, spacing, planting densities, border rows, etc.), and 4) post-harvest inspection (seed sampling, seed testing, labelling, and bagging).

4.4.2 Advances

- Membership of the International Seed Testing Association,
- Establishment of a functional National Seed Laboratory and three satellite laboratories,
- Increase in the number of qualified trained staff,
- Piloting accrediting private seed inspectors,
- Developed guidelines for Seed Quality Assurance, Certification and Accreditation for seed inspectors,
- Establishing a National Seed Regulation scheme.

4.4.3 Challenges

- Soaring number of land sizes and locations of registered seed producers / fields,
- Flouting of quality assurance procedures by seed producers of all classes,
- Unprofessional conduct by seed inspectors,

- Faking and adulteration of seeds offered for sale,
- Weakness in the enforcement of Part 2 of ACT 803 by GSID,
- Limited funding for seed inspection, sampling and laboratory analysis, post certification monitoring, and supervisory visit,
- Inadequate quality assurance training for inspectors and producers/dealers,
- Inadequate certification kits for inspectors and conditioning equipment's for private sector operators,
- Inadequate information on DUS and VCU,
- Inadequate logistical support,
- Limited number of seed inspectors,
- Inadequate Isolation and mixtures,
- Poor documentation on the production levels of foundation and certified seeds,
- Weak capacity of actors along the value chain,
- Rapid loss of seed viability in storage,
- Limited knowledge of the seed issues by students in various institutions.

4.4.4 Perspectives

- Advocating for more private sector investments to ensure sustainability in seed production and marketing,
- Improving transparency in variety development,
- Streamlining variety release mechanisms,
- Intensifying use of novel and practical approaches to improving certified seed adoption using PFJ platform,
- Applying Innovative, efficient and vibrant seed regulation and quality assurance,
- Adopting efficient and reliable integrated data capturing and management system,
- Making regulatory environment attractive and firm,
- Using drones to support and improve inspection of seed fields,
- Acquiring seed processing equipment (e.g., threshers) at mechanization centres,
- Acquiring ambient storage facilities at major markets areas for seed storage,

- Expediting action on accreditation of private seed inspectors,
- Releasing more productive locally developed varieties,

4.4.5 Recommendations

1. Promote innovative, efficient and vibrant seed regulation and quality assurance,
2. Ensure efficient and reliable integrated data capturing and management system,
3. Make the regulatory environment attractive and firm,
4. Use drones to support and improve inspection of seed fields,
5. Speed up action on accreditation of private seed inspectors on a pilot basis,
6. Train inspectors on descriptors,
7. Provide means of transport for inspectors,
8. Develop new protocols for isolation in space and time,
9. Build capacity of appropriate technical persons on data collection and management,
10. Provide functional cold store facilities,
11. Promote public-private sector partnerships to increase access to storage facilities,
12. Improve curricula on seed technology in tertiary institutions,
13. Explore new ways of reducing the cost of variety release.

4.5. Seed Policy and Coordination

- Solomon Gyan-Ansah - Deputy Director, CSD, MoFA

4.5.1 Advances

The National Seed Policy (NSP) is a statement of intent by Government and its partners regarding short, medium and long term development and management of the position and intentions related to the seed sector. The basis of the NSP are the intentions enshrined within the MOFA agricultural policy documents (FASDEP II, METASIP etc.). The NSP aims to support the establishment of a well-coordinated, comprehensive and private sector-driven sustainable seed industry. This will be achieved through systematic and strategic approaches which would continuously create and supply new improved varieties for use by farmers; and, support successful seed production, certification, marketing and seed security systems.

The NSP encourages the private sector to assume command of the commercial components of the seed industry.

Under the current legislative framework, the National Seed Council (NSC) coordinates the National Seed System. The Seed and Adaptive Research Unit of the Directorate of Crop Services (DCS) under Ministry of Food and Agriculture (MoFA) is responsible for the promotion and provision of services for the development of the seed industry. It also supervises the five national agriculture research stations which provide support for testing and dissemination of technologies. The research institutions and universities have the mandate to produce breeder seeds. The Grains and Legumes Development Board (GLDB), produces foundation seeds, and provides processing and storage services for foundation and certified seeds at three strategic locations in southern Ghana - Ho, Winneba and Kumasi, whereas the center at Tamale is managed by the Ghana Seed Inspection Division (GSID) of the Plant Protection and Regulatory Services Directorate (PPRSD). The National Seed Trade Association of Ghana (NASTAG) is the umbrella association of the seed enterprises and companies in the country. For the seed industry to thrive, it must be transformed into a private sector-led, market-oriented industry with the appropriate institutional support and services.

The overall coordination of the seed sector is entrusted to the National Seed Council (NSC) hosted by the the Plant Protection and Regulatory Services (PPRSD) whereas the Directorate of Crop Services (DCS) coordinates seed policy and adaptive research. The National Seed Trade Association of Ghana (NASTAG) coordinates the private sector, which include the Small and Medium Enterprises (SMEs) and seed producers under the Seed Producers Association of Ghana (SEEDPAG). Activities and responsibilities of various institutions are summarized below:

Activity	Responsible Organizations
Variety development	Research Institutions and Universities
Breeder seed production	Research Institutions and Universities
Foundation seed production	Public and private sectors
Certified seed production	Seed Enterprises (SEEDPAG & NASTAG)
Seed conditioning	GLDB and GSID and the Private Seed Enterprises
Seed packing and storage	Seed growers and dealers (SEEDPAG, NASTAG & GAIDA)
Distribution and marketing of seed	Seed growers, dealers and non-governmental agencies

Key elements of the NSP were listed as: 1) Research and Variety Development; 2) Biotechnology in Crop Improvement; 3) Seed Production; 4) Informal seed sector; 5) Seed Conditioning and Storage; 6) Seed Regulatory Framework (Seed Quality Assurance, Variety Release, Intellectual Property Rights); 7) Agricultural Extension; 8) Seed Marketing; 10) Seed Import and Export; 11) Private Seed Enterprise Development; 12) Value Chain; 13) National Seed Security; 14) Capacity Building; 15) National Funding Mechanisms; and 16) Regional and International Cooperation (Donors, International Seed Associations and Institutions, Regional Seed Sector Cooperation, Continental Seed Cooperation). The National Seed Plan (NSP) has 10 project profiles under four main components as shown below:

Component	Project
Direct seed intervention	1. Strengthening the role of the Private Sector in the Ghana Seed Industry
	2. Developing the Private Sector Seed Marketing
	3. Assisting the Private Seed Sector with improved infrastructure
Supportive services for Seed Industry Growth	4. A Strong Seed Value Chain for a Strong Seed Industry
	5. Ensuring Adequate Human Resources for the Seed Industry
	6. Strengthening the Plant Genetic Resources Base of the Seed Industry
Addressing Gaps in the Strategic Seed Sector	7. Catering for the Seed Needs of Traditional Crops
	8. National Seed Security Project

Component	9. Facilitating the Positive and Contributory Role of the Informal Seed Sector in Ghana
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Seed Sector	10. Strengthen the National Seed Council's Secretariat (P10)
Governance and Coordination	

4.5.2 Challenges

- Weak support for the operation of the NSC and its secretariat,
- Lack of one-stop clearing house for the seed sector information and database,
- Inadequate publicity of the National Seed Policy, Part II of the Plants and Fertilizer Act, 2010 (803) and its regulations, ECOWAS-UEMOA-CILSS Seed Regulations,
- Non operationalization of the National Seed Security system,
- Weak information flow within and among both public sector agencies as well as the private sector players,
- Lack of Monitoring and Evaluation (M&E) framework for the seed sector including web-based M&E,
- Limited resources for smooth running of the Seed Council Secretariat to support the work of the Council,
- Limited human resource in the seed sector,
- Weak seed value chain

4.5.3 Perspectives

- Identifying an expert and support staff (with Terms of Reference) for the secretariat;
- Acquiring basic secretariat equipment for smooth functioning of the secretariat;
- Acquiring adequate resources to the secretariat to carry out its duties.
- Sensitizing all the seed sector stakeholders,
- Encouraging seed splinter groups to come under one umbrella body,
- Developing factsheets, leaflets for distribution to the public,
- Instituting annual demand and supply forecast of all seed categories,
- Establishing a credible and strong seed market information system,
- Providing access to full complement of equipment and infrastructure needed for quality seed conditioning and storage,

- Establishing a strong National Seed Business net-work,
- Organizing fora to discuss topical issues,
- Establishing early warning systems,
- Building infrastructure (e.g. conditioned storage).

4.5.4 Recommendations

1. Provide resources to operationalize the NSC secretariat (e.g., identify an expertise and support staff with terms of reference for the Secretariat; provision of basic secretariat equipment for smooth functioning of the secretariat),
2. Sensitize the public, more especially seed sector stakeholders on the National Seed Regulation and the Plants and Fertilizer Act, 2010 (Act 803),
3. Find innovative ways in reducing the cost of releasing crop varieties,
4. Establish the Plant and Fertilizer Fund, including the Seed Sector Support Fund,
5. Hold the Annual NASTAG Seed Stakeholder Business Forum as the platform for information sharing and for addressing issues in the seed sector,
6. Encourage seed sprinter groups to come together under one association,
7. Establish early warning systems,
8. Institute annual demand and supply forecast for seed categories,
9. Establish a credible seed market information system,
10. Facilitate access to full complement of equipment and infrastructure for quality seed, conditioning, testing, treatment, bagging, storage
11. Build human capacity of technical persons, e.g., seed technicians, laboratory technicians,
12. Establish a strong national seed business network.

5. General Recommendations

5.1. Preamble

Arising out of the Seed Sector Support Workshop in Tamale from 15th to 17th January, 2019, during which stakeholders of the national seed industry considered the workshop as very relevant and timely in bringing actors on a common platform to respond to national policy objectives, particularly the PFJ, which enters its third year in 2019,

Considering that the workshop provided stakeholders the opportunity to learn of the new trends in the seed sector and the impact of the PFJ in growing the national seed industry and ushering in unprecedented opportunities for private sector investment in the seed sector,

Recognizing that the PFJ has moved the national seed production level from about 6,000 tons in the 2016/2017 cropping season to over 16,000 tons in the 2018/2019 season,

Mindful that the workshop has helped deepen stakeholders' understanding of the national seed policy orientation and functions of the seed industry as well as helped to diagnose the seed sector, taking stock of past performance to plan for the future,

Observing that in the course of the Workshop, opportunities were identified in the seed industry that helped stakeholders to re-position themselves to step up their respective responsibilities while achieving adequate clarity on critical areas of interventions by development programs such as those by AGRA, USAID and SAPIP, working in synergy,

Aware that in view of low crop productivity, the plant breeding institutions require to re-strategize their approaches to meet the increasing demands for highly productive genetic materials and breeder seeds while good agricultural practices are also promoted,

Recognizing that while there is growing demand for early generation seeds, the supply side is weak and disjointed and the various organizations and enterprises will need some support and reforms to sustainably deliver foundation seeds quantitatively and qualitatively,

Supporting that the accelerated increases in the production of certified seeds coupled with boosting farmers' confidence in their use, require the quality assurance system to be strengthened and innovative approaches adopted for seed extension and marketing in reaching out to the rural communities,

Accepting that the national seed infrastructure, particularly processing and storage facilities, which have been in use for over 40 years, are in a deplorable state, requiring urgent interventions, while the private sector needs also to be encouraged to acquire, as far as possible, custom made processing and storage equipment that suit their individual operations, and

Realizing that an effective coordination of the seed industry will be essential to facilitate its growth,

Participants unanimously showed their commitment to support the government's seed sector policy and other initiatives, particularly the PFJ and made recommendations as follows:

5.2 Actions

5.2.1 Urgency to respond to Seed Sector Constraints: Participants agreed that there is a multitude of gaps and shortfalls in the current seed sector dispensation which requires rapid resolution through policy and coordination actions and recommended enhanced support to the National Seed Council, acting in concert with relevant stakeholders, including MOFA, to address the shortfalls, particularly those found in coordination and knowledge management with the goal of addressing the complex needs of stakeholders (Referred to NSC).

5.2.2 Implementation of the National Seed Policy and Plan: Recognizing that several of the current constraints of the seed sector can be addressed through the implementation of the National Seed Plan, Participants reiterated calls for a rapid exercise of resource mobilization for the implementation of the Plan, particularly interventions relating to private sector facilitation and quality assurance, to lift the National Seed Industry to its proper level (Referred to NSC).

5.2.3 Sustainable Plant Breeding and Breeder Seed Production: To further boost farmers' confidence, research organizations were encouraged to develop crop varieties and hybrids that vividly show outstanding performance compared to farmer saved seeds. The need to institute sustainable funding mechanism for innovative and competitive variety development was also recommended.

It was also suggested that the cost of releasing crop varieties should be significantly moderated. (Referred to CSIR & Universities and MoFA).

5.2.4 Rehabilitation of Seed Processing and Storage Centers:

Stakeholders agreed on SAPIP's plan to carry out a feasibility study to determine the economic viability of the four seed centers at Ho, Winneba, Kumasi and Tamale. Stakeholders suggested that such a study should consider not only the engineering aspects but also should be extended to cover other dimensions of the seed industry that will inform considerations for the future use of the plants. (Referred to MoFA and Development Projects).

5.2.5 Prioritization of the Rehabilitation Exercise: In the light of limited resources, it was recommended that after the study, SAPIP should prioritize the centers for subsequent investment, ensuring availability of new facilities in areas where seed production levels were currently high. In that regard, participants lauded SAPIP's quest to develop sound business and management models for any of such centers whenever they are rehabilitated or constructed. **(Referred to MoFA and Development Projects).**

5.2.6 Farmers' Hesitation to Purchase Certified Seeds: Considering the current hesitation of some farmers to purchase seeds offered for sale, participants recommended an increased campaign to sensitize farmers on the benefits of true certified seeds and enhance farmers' best practices with regard to proper seed utilization practices. (Referred to DCS, AESD and NASTAG).

5.2.7 Strengthening the Quality Control System: Stakeholders recommended that PPRSD-GSID be supported to step up its campaign dubbed "Operation Clean Seeds" as well as to strengthen its capacity for innovative quality control and certification, including the accreditation of private inspectors and the use of barcode. The promotion of internal (and/or association) quality control system and the use of other cost-saving approaches for quality control and certification were stressed. Furthermore, in view of the growing number of seed production fields, vis-a-vis the high cost of physical field inspection,

stakeholders recommended the use of modern technology (e.g. the use of drones) in obtaining quality control data in the field. **(Referred to PPRSD-GSID)**

5.2.8 Creating Demand for Certified Seeds: To create a sustained level of demand for certified seeds, adequate to form a basis for a viable and credible national seed industry, stakeholders recommended increased effort in seed extension through demonstrations, mass media sensitization and the use of ICT tools, with active engagement of the private sector and other concerned stakeholders. Regular market studies alongside the use of a seed demand forecasting tool should be encouraged to determine the actual demand levels for the three classes of seeds. **(Referred to DCS, AESD and NASTAG/SEEDPAG).**

5.2.9 Enforcement of Best Practices in Seed Production and Marketing: Stakeholders recommended the enforcement of best practices in seed production and marketing in line with the requirements, standards, penalties and sanctions stipulated in the Seed Regulations. Branding by the respective enterprises should be adopted to put checks on the infiltration of unauthorized seed dealers. **(Referred to PPRSD-GSID and NASTAG/SEEDPAG).**

5.2.10 Addressing Challenges Associated with Climate Change: With the advent of climate change and associated biotic and abiotic stresses, stakeholders recommended the use of climate forecasting tools and the establishment of a seed security system **(Referred to NSC, CSIR, CSD).**

5.2.11 Seed Sector Human Capacity Development: In view of the weak human capacity in the current seed value chain, coupled with the increasing role of the private sector in foundation and certified seed production and marketing requiring even further human resources, it was recommended that a unit (recommended to be housed in GLDB) be supported to develop the required capacity of the private sector and to effectively coordinate the production and marketing of foundation seed and other related steps in the seed value chain. **(Referred to NSC, DCS and GLDB)**

5.2.12 Institutionalization of Annual Seed Sector Support Workshop:

In view of the numerous challenges confronting the seed industry, participants recommended that the Seed Sector Support Workshop be institutionalized as an annual event alongside seed business networking that may be organized by the private sector. **(Referred to NSC, NASTAG/SEEPAG, DCS)**

5.2.13 Roadmap for Seed Sector Growth:

As part of the report of the Seed Sector Support Workshop, stakeholders recommended the development of a roadmap with targets that will move the current certified seed supply level from 12% to 50% within the next 5 years. **(Referred to NSC, Development Projects)**

5.2.14 Presenting Workshop Outcome to the Honorable Minister of Food and Agriculture:

Participants recommended that a team be constituted to present the outcomes of the workshop to the Minister of Food and Agriculture in order to secure his support for the above recommended actions. **(NSC and Key Stakeholders)**

6. Workshop Evaluation



Participants completed evaluation forms to provide feedback on the event. This strategy is intended to contribute to evidence-based information for improving the planning and implementation of future events, to achieve greater impact.

The analysis of the responses revealed that participants appreciated the importance of the Seed Sector Support Workshop as a useful platform for stakeholders to deliberate on the concerns that are critical to the development of the national seed industry. As noted by a participant: “It is one of the events that assembled key and relevant stakeholders to address the issues on hand. This is commendable”. Participants were particularly impressed with the high-level participation of key institutions and partners, as it has prospects for ensuring the commitment and support required to consolidate and sustain gains made in the seed sector through the collaborative efforts of stakeholders.

More than 90% of the participants either agreed or strongly agreed that: the workshop increased their understanding of the national seed policy orientation and the Seed Industry; the key messages and presentations given were appropriate, passionate and need to be pursued; the workshop was participatory and offered national experiences; the general approach of the workshop was effective; and the workshop met their expectations.

7.Implementation Plan for the Future

A post workshop exercise was conducted to develop a five-year implementation plan with details on partners, resources and estimated budgets and aimed at improving the seed industry in order to meet the increasing demand for certified seeds in Ghana. The plan was developed based on the presentations, group work and plenary discussions. The implementation plan which has been partitioned into five components, aims at improving the production and marketing of breeder seed (Implementation Plan 1), foundation seed (Implementation Plan 2); certified seed (Implementation Plan 3); seed quality assurance and certification (Implementation Plan 4) and the National Seed Policy and Coordination (Implementation Plan 5). Estimated budget for the five-year implementation plan is summarized as follows:

	Component	Budget (US\$)
1	Improve the production and marketing of breeder seed	920,000
2	Improve the production and marketing of foundation seed	1,245,000
3	Improve the production and marketing of certified seed	1,920,000
4	Improve Seed quality assurance and certification	950,000
5	Facilitating the implementation of the National Seed Policy and Coordination	515,000
	Total Budget	5,550,000

Details of the budgets for the five components of the Plan are presented below:

7.1. Implementation Plan 1. A Five-Year Work Plan and Budget to Improve the Production and Marketing of Breeder Seeds (US\$ 920,000)

Key constraints	Proposed actions	Partnership	Resources	Budget(US\$)	2019	2020	2021	2022	2023				
1. Lack of institutional linkages among the various breeder seed producers	Enforce the national seed policy and other frameworks	NSC, DCS	Advocacy material	5,000		x	x	x	x	x	x	x	X
	Facilitate coordination among the various breeder seed producers	NSC, CSIR-SARI, CSIR-CRI, WACCI, NASTAG,	Travel and logistics	20,000		x	x	x	x	x	x	x	x
	Organize an annual planning for breeder seed sector actors	NSC, CSIR-SARI, CSIR-CRI, GLDB, WACCI, NASTAG/SEEDPAG	Conference facility, travel and logistics	40,000			x		x			x	
2. Limited forecasting to know the expected varieties and quantities of breeder seed needs	Adapt the demand forecasting tool used by CORAF to develop a 5-year seed need plan	CSIR-SARI, CSIR-CRI, WACCI/Universities universities, ASP, PPRSD, NASTAG/SEEDPAG	Conference facility, travel and logistics	30,000		x							
	Establish public-private partnership contracts with foundation seed entrepreneurs	CSIR-SARI, CSIR-CRI, GLDB, WACCI, NASTAG, universities	Consultant to develop a model contract	20,000			x	x					
	Establish market information system	DCS, CSIR-SARI, CSIR-CRI, NASTAG/SEEDPAG	Consultant ICT equipment	20,000			x	x					
	Improved timeliness communication for breeder seed request.	CSIR-SARI, CSIR-CRI, GLDB, NASTAG/SEEDPAG ASP	Consultant ICT equipment	20,000			x	x	x	x	x	x	x
	Increase information delivery about crop varieties in the public domain	NASTAG/SEEDPAG, CSIR-SARI, CSIR-CRI, SEEDPAG	On-line crop variety catalogue	20,000	x	x	x	x	x	x	x	x	x

3. Limited and non-sustainable funding from government source	Establish yearly prices of breeder seeds based on actual cost	PSI, donors, NSC, CSIR-SARI, CSIR-CRI, GLDB, NASTAG	Consultant to develop business models and provide coaching	20,000			x											
	Develop business models for the breeder seed enterprises	CSIR-SARI, CSIR-CRI, WACCI, GLDB, NASTAG						x										
	Leveraging from development projects	SARI, CRI, WACCI	Proposal	5,000		x	x	X	x	x	x	x	x	x	x	x	x	x
4. Poor markets for breeder seeds - unstable and unreliable, small and unstructured markets	Strengthen partnership with the private sector to bridge demand-supply gap.	CSIR-SARI, CSIR-CRI, GLDB, NASTAG, PSI,	Consultant – Marketing Specialist	20,000			x											
	Brand quality breeder seeds to enhance marketability	SARI, CRI, WACCI, GLDB, NASTAG						x	x	x	x	x	x	x	x	x	x	x
	Establish strong and credible market information systems for breeder seeds	CSIR-SARI, CSIR-CRI, WACCI, GLDB, NASTAG/SEEDPAG					x	x										
	Produce breeder seed based on demand	CSIR-SARI, CSIR-CRI, WACCI/Universities		100,000			x	x	x	x	x	x	x	x	x	x	x	x
5. Poor infrastructure - irrigation, processing, drying, packaging, storage facilities, etc.	Rehabilitate and/or install seed processing, drying and storage facilities	CSIR-SARI, CSIR-CRI, WACCI/Universities DEP, PSI, Donors,	Financial resources	100,000			x	x	x	x	x	x	x	x	x	x	x	x
	Acquire suitable piece of irrigated land for breeder seed production	PSI, DCS, SARI, CRI, WACCI		20,000			x	x	x	x	x	x	x	x	x	x	x	x
	Rehabilitate and/or develop irrigation facilities to ensure year-round breeder seed production	DEP, PSI, Donors, DCS, CSIR-SARI, CSIR-CRI, WACCI/Universities		100,000			x	x	x	x	x	x	x	x	x	x	x	x
6. Insufficient mechanization support -field equipment	Collaborate with other entities to refurbish/replace broken down equipment and ensure efficient management	CSIR-SARI, CSIR-CRI, WACCI/Universities DEP, PSI, Donors, DCS,	Financial resources	20,000			x	x	x	x								
7. Limited human	Train new generation of the	CSIR-SARI, CSIR-	Financial	200,000			x	x	x	x	x	x	x	x	x	x	x	X

resources/skilled labour and high cost of labour for breeder seed production	plant breeders in the use of modern plant breeding tools; genetic engineering and hybrid development	CRI, WACCI/Universities, DVP, Donors, DCS,	resources															
	Facilitate the participation of technical staff in short courses for seed production, quality control and seed business management	CSIR-SARI, CSIR-CRI, WACCI, universities, DEP, PSI, Donors, DCS,	Financial resources	100,000		x	x	x	x	x	x	x	x	x	x	x	X	
	Acquire labour-saving farm equipment	CSIR-SARI, CSIR-CRI, WACCI, DEP, PSI, Donors, DCS,		60,000			x	x	x	x	x	x	x	x	x	x		
8. Inadequate quality control and quality assurance	Support GSID with needed personnel, logistics and infrastructure	PPRSD-GSID, DEP, PSI, Donors, DCS	Financial resources	Ref. Table 8	x	x	x											
	Equip breeder seed laboratories to carry out internal quality control	DEP, PSI, Donors, DCS, CSIR-SARI, CSIR-CRI, WACCI	Financial resources				x	x	X									

7.2. Implementation Plan 2. A Five-Year Activity Plan and Budget to Improve the Production and Marketing of Foundation Seeds (US\$ 1,245,000)

Key constraint	Proposed Actions	Partnership	Resources	Budget(US\$)	2019		2020		2021		2022		2023	
1. Lack of institutional linkages among the various foundation seed producers	Coordinate and support capacity development of the private sector	GLDB, NSC, DCS, NASTAG/SEEDPAG	Financial resources to restructure GLDB	100,000			x	x	x	x	x	x	x	x
	Organize an annual planning sessions for seed sector stakeholders	NSC, DCS, GLDB, NASTAG/SEEDPAG	Conference facility, travel and lodging for 50 participants	100,000			x		x		x		x	
2. Limited forecasting to know the expected varieties and quantities of foundation seed needs	Adapt the demand forecasting tool used by CORAF to develop a 5-year seed need plan;	GLDB, ASP, PPRSD-GSID, CSIR-SARI, CSIR-CRI, WACCI/Universities, NASTAG/SEEDPAG	Conference facility, travel and lodging for 50 participants	40,000		x	x							
	Establish public-private partnership contracts between foundation and certified seed producers	GLDB, CSIR-SARI, CSIR-CRI, WACCI, NASTAG/SEEDPAG other universities	Consultant for contract management	NA			x	x	x	x	x	x	x	x
	Establish market information system	DCS, GLDB, NSC, NASTAG/SEEDPA, DEP, donors,	ICT facility	20,000			x	x						
3. Non-sustainable funding from government source	Support the institutions to develop and operate on business models	GLDB, NSC, CSIR-SARI, CSIR-CRI, NASTAG, PSI,	Consultant on business development	10,000			x	x						

4. Lack of seed processing, testing and cold storage infrastructure.	Rehabilitate/construct new processing plants and cold storage facilities	donors, DEP, PSI, Donors, GLDB, NASTAG, CSIR-SARI, CSIR-CRI, WACCI	Seed process, testing and storage equipment; Contractor	400,000				x	x	x	x	x	x	x	x	x
5. Insufficient irrigation facility in the mist of dry spells, drought	Rehabilitate/construct irrigation facilities, e.g., dams Acquire irrigation machines	GLDB, GIDA, NASTAG/SEEDPAG CSIR-SARI, CSIR-CRI, WACCI, DEP, PSI, Donors,	Contractor; Equipment	200,000				x	x	x	x	x	x	x	x	x
6. Weak capacity in innovative variety development	Train new generation of the plant breeders in modern tools of genetic engineering and hybrid production	DEP, Donors, CSIR-SARI, CSIR-CRI, WACCI	Funds for post-graduate training	Ref. Appendix 1				x	x	x	x	x	x	x	x	x
	Advocate for inclusion of multi-national private companies	DCS, NSC, NASTAG	Appropriate advocacy model	5,000				x	x	x	x	x	x	x	x	x
7. Weak capacity in foundation seed production and marketing	Train plant breeding technicians in DUS and VCU and breeder seed production and marketing	GLDB, CSIR-SARI, CSIR-CRI, WACCI/Universities NASTAG	Resource persons; materials and logistics	100,000				x		x		x		x		
	Train the private sector in foundation seed production and marketing	GLDB, CSIR-SARI, CSIR-CRI, WACCI, NASTAG, SEEDPAG	Resource persons; materials and logistics	50,000				x	x	x	x	x	x	x	x	x
8. The weak state of the seed processing and testing structures of the seed centers at Ho, Kumasi, Winneba and Tamale	Recruit an expert to carry out feasibility study and to develop business model for managing the centres after rehabilitation;	GLDB, PPRSD-GSID DCS, Other Donors, DEP	Consultant Financial resources	20,000				x	x							

	Use available limited resources to build new infrastructure at new locations based on current dynamics in the seed sector or rehabilitate existing ones	GSDB, PPRSD-GSID, GASI, DCS, other Donors, DEP	Consultant Financial resources for procurement	400,000			x	x	x	x	x	x		
9. The seed centers at Ho, Kumasi, Winneba and Tamale are poorly managed.	Develop a private or public-private partnership model for a sustainable management of the seed centers.	DCS, Donors, DEP	Consultant	20,000			x	x	x	x	x	x	x	x

7.3. Implementation Plan 3. A Five-Year Activity Plan and Budget to Improve the Production and Marketing of Certified Seeds (US \$ 1,902,00)

Key Constraints	Proposed Actions	Partnership	Resources	Budget(US\$)	2019	2020	2021	2022	2023			
1. Inadequate equipment and infrastructure (irrigation, harvesting, drying, processing and storage) along the seed value chain	Advocate for public and private sector investment in the provision of equipment and infrastructure	NSC, NASTAG/SEEDPAG, PSI, DCS, DEP	Financial resources targeted at private and public sectors	500,000		x	x	x	x	x	x	x
2. Inadequate access and high cost of quality foundation seeds (quantity and quality) and high prices	Advocate to accelerate the processes of private sector take-over of foundation seed production	NASTAG/SEEDPAG NSC, CSIR-SARI, CSIR-CRI,	Appropriate advocacy model	2,000	x	x	x	x	x			
	Provide support to NASTAG & SEEDPAG to establish internal quality assurance system	PPRS-D-GSID, NASTAG/SEEDPAG	Equipment and logistics	100,000		x	x	x	x			
3. Insufficiency of good quality hybrid lines	Engage local seed enterprises and multi-national seed companies to scale up hybrid seed production	NSC, DCS, NASTAG/SEEDPAG	Appropriate advocacy model and incentive package	10,000	x	x	x	x	x	x	x	x
4. Weak operational, technical and business capacities of the certified seed producers to produce quality seed	Train seed producers in the best practices of seed production, quality assurance and business management	GLDB, PPRS-D-GSID, CSIR-SARI, CSIR-CRI, NASTAG/SEEDPAG	Consultant; Training facility, logistics and travel;	50,000	x	x	x	x	x	x	x	x
	Train agriculture extension agents in seed	GLDB, PPRS-D-GSID, CSIR-SARI, CSIR-CRI,	Resource persons,	50,000		x	x	x	x	x	x	x

	extension	NASTAG/SEEDPAG, DAES, NASTAG	Training facility, logistics and travel;															
	Facilitate exchange and learning visits	GLDB, PPRSD-GSID, CSIR-SARI, CSIR-CRI, SEEDPAG, DAES, NASTAG	Travel cost	50,000			x	x	x	x	x	x	x	x				
5. Weak linkages with foundation seed producers and seed dealers, retailers and farmers	Strengthen Innovation Platforms for strong inclusion of seed actors including youth and women	NSC, DCS, GLDB, CSIR-SARI, CSIR-CRI, WACCI, ASP, NASTAG, Seed Sector Actors	IP Facilitators; logistics	100,000			x	x	x	x	x	x	x	x				
	Use the Annual NASTAG Seed Stakeholder Business Forum as knowledge exchange platform	SEEDPAG, NASTAG, NSC, GLDB, PPRSD-GSID, DCS, SAPIP	Financial resources	100,000			x		x		x			x				
6. Weak quality assurance system	Support NASTAG/SEEDPAG to establish internal quality control system	PPRSD-GSID, DCS, Development Projects, Donors, NASTAG/SEEDPAG	Equipment, logistics, personnel	100,000			x	x	x	x	x	x	x	x	x	x	x	
	Enforce best practices in seed production and marketing (production manuals)	PPRSD-GSID, GLDB, NASTAG, SEEDPAG	Consultant, Training material, manuals	50,000	x	x	x	x	x	x	x	x	x	x	x	x	x	
7. Limited market intelligence and demand forecasting for certified seed	Carry out periodic market surveys	NASTAG/SEEDPAG, PPRSD-GSID	Consultant	40,000		x				x								
	Facilitate strong links between input dealers and seed growers (meetings)	NASTAG, PPRSD-GSID, GAIDA, SEEDPAG, DEP, Donors, PSI, DCS, GAIDA	Cost of organizing meetings; ICT tools	30,000		x	x	x	x	x	x	x	x	x	x	x	x	
	Enforce packaging, branding and barcoding among the seed enterprises	NSC, SEEDPAG, NASTAG, PPRSD-GSID, GAIDA	Consultant, Equipment	50,000		x	x	x	x	x	x	x	x	x	x	x	x	

8. Flouting of quality assurance procedures by seed producers	Check faking and adulteration of seed offered for sale	PPRSD-GSID, SEEDPAG, NASTAG	Cost of barcoding equipment	20,000	x	x	x	x	x	x	x	x	x	x
	Train NASTAG/SEEDP designated staff in internal quality control practices	PPRSD-GSID, GLDB, CSIR-SARI, CSIR-CRI, NASTAG/SEEDPAG	Cost of travel; Training facilities and logistics	50,000		x	x	x	x	x	x	x	x	x
	Ensure adequate supervision of certified seed producers for seed quality assurance and certification.	PPRSD-GSID, NASTAG/SEEDPAG	Drone, logistics, personnel	100,000	x	x	x	x	x	x	x	x	x	x
	Increase post-certification monitoring and supervisory visits	PPRSD-GSID, NASTAG/SEEDPAG	Logistics and personnel	50,000	x	x	x	x	x	x	x	x	x	x
9. Low adoption of certified seed by farmers	Set-up community-level certified seed sales outlets to facilitate farmers' access to certified seeds at affordable prices	NASTAG/SEEDPAG, PSI, Donors and Development Projects	Outlets; small vans	100,000		x	x	x	x	x	x	x	x	x
	Establish field demonstrations to showcase advantages of certified seeds over farmers' seed	NASTAG/SEEDPAG, PSI, DAES, DDA,	Land, travel, logistics	100,000	x	x	x	x	x	x	x	x	x	x
	Organized field tours, field days, and traveling workshops to showcase advantages of certified seeds	NASTAG/SEEDPAG, PSI, DAES, DDS	Travel, logistics, workshop facilities,	50,000	x	x	x	x	x	x	x	x	x	x
10. Low participation of women and youth in the seed industry	Organize knowledge exchange workshops on seed sector for women and youth	NSC, SEEDPAG/NASTAG, DEP, PSI,	Travel, logistics, workshop facilities,	50,000	x	x	x	x	x	x	x	x	x	x

11. Farmer preference for open-pollinated maize varieties as compared to hybrid maize varieties	Support knowledge exchange and dissemination on hybrid maize	NASTAG/SEEDPAG, CSIR-SARI, CSIR-CRI, WACCI, DAES, GLDB, ASP, PSI,	Travel, logistics, workshop facilities,	50,000	x	x	x	x	x	x	x	x	x	x
	Promote hybrid seed available (demonstrations, fact sheets, radio programs, etc)	NASTAG/SEEDPAG, CSIR-SARI, CSIR-CRI, WACCI/Universities DAES, GLDB, ASP, PSI,	Outlets; small vans	100,000	x	x	x	x	x	x	x	x	x	x

7.4. Implementation Plan 4. A Five-Year Activity Plan and Budget to Improve Seed Quality Assurance and Certification (US\$950,000)

Key Constraints	Proposed Actions	Partnership	Resources	Budget (US\$ 950,000)	2019		2020		2021		2022		2023	
1. Inadequate information on DUS and VCU	Document DUS and VCU and submit documents to GSID and NVRRC six months before candidates are proposed for release	PPRSD-GSID, CSIR-SARI, CSIR-CRI, DEP, WACCI/Universities	Resources needed – funds for training inspectors and printing	40,000		x		x		x		x		
	Train inspectors on the descriptors	PPRSD-GSID, DCS, Universities, CSIR-SARI, CSIR-CRI, WACCI	Resource persons; workshop facilities	40,000		x		x		x		x		
	Ensure efficient and reliable integrated data capturing and management systems	NSC, PPRSD-GSID,	Computer tablets; ICT system	100,000	x	x	x	x	x	x	x	x	x	x
2. Inadequate logistical support	Provide means of transport and inspection equipment	Donors, DEP, DCS, PPRSD-GSID, CSIR-SARI, CSIR-CRI, NASTAG, Universities	• Vehicles, inspection kits – drones and or GPS, tablets.	100,000			x	x						
3. Limited number of inspectors	Accredit private sector inspectors on a pilot basis	PPRSD-GSID, NSC, GSID, NASTAG	• Logistics and travel	100,000	x	x	x	x	x	x	x	x	x	x
4. Isolation and mixtures	Develop new protocols for isolation in space and time	PPRSD-GSID, CSIR-SARI, CSIR-SARI, CSIR-CRI, GLDB				x	x							
5. Poor documentation on the production levels of foundation and certified seeds	Train appropriate technical persons on data collection and management	PPRSD-GSID, NASTAG, CSIR-SARI, CSIR-CRI, WACCI, Universities	Resource persons, training logistics, travel	20,000		x		x		x		x		x

6. Weak capacity of actors along the value chain	Develop simple training manuals to train various levels of seed producers.	PPRSD-GSID, CSIR-SARI, CSIR-CRI, Universities, GLDB, DCS, NASTAG/SEEDPAG, Universities,	Resource Persons and logistics	10,000			x	x									
	Train appropriate technical persons e.g., graduate students, seed technologist, seed technicians, field and laboratory technicians and extension staff on seed quality assurance practices.	GLDB, PPRSD-GSID, CSIR-SARI, CSIR-CRI, Universities, SEEDPAG		100,000		x	x	x	x	x	x	x	x	x			
	Improve curricula on seed technology at the tertiary institutions	Universities, CSIR-SARI, CSIR-CRI, GLDB; PPRSD-GSID, GLDB, NASTAG/SEEDPAG, DCS, PSI, DEP, Donors,	Consultant														
7. Loss of viability of seed in storage	Provide functional cold storage facility	PPRSD-GSID, GLDB, NASTAG/SEEDPAG, DCS, PSI, DEP, Donors,	Financial resources for Seed storage infrastructure	100,000			x	x									
	Advocate for private sector investment to increase access to storage facilities	NSC, NASTAG/SEEDPAG, DCS	Consultant and Advocacy material	5,000		x	x										
8. Long and costly variety release process	Streamline variety release process	NSC (NVRRC), PPRSD-GSID, DCS,	Consultant to develop cost-effective guidelines for variety release				x	x									
	Promote public-private sector partnership in the variety release process (advocacy and meetings)	NSC, NVRRC, PPRSD-GSID, NASTAG/SEEDPAG, CSIR-SARI, CSIR-CRI, WACCI/Universities		5,000			x	x	x								

7.5. Implementation Plan 5. A Five-Year Activity Plan and Budget to Facilitate Implementation of the National Seed Policy and Coordination (Budget: US\$ 515,000)

Key Constraints	Proposed Actions	Partnership	Resources	Budget(US\$)	2019	2020	2021	2022	2023
1. Weak support for the operation of the fields spread all over the country	Provide the needed resources to support and improve operation of seed fields	DEP, donors, DCS, PPRSD, GSID, NASTAG/SEEDPAG Donors, DEP	Cost/ Financial resources	100,000	x	x	x	x	x
10. Flouting of quality assurance procedures by seed producers	Train more public and private sector seed inspectors	PPRSD-GSID, GLDB, Universities, NASTAG, CSIR-CRI, CSIR-SARI	Financial resource;	50,000	x	x	x	x	x
	Train and provide accreditation to private seed inspectors	PPRSD-GSID, GLDB, Universities, NASTAG, CSIR-CRI, CSIR-SARI	Consultant; Training facility; travel; logistics; lodging;	40,000	x	x	x	x	x
	Increase post-certification monitoring and supervisory visits	PPRSD-GSID, ASI	Logistics, travel, lodging	50,000	x	x	x	x	x
	Provide certification kits for inspectors	PPRSD-GSID, PIS, Donors, DEP	Financials resource	50,000	x	x	x	x	x
	Enforce Part 2 of ACT 803 (seed regulations and laws) – Training and Sensitization campaigns	PPRSD-GSID		40,000	x	x	x	x	x

NSC and its secretariat	Activate the Plant and Fertilizer Fund	NSC, DCS	Consultant; Appropriate advocacy model	5,000		x											
	Increase budgetary allocation to NSC	DCS				x											
2. Inadequate publicity of the National Seed Policy, Part II of the Plants and Fertilizer Act, 2010 (803) and its regulations, ECOWAS-UEMOA-CILSS Seed Regulations.	Sensitize all the seed sector stakeholders.	NSC, PPRSD, GSID, DCS, CSIR-SARI, CSIR-CRI, NASTAG, ECOWAS Seed Task Force.	Resource persons to develop a guide	10,000		x	x										
	Advocate for seed splinter groups to come under one umbrella body	NSC, NASTAG, SEEDPAG	Consultant; Appropriate advocacy model	5,000			x	x									
	Develop factsheets, Television discussions, leaflets etc. to share knowledge on the National Seed Regulation Act	NSC, NASTAG,	Resource persons; logistics	5,000			x	x									
3. Non operationalization of the National Seed Security system	Establish early warning systems	NADMO, : NSC, PPRSD-GSID, DCS, CSIR-SARI, CSIR-CRI, NASTAG, GAIDA, DAES	Consultant to develop a functional model	5,000			x	x	x								
	Rehabilitate infrastructure (e.g. conditioned storage)	PSI, DEP, DCS, SARI, CRI, SAPIP	Financial resources	100,000			x	x									
4. Limited human resource in the seed sector	Build human capacity of appropriate technical persons, e.g., graduate students, seed technologist, seed technicians, field and laboratory technicians and extension staff.	GLDB, CRI, CSIR-SARI, CSIR-CRI, PPRSD-GSID, WACCI, Universities		100,000			x	x	x	x	x	x	x	x	x	x	x

5. Weak seed value chain	Establish a strong national seed business net-work	NASTAG, NSC, PPRSD-GSID, CSIR-SARI, CSIR-CRI, GLDB, SEEDPAG, DCS, DAES	Consultants Conference facilities; Financial resources;	10,000			x	x							
	Organize fora to discuss topical issues	NSC, NASTAG/SEEDPAG, DCS,		100,000			x		x		x		x		
10. Monitoring and Evaluation (M&E) framework for the seed sector including a Web-based M&E is lacking	Establish a one-stop clearing house for the seed sector information and database	NSC, NASTAG, DCS,	Consultant, ICT equipment	25,000			x	x							
	Ensure an efficient and reliable integrated data capturing and management systems for the seed industry	NSC, NASTAG, DCS,		50,000			x	x	x	x	x	x	x	x	x

Appendix 1. Workshop Agenda

Time	Activity	Responsible
Day 1	Session 1: Registration and Opening	
0830-0900	Registration	SAPIP Secretary
0900-0915	Opening Prayer	
	Introduction of Chairperson	Facilitator
	Opening Remarks	Director – CSD Director – PPRSD Regional Director of Agric. SAPIP Project Coordinator
	Keynote Address	Hon. Minister, MoFA
0915-0930	Introduction of Participants	Facilitator
0950-1015	Group Photograph, Coffee Break and Press Interviews	
	Session 2: Introductory Presentations and Framing	
1015-1030	Concept Note: Context, Objectives and Agenda	Ernest Asiedu
1030-1045	Overview of SAPIP	Felix Darimmani
1045-1115	Discussions	Facilitator/Rapporteur
	Session 3: Seed Sector Support - SAPIP	
1115-1135	National Seed Policy Orientation	Director, DCS
1135-1155	General seed sector support under SAPIP	Ernest Asiedu
1155-1215	Infrastructural rehabilitation of four processing centers	B. C. Attipoe
1215-1300	Discussions, Conclusions, Recommendations and Actions for the Future – Session 3	Facilitator/Rapporteur
1300-1400	Lunch Break	
	Session 4A: Seed Sector Development - National Advances, Challenges and Perspectives	
1400-1420	AGRA's Support to Seed Industry Development	
1420-1500	Breeder Seed Production and Marketing	CSIR: SARI & CRI
1500-1520	Foundation Seed Production and Marketing	GLDB
1520-1540	Certified Seed Production and Marketing: Advances,	NASTAG
1540-1600	Challenges and Perspectives	
1600-1700	Coffee Break	

1115-1130	Conclusions, Recommendations and Actions for the Future- Session 4B Group Work: Activities for Support Session 5: Group Work	Facilitator /Rapporteur
1130-1115	Terms of Reference for Group Work Group 1: Breeder and Foundation Seed Production and Marketing Group 2: Certified Seed Production and Marketing Group 3: Quality Control and Regulation Group 4: Policy and Coordination	Ernest Asiedu Group Chairperson/Rapporteur
1300-1400	Lunch Break	
1400-1600	Group 1: Breeder & Foundation Seed Production & Marketing Group 2: Certified Seed Production and Marketing Group 3: Quality Control and Regulation Group 4: Policy and Coordination	Group Chairperson/Rapporteur
1600-1630	Coffee Break Group 1: Breeder & Foundation Seed Production 7& Marketing	Group
1630-1700	Group 2: Certified Seed Production and Marketing Group 3: Quality Control and Regulation Group 4: Policy and Coordination	Chairperson/Rapporteur
Day 3 Group Work – Plenary Presentation		
0830-0930	Group 1: Breeder and Foundation Seed Production and Marketing + Discussions	Group Chairperson/Rapporteur
0930-1030	Group 2: Certified Seed Production and Marketing + Discussions	Group Chairperson/Rapporteur
1030-1100	Group 3: Quality Control and Regulation + Discussions	Chairperson/Rapporteur
1100-1200	Coffee Break	Group
1200-1300	Group 4: Policy and Coordination + Discussions	Group Chairperson/Rapporteur
1300-1400	Lunch Break	Chairperson/Rapporteur
1400 - 1530	Workshop Evaluation Finalize Conclusions, Recommendations and Roadmap	Chairpersons/Rapporteurs

Appendix 2. List of participants

Name	Agency	Agency	Telephone	E-mail
1. Ministry of Food and Agriculture				
Hon. Sagre Bambangi	MoFA	Deputy Minister, Crops	244842477	sambangiy@yahoo.co.uk
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