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

FEED THE FUTURE GHANA AGRICULTURE POLICY SUPPORT PROJECT (APSP)

**ASSESSMENT OF IMPLEMENTATION OF PLANTING FOR FOOD AND
JOBS (PFJ) PROGRAMME: LESSONS AND WAYS FORWARD**



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FEED THE FUTURE GHANA AGRICULTURE POLICY SUPPORT PROJECT (APSP)

**ASSESSMENT OF IMPLEMENTATION OF PLANTING FOR FOOD AND
JOBS (PFJ) PROGRAMME: LESSONS AND WAYS FORWARD**

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EXECUTIVE SUMMARY

The cardinal aim of most developing countries is to eliminate hunger, reduce poverty, achieve food sufficiency and eliminate unemployment among the youth within the shortest possible time. The agriculture sector has the potential of spurring on governments to attain this feat particularly in sub-Saharan Africa. A modernized agricultural sector capable of running farmsteads as businesses with the necessary linkages to key manufacturing sectors has the reciprocal benefits of transforming economies through the supply of raw materials to industries. Appropriate and comprehensive policies, programmes and projects must be put in place in order to attain modernized agricultural sector.

In order for government of Ghana through Ministry of Food and Agriculture (MoFA) to motivate farmers to adopt improved agricultural technologies (seed and fertilizer), expand their farms and encourage youth to enter into agricultural production so as to increase crop productivity, “Planting for Food and Jobs” (PFJ) programme was launched in April, 2017. The programme is to facilitate access to both inputs and output markets thereby creating employment opportunities in the agricultural value chain. The PFJ has been carved out to inject the necessary energy in transforming the agricultural sector and the economy in general in the medium to long term. The actors involved in the PFJ programme would be linked onto an integrated electronic platform where relationships between farmers and relevant agribusiness enterprises can be facilitated and coordinated to ensure efficient implementation of the programme.

The initial implementation of this programme was done in 2017. During the first-year implementation of the programme, many stakeholders in agricultural sector complained about the inability of the programme to achieve its intended objectives. It is against this backdrop that this study principally assessed the awareness of the packages of pillars of PFJ, identified the implementation challenges, evaluated potentials of the PFJ programme and suggested ways for improving its implementation in the subsequent years.

This research was conducted in the Northern, Volta and Brong-Ahafo regions and it cut across the entire agricultural value chain of maize, rice and soybeans. The study used both qualitative and quantitative approach. The study adopted a Likert scale to determine the degree of people’s perception about the awareness of the PFJ packages, the potentials of PFJ in reducing unemployment, food insecurity and poverty. Both descriptive and inferential statistics were used for the analysis of the data. Because of the complex nature of the intervention programme, being operated under diverse conditions with varying perspectives and interests, domain and network analysis approach was employed to assess the interaction among implementation challenges as identified by major stakeholders (i.e farmers, AEA, research institutions, senior MoFA officers, agro-input dealers, aggregators and NGOs).

The results of the study indicated that the PFJ programme was well appreciated by all stakeholders. Farmers in particular were however not much aware of the packages of agriculture, agricultural extension services and market linkages as compared to fertilizer and seed components of PFJ.

From the results, while researchers and NGOs participated in the seed pillar of PFJ more, Senior MoFA officers and aggregators took part more in establishment of market and fertilizer respectively. Agro-input dealers were engaged in fertilizer component of PFJ more as compared to other pillars. The participation of youth and women in the programme was very low. While 6% of the participants were youth, 15% were women. There were no special strategies adopted by the District Technical Committee (DTC) to whip up the enthusiasm of youth and women to participate in the programme.

The programme has the potential of reducing unemployment, poverty and food insecurity but at a slower pace. In this first year of implementation, the maize, rice and soybean yields of PFJ participants have increased by 3.66%, 8.54% and 7.54% respectively. The programme has potential of increasing maize, rice and soybean yields but also at a much slower pace. The greatest potential of the programme is its ability to increase fertilizer application rate. The four major implementation challenges of PFJ are the inadequate supply of inputs at the right time, interference of politicians, cumbersome mode of payment and lack of support from MoFA and District Assemblies.

It is therefore recommended that much awareness campaign should be mounted (using local languages) on community radios, in churches, mosques and traditional durbars to spell out details of the programme to farmers on how and where they may access each of the pillars. There is the need for MoFA and major stakeholders to come out with a special package for youth and women. Most of the concerns of the youth and women had to do with lack of access to land, and capital as well as social discrimination. Therefore, government and NGOs could come in to appeal to the chiefs and family heads to make land available for the youth and the women. Sensitisation on the importance of gender inclusiveness and empowerment should be rolled out. Mechanisation services should be included in the PFJ pillars and women and youth should be given priority. Farmers especially women and youth should be supported to acquire simple machinery (power tillers, rippers etc) to facilitate the production process.

Timely release of inputs is critical and should be differentiated for each agro-ecological zone. Inputs should be made available all year round especially in the southern sector where cropping is done twice a year. PFJ must be stripped off political colour to reflect an inclusive national character. This study therefore suggests that political party executives and other opinion leaders should educate farmers irrespective of their party affiliation to endeavour to pay for the inputs and refrain from their entrenched position that the inputs should be given to them for free. Experts, irrespective of their political party affiliation should be put on DTC, RTC and NTC.

The private sector should be engaged to take full charge of the distribution and sale of the subsidized inputs. This would make the inputs available to the farmers in or closer to their communities thereby reducing the long-distance farmers had to cover to make payments at the banks before getting access to the inputs. Agricultural extension service delivery has been low. Much of the problem has been attributed to inadequate professional AEs, inadequate logistics and the refusal of non-professional AEs employed under youth in agriculture model to work in rural districts. In order to deal with the issues of inadequate extension agents, as well as inadequate logistics for AEs to carry out their mandate effectively, poor market linkages and poor tracking of inputs, comprehensive e-agriculture (e-extension via mobile phone platform, e-input tracking system, e-market linkages, e-payments for inputs, e-registration of farmers etc.) should be intensified and expanded to include more local languages. Also, authorities in charge of employing non-professional AEs under youth in agriculture model should endeavour to recruit people from their catchment districts.

Different models should be used to implement the programme in different regions as these regions have varied experiences with respect to agricultural projects. Nucleus farmer-outgrower scheme or Farmer-Based Organisations (FBOs) or Community-Based Organisations (FBOs/CBOs) be adopted in the three northern regions if the 25% down payment and after harvesting would continue. With that, the nucleus farmers should be given the inputs for onward distribution to outgrowers. This will facilitate recovery of payments.

The cumbersome mode of payment for inputs by farmers should also be made simpler. This could be done through the use of mobile money payment systems.

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ACRONYMS

AEAs	Agricultural Extension Agents
AU	African Union
CAADP	Comprehensive Africa Agriculture Development Programme
CBOs	Community-Based Organisations
DTC	District Technical Committee
FAO	Food and Agricultural Organisation
FASDEP	Food and Agriculture Sector Development Policy
FBOs	Farmer-Based Organisations
GOG	Government of Ghana
GSS	Ghana Statistical Service
ICT	Information and Communication Technology
ISSER	Institute of Statistical, Social and Economic Research
METASIP	Medium-Term Agricultural Sector Investment Plan
MMDAs	Metropolitan, Municipal and District Assemblies
MoFA	Ministry of Food and Agriculture
NGOs	Non-Governmental Organisations
NTC	National Technical Committee
RTC	Regional Technical Committee
SHS	Senior High School
SRID	Statistics, Research and Information Directorate

CHAPTER ONE

INTRODUCTION

1.1 Background

The African agricultural sector still has the key to achieving pro-poor economic growth and attaining the Sustainable Development Goals (SDGs). The industry has the potential to contribute to poverty reduction, eliminate hunger, increase production significantly and generate employment in areas such as agro-processing and services. Historically, a well-performing agricultural sector has contributed substantially to the overall economic growth and poverty reduction in modernized economies. Modernization involves two main routes: running farms as business entities to boost productivity and strengthening the links between agriculture and manufacturing industries in a mutually beneficial process whereby farm output service the manufacturers and the manufacturers provide modern agricultural inputs to farmers. Many of the successful economies today followed this path of economic transformation.

Fortunately, many governments in Africa are beginning to look through the lens of economic transformation through agricultural modernization, hence, prioritize agriculture in economic policy planning (African Center for Economic Transformation Report [ACET] 2017). This new way of thinking coupled with the weak agricultural policies of many African countries led to the development of critical agricultural programmes in the New Partnership for Africa Development (NEPAD), officially established in 2001. Among the unique agriculture initiatives of NEPAD is Africa Union's 2003 Maputo declaration on Food Security and Agriculture in Africa and the Accelerated Agricultural Growth and Transformation and its related Comprehensive African Agriculture Development Programme (CAADP) dubbed 2014 Malabo declaration. CAADP is one of the NEPAD's broad priority areas. The primary goal is to attain sustainable agricultural growth and reduce poverty. Another critical element of NEPAD's initiative that has a significant impact on African agriculture sector is the African Peer Review Mechanism (APRM). The APRM, though not a sectoral initiative, is one targeted at streamlining governance in Africa, has an active link with agricultural industry since it is the most significant sector of many Sub-Saharan African economies.

As a result, some African countries such as Ethiopia pursue an agro-based industrialization strategy to harness the idea of economic transformation through agriculture. In Kenya, there were two critical policies - Dairy Development Policy and Coffee Industry Restructuring to revitalize the Kenyan agricultural sector. In Ghana, many policies and programmes have emerged out of NEPAD and CAADP which have helped to shape the Ghanaian agricultural economy.

1.2 Agricultural Policies and Programmes in Ghana

The agricultural sector employs almost 50% of the employable persons in Ghana [Ghana Statistical Service (GSS), 2015]. The national survey indicates that about 75.25% of the agricultural labour (formal and informal) constitutes rural dwellers operating small farms and livestock, while 22% of the labour force engaged in agriculture and its related activities are in the urban areas (GSS, 2014). However, the sector remains predominantly small-scale with about 90% of farm households operating less than 2 hectares and contributing about 80% of the national agricultural output (FAO, 2015). Despite, the significant contribution of agriculture to the labour market coupled with the increment in area under cultivation, the

contribution of agriculture to Gross Domestic Product (GDP) has been dwindling since 2009. For instance, the contribution of the agricultural sector to the economy fell from 31.8% in 2009 to 20.2% in 2015 (Institute of Statistical, Social and Economic Research [ISSER], 2017). With Ghana's population expected to reach 30.5 million by 2020, the production of food, particularly food crops, are expected to increase accordingly, especially for communities where food insecurity is pervasive.

In response to the challenges of the agricultural industry and to boost agricultural productivity on a sustainable basis, Ghana has been very instrumental in agricultural policies such as CAADP and APM. These agricultural policies have played an essential role in determining the performance of the Ghanaian economy (Zimmerman et al. 2009). With regards to domestic agricultural policies, the first Food and Agricultural Sector Development Policy (FASDEP) was developed in 2002 as a framework to modernize the Ghanaian agricultural industry. The strategies in FASDEP were anchored on the Accelerated Agricultural Growth and Development Strategy which was designed in 1996 to foster linkages in the agricultural value chain. After the implementation of FASDEP, it was revised to correspond to the lessons learnt from its implementation and the emerging needs of the sector. The revised FASDEP (FASDEP II, 2008) has sustainable utilization of resources, commercialization of activities, and market-driven growth as its main focus. One of the fundamental programmes of this policy was Medium Term Agricultural Sector Investment Plan (METASIP I, 2011 – 2015) and METASIP II (2014 – 2017). METASIP was designed in accordance with the Maputo and Malabo declarations to make the government of Ghana allocates 10% of its GDP to agricultural sector. The 10 percent allocation of government expenditure is expected to result in 6 percent GDP growth within the planned period. This is in line with ECOWAS Agricultural Policy (ECOWAP) and CAADP, an integrated framework to boost agricultural growth, rural development and food security in Africa.

Some of the strategies that the government of Ghana implemented through its Ministry of Food and Agriculture (MoFA) to boost agricultural productivity over the years include state farms, irrigation programmes, government-subsidized agricultural input, provision of agricultural credit, and output market controls. However, one that has been key is the fertilizer subsidy programmes with a primary objective of attaining national self-sufficiency and food security. While food security is defined as the availability and physical access to food by the population, self-sufficiency implies that Ghana produces all its food needs. These policies have over the years provided some positive results. For instance, the total area of land under maize and rice cultivation increased by about 32 percent and 74 percent respectively, with a corresponding production increase of about 60 percent and 160 percent respectively, within the fertilizer subsidy period of 2008-2012 (FAOSTAT and MoFA, 2015). Though these policies yielded positive results, they were however not sufficient to address the numerous challenges in the sector. Moreover, access to market by smallholder farmers and post-harvest management remain a challenge irrespective of the establishment of Ghana Buffer Stock Company.

The fertilizer subsidy programme that was instituted by the government since 2008 has the focus of enhancing food security by increasing domestic production of staple food crops through increased use of fertilizer. However, empirical evidence (Wanzala-Mlobela et al., 2013; Fearon et al., 2015; Alliance for Green Revolution in Africa [AGRA] 2016) suggests that fertilizer subsidy programmes in isolation do not increase its accessibility. This implies that there is a need to improvise subsidy reachability, improve farmers' managerial and technical skills through capacity building, and enhancement of market-based solutions within the output

and input supply chain (MoFA, 2017). Moreover, MoFA (2017) has indicated that major factors impeding agricultural total factor productivity include; (i) low accessibility and inadequate use of certified seeds, (ii) insufficient nutrient fertilizer application, (iii) lack of extension services to farmers, (iv) weak linkages between producers and markets, and (v) limited use of information and communication technology (ICT). In an attempt to address these challenges, the government through MoFA launched a flagship programme dubbed “Planting for Food and Jobs (PFJ) programme in April 2017.

1.3 The PFJ Programme

The primary objective of the PFJ programme is to directly motivate farmers to increase their crop productivity through easy access to both inputs and output markets, thereby creating employment opportunities in the agricultural value chain. The PFJ programme is a national agricultural policy to address food deficits and reduce importation of some basic food crops. It is also to boost Ghana’s production competitiveness and create more jobs. The programme seeks to enhance productivity of significant food crops through integrated services on farming and marketing.

As part of the PFJ programme, the government through Ministry of Food and Agriculture (MoFA) is distributing subsidised farm inputs and providing extension services to farmers. This is to ensure that the technical knowledge received by farmers through extension service is complemented with the necessary farm inputs to enhance productivity. The PFJ also intends to provide a framework for agricultural value chain development where farmers would be engaged through the private sector (MoFA, 2017). The value chain development is to lead to increase in the adoption of improved seeds, fertilizer application and other good agronomic practices, and marketing of farm outputs. The agricultural value chain development would be operationalized such that there is an integrated electronic platform where relationships between farmers and relevant agribusiness enterprises can be facilitated to ensure reliable access to inputs (improved quality seeds, fertilizers, etc.), financial services and output markets (MoFA, 2017). Also, with PFJ, MoFA advanced plans to collaborate with Ministry of Health, Ministry of Education, Ministry of Trade and Industry as well as the private sector to provide a reliable and readily available output market for the agricultural produce. Past programmes and projects in the agricultural sector did not receive the kind of attention that has been received by the current PFJ programme.

1.3.1 The PFJ Programme Goal and Objectives

PFJ forms part of the Modernization of Agriculture in Ghana (MAG) Project, which MoFA is implementing to reverse the declining growth of the agriculture sector (MoFA, 2017). The PFJ programme is one of the key strategies of the structural transformation of the economy through agricultural modernization that will lead to food security, self-sufficiency, reduced poverty and employment opportunities. The specific objectives of the PFJ programme includes:

- i. To ensure self-sufficiency by improving productivity and intensifying the cultivation of some selected food crops.
- ii. To provide employment opportunities (both formal and informal) to the unemployed persons, especially the youth in agriculture and its related sectors
- iii. To create general awareness of the significance of having farms and backyard gardens for the cultivation of cereals and vegetables.

1.3.2 Thematic Strategies of the Programme

The PFJ programme covers five pillars, namely, (i) provision of subsidized and improved seeds; (ii) subsidized fertilizer; (iii) agricultural extension services; (iv) establishment of markets; and (v) e-agriculture. These pillars are expected to increase agricultural yields (maize by 30%, rice by 49%, soybean by 25%, and sorghum by 28% (MFEP, 2017). Specifically, PFJ aims at increasing the yields of maize, rice and soybean from the current figures of 1.7Mt/Ha, 2.7Mt/Ha and 1.7Mt/Ha to 5Mt/Ha, 4Mt/Ha and 5Mt/Ha respectively at the end of the fourth year, which is 2020. As a result, an initial amount of US\$140.1 million (GH¢560.5 million) has been allocated in the 2017 budget for the implementation of the programme. Figure 1 indicates how the five strategic pillars of the PFJ programme are organized to help achieve structural economic transformation through agriculture (MoFA, 2017).

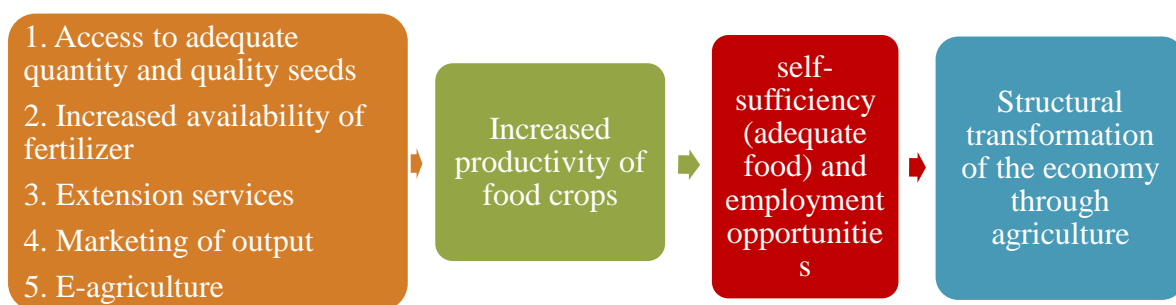


Figure 1: Key intervention pillars of the PFJ programme

Source: MoFA (2017)

The PFJ programme is expected to bring some relief to smallholder farmers by ameliorating their financial burden through the provision of an option where farmers pay 50% of the already 50% subsidized inputs. Thus, the government of Ghana pays 50% of the market price of the inputs (fertilizer and seeds) sold. Farmers then make a 50% (25% of the total cost) down payment at the time of collecting the inputs and pay the remaining 50% (25% of the total cost of the inputs) after harvest. The five strategic pillars of the programme are described as follows:

1. *Certified seeds:* The programme provides timely access to adequate quantities of hybrid or improved seeds through private enterprises at a subsidized price. Farmers can have access to these inputs at certified public and private outlets.
2. *Fertilizer subsidy:* Through this pillar of the PFJ, adoption and intensity of fertilizer application by farmers is re-enforced through the provision of adequate quantities and cost-effective fertilizer. Private enterprises are hired to facilitate demand of farmers for this input through timely procurement and distribution of the inputs.
3. *Extension service delivery:* The Ministry of Food and Agriculture will beef up extension service delivery through recruitment, provision of adequate logistics and close working relationships with the beneficiary farmers. The extension agents are to provide technical support to the beneficiaries, so they can enjoy the full benefit of the programme.

4. *Marketing*: Under this programme, input and output markets will be strengthened through the promotion of partnerships amongst farmers, nucleus farmers, aggregators, input dealers, farmer-based organizations and private agribusiness production units. The programme also collaborates with the Ministry of Health, Ministry of Education (under the free SHS policy) Ministry of Trade and Industry as well as the private sector to provide a reliable and readily available output market for the agricultural produce. As part of the programme, new warehouses are to be constructed closer to the production districts and old warehouses are to be rehabilitated. These are to ensure that farmers' outputs are marketed so that: (a) farmers are able to pay for the remaining 50% of the inputs cost, and (b) minimize the seasonal effects of price volatility, which has been one of the critical challenges in the agricultural sector.
5. *E-agriculture*: The PFJ employs ICT to profile the beneficiaries to minimize the rate of subsidized input diversion. It uses real-time and cloud computing services to validate the profile of the beneficiaries and create an integration amongst the pillars. This is to ensure prompt responsiveness, efficiency, transparency and accountability of both government and private agencies providing inputs and other services to the beneficiaries.

1.3.3 Implementation and Coordination of PFJ

It is important to note that PFJ is implemented by MoFA. The structure for the implementation and coordination consists of a 3-tier structure namely National Technical Committee (NTC), Regional Technical Committee (RTC) and District Technical Committee (DTC) (MoFA, 2017). The National Technical Committee (NTC), Regional Technical Committees (RTC) and District Technical Committees (DTC) are chaired by Deputy Minister of Agriculture in-charge of crops, Regional Ministers and Metropolitan/Municipal/District Chief Executives respectively. The NTC takes major national decisions on the course of action of the programme. The RTC and DTC are responsible for the day-to-day implementation of the programme at their respective hierarchical level and jurisdictions. The three-tier structure for implementing and coordinating activities of PFJ is shown in figure 2 below.

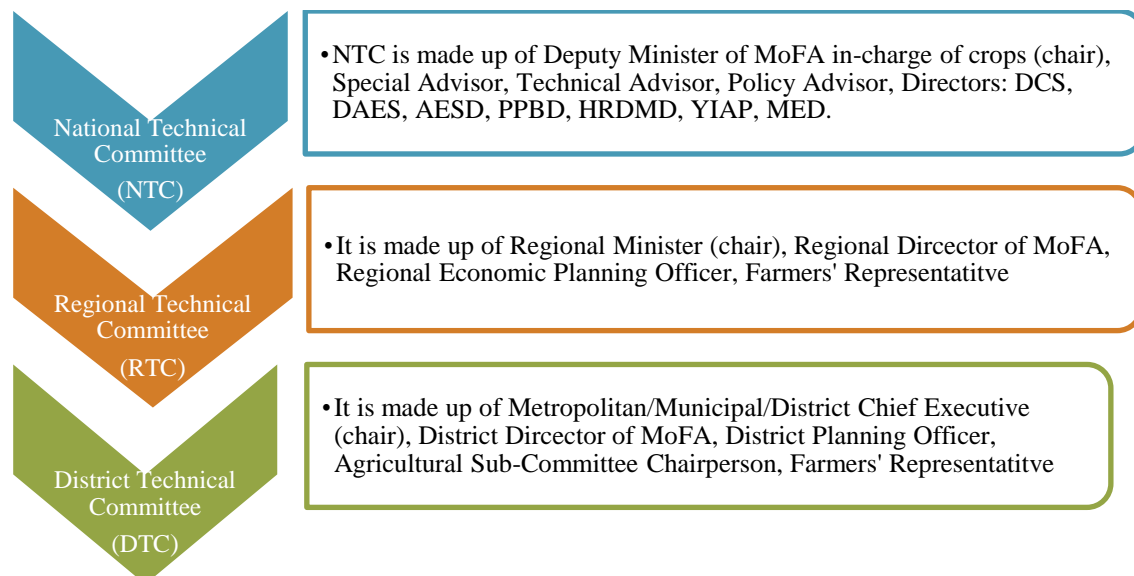


Figure 2: Structures for implementing and coordinating activities of PFJ

Source: MoFA (2017)

According to MoFA (2017), the DTC is responsible for developing seasonal and annual operational plans and mobilizing private- and public-sector actors and supporters to help in the implementation. They are supposed to monitor day-to-day activities and constantly assess, manage any risks and threats, and report on a monthly basis to the RTC. The reporting, communication and coordination are to be facilitated by ICT tools. In a nutshell, the technical committee members at respective levels of the tier are to take a leading role in tracking the progress and providing counseling to stakeholders on the implementation of the various activities across the different value chains (MoFA, 2017).

1.4 Motivation for the Assessment

The strategies outlined in the PFJ programme aim to lay a strong foundation for economic transformation through agriculture. From the brainstorming stage to the current ongoing implementation stage, many organizations both stakeholders and non-stakeholders in the agricultural sector have criticised the intended impact and sustainability of the programme. According to IMANI International (2017), all the five essential pillars of PFJ programme do not offer any new solution/intervention for agricultural modernization.

During the launch of the programme on Wednesday, April 19, 2017, in the Goaso in Brong-Ahafo Region, the president, Nana Addo-Danquah Akuffo-Addo opined that the programme aimed at creating 750,000 direct and indirect jobs. The question that lingers in the minds of Ghanaians is how these jobs will be created considering that existing farmers and the youth are the primary targets.

The late development of the implementation plan has the potential of affecting stakeholders understanding of how to implement the programme. ISSER (2017) noted that agricultural modernization and transformation strategies analogous to the PFJ programme had been implemented since independence, what stifled their impacts is the effective implementation and monitoring. The substantive issue for assessing the PFJ is whether the design framework and policy orientation will achieve the expected sustainable agricultural transformation in the country in an effective manner.

1.5 Objective of the Study

This study principally aims at identifying and assessing the implementation potentials and challenges of the PFJ programme in the quest of government to modernize and transform agriculture, and to suggest ways for improving its implementation in subsequent years.

The specific objectives of the study are to:

- i. assess stakeholders' understanding and awareness of the packages involved in all the five pillars of the PFJ programme in Ghana
- ii. determine the level of participation of stakeholders in all the five pillars.
- iii. provide an evidence-based analysis of the implementation challenges that the principal actors of the programme faced in all the five pillars
- iv. determine the level of participation of women and youth in the PFJ programme
- v. assess how effective the methodology adopted by the programme District Technical Committee (DTC) targeted the youth and female beneficiaries
- vi. assess innovations that could be introduced to efficiently target youth and female beneficiaries.

- vii. to assess the perception of the stakeholders on the potentials of the programme, amid the implementation challenges, in reducing food security, unemployment and poverty.
- viii. solicit for and analyze the suggestions from the principal stakeholders on ways to improve the programme implementation for subsequent years.

I.6 The Significance of the Study

This study has a strong linkage to Medium-Term Agriculture Sector Investment Plan (METASIP) policy priority areas and hence meets USAID/Feed the Future/APSP objectives (*Increased Income and Growth, and Food Security and Emergency Preparedness*). This is because the research findings seek to provide evidence-based and actionable recommendations that will help government and other agricultural sector stakeholders to improve PFJ programme in the subsequent years. Since the PFJ project had just started, nothing can be said about the impact of the project. However, empirical observation of the programme implementation process remains vital for the successful outcome of the programme that aims to strengthen the economy through agriculture. Therefore, assessing the programme after the first year of its implementation will improve the implementation process through the enhancement in the quality of participation of all concerned stakeholders and the general population in decision-making. This evaluation will provide empirical guidelines for challenges to be addressed and enhancement to be made through the implementation process.

Beyond the possibility of improving upon the implementation process of the PFJ programme, the impact of such an intervention programme will depend largely on the extent to which the actions of the programmes are implemented. Thus, benchmarking the early signs of governance-related problems, recommended solutions and strategies for addressing these challenges will enhance the implementation process, and help to achieve the desired outcomes. Moreover, analysing individual stakeholder's perception of the implementation of the programme is a significant component of knowing how the PFJ programme will help to shape the national agricultural policy process. Thus, the study provides comprehensive information on the operational challenges and potentials of the programme in transforming agricultural sector. Lastly, research fits perfectly into the second contractual components of the APSP. Thus, policy research to increase the availability of rigorous policy analysis for evidence-based policymaking

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Attaining food security and improving the general livelihoods of farm households whose hard work partly sustains most developing economies has always been one of the top priorities of governments in such nations, particularly countries in Sub-Saharan Africa. As a result, Africa has undergone and still undergoing agricultural transformation policies as a way of achieving self-sufficiency through an increase in total factor productivity. Some of these development policies within the continental context include NEPAD and its related programmes such as CAADP and APRM. On the regional context, members of heads of state in West Africa (ECOWAS) adopted a regional agricultural policy (ECOWAP) on 19th January 2005 to steer agrarian activities within the sub-region. At the national level, the first food and agricultural policy developed in recent times is the Food and Agriculture Sector Development Policy (FASDEP I & II). One of the critical strategies that had been implemented over the years to ensure food security by increasing domestic production of food and cash crops is the implementation of fertilizer subsidy programmes. Moreover, the comprehensive programme dubbed Planting for Food and Jobs launched in 2017 is also one of the critical strategies to modernize agriculture in Ghana.

The following sections discuss the above-mentioned development frameworks within which Africa and for that matter, Ghana, has engaged in its quest to attain food self-sufficiency, minimize food insecurity and reduce hunger and poverty through improvement in on-farm productivity.

2.2 African Agricultural Policies

Despite the structural weakness of agricultural sector in Sub-Saharan Africa, it is critical for spurring economic growth, reducing poverty and hunger, and meeting the SDGs. The African continent has recognized these significant roles of agriculture not only about food security and self-sufficiency, but also as a critical route for broader economic development. Thus, agriculture as the central pillar for Africa economic transformation. The plans to revitalize agriculture at the Pan-African level was consolidated in the most comprehensive continental economic policy called ‘The New Partnership for African Development (NEPAD). NEPAD is *“a pledge by African leaders, based on a common vision and a firm shared conviction, that they have a pressing duty to eradicate poverty and to place their countries, both individually and collectively, on a path of sustainable growth and development, and at the same time to participate actively in the world economy and body politics”* (NEPAD 2001). The vital long-term objectives of NEPAD are poverty eradication, accelerated growth and, reversing the marginalization of Africa in the global process.

To boost agricultural development in Sub-Saharan Africa, NEPAD in 2003 launched CAADP under the Maputo declaration on agriculture and food security in Africa. The principal goal of CAADP is to “help African countries reach a higher path of economic growth through agriculture-led development, which eliminates hunger, reduces poverty and food insecurity, and enables expansion of exports.” CAADP specifically focuses on three pillars of agriculture, namely (i) sustainable land use, (ii) rural infrastructure and trade-related capacities, and (iii) food security (FAO 2004). Some of the fundamental principles of the Maputo declaration set to be achieved by 2015 included; boosting agricultural productivity to attain an average annual

growth rate of 6 percent with the primary focus on smallholder farmers, particularly women. CAADP also mandated member states to allocate at least 10 percent of budgetary allocation to agriculture

The second agricultural related pillar of NEPAD, i.e., to create a framework of governance including agriculture, is based on APRM. The principal purpose of the APRM is to foster democracy, economic governance and management, corporate governance and socio-economic development (NEPAD 2003). Some of the issues of governance relevant to the agricultural industry include the following; (i) access to land and security of tenure, (ii) input qualities such as seeds, fertilizer, machinery, etc., (iii) maintenance of grazing lands and pasture burning, (iv) access to rural credit, and (v) provision of public goods such as roads, irrigation, markets, and price information.

After a detailed assessment of the implementation of NEPAD at the regional level, there was a need to formulate regional agricultural policy as a response to agricultural and food issues in West Africa, hence, the creation of ECOWAP. The regional agricultural policy adopted by ECOWAS has the general objective to “contribute in a sustainable way to meeting the food needs of the population, to economic and social development, to the reduction of poverty in the Member States, and thus to reduce existing inequalities among territories, zones and nations”. This primary objective is then broken down into the following specific objectives; (i) food security for regional citizens, (ii) reduction of food dependence and achieving food sovereignty, (iii) creating markets for producers, (iv) creating jobs with guaranteed incomes to boost the standard of living, (v) sustainable intensification of production systems, (vi) adopting appropriate funding mechanisms, among others. Thus, the long-term vision of ECOWAP is to enable member countries to explore their potential to achieve sustainable food security, increase producers’ income and expand trade among the member states and between the sub-region and the rest of the world.

Some countries across the region have responded in different ways to policies at the national levels. For instance, in 2004, Kenya developed a Strategy for Revitalization of Agriculture (SRA) to address the challenges and constraints in the Kenyan agricultural sector. SRA aims at the transformation of primary production, services and trade, modernization and mechanization of farms, as well as enhancing agricultural infrastructure. The agricultural revitalization policy of Kenya was geared towards the UN’s Millenium Development Goals of reducing hunger and eliminating extreme poverty which, in turn, fall within the framework of NEPAD (specifically, CAADP).

2.3 Selected Agricultural Policies in Ghana

This section examines some critical policies and programmes that have been implemented, as well as those being implemented, to boost the agricultural economy in Ghana. These include the Food and Agricultural Sector Development Policy (FASDEP), the Medium-term Agricultural Sector Investment Plan (METASIP), input subsidy programmes, and programmes in the agricultural extension sub-sector.

2.3.1 Food and Agricultural Sector Development Policy (FASDEP)

FASDEP I, developed in 2002, was the first comprehensive policy of the government of Ghana through Ministry of Food and Agriculture (MoFA) that hinge on the critical elements of Accelerated Agriculture Growth and Development Strategy prepared in 1996. This policy

aimed to strengthen the private sector as an engine of growth. The primary focus of FASDEP I was to provide a framework for agricultural modernization, to serve as a spur for rural economic transformation. However, Poverty and Social Impact Analysis concluded that FASDEP I could not achieve the desired results due to some significant limitations.

Some of the challenges of FASDEP I included; improper definition of “poor smallholder farmer” within an environment where there is limited access to credit and technology, poor infrastructure, and limited access to input and output markets. Another key reason that could be ascribed to the failure of FASDEP I was that the process by which MoFA was to stimulate a response from other Metropolitan, Municipal and District Assemblies (MMDAs) for interventions, that fell outside the domain of MoFA, was not well specified (MoFA 2007). These, among other reasons, incited a review of FASDEP I in 2007 to FASDEP II, that spanned from 2007 to 2015. The review of FASDEP I had seven pillars. These included, human resource development, technology development and dissemination, infrastructure development, promotion of specific commodities for markets, improved access to financial services, cross-cutting issues (e.g., gender, land, etc.) and implementation framework. Thus, FASDEP II was developed as a long-term policy objective of the government regarding the development of the agricultural sector to ensure that the stakeholders in the industry are well positioned to take advantage of the evolving opportunities within the sector.

2.3.2 Medium-Term Agricultural Sector Investment Plan (METASIP)

The METASIP was a medium-term investment plan which sought to make the country food secured by 2015 (MoFA, 2010). METASIP was to increase investment in agriculture to at least ten percent of the national budgetary allocation in line with the Maputo declaration in 2003. The ten percent investment in agriculture was aimed at inducing growth in GDP by 6%. Thus, METASIP provided an integrated investment framework to support growth in the agricultural sector, rural development and food security (MoFA, 2007). The METASIP was intended to implement the six programmes outlined in FASDEP II. These were; Food security and emergency preparedness, improved growth in incomes, increased competitiveness and enhanced integration into domestic and international markets, sustainable management of land and environment, science and technology applied in food and agriculture development, and improved institutional coordination. The METASIP was expected to make a significant contribution to achieving the targets of the Millennium Development Goals of the United Nations.

It is important to mention that the primary stakeholders of these agricultural policy documents are the MoFA, the Council for Scientific and Industrial Research, academia, civil societies, farmers and farm and non-farm operators, etc. MoFA was to champion the implementation of this programmes just as PFJ.

2.3.3 The fertilizer subsidy programme

Agricultural transformation largely depends on productivity. Higher productivity enables farmers not only to have enough food to feed their households, but also acquire income from the sale of the surpluses to meet their non-food needs. As productivity increases, smallholder farmers accumulate more assets and engage in non-farm productive activities, increasing household income, which in turn, enhance their general well-being. Higher productivity will also generate surpluses to be used by the agro-processing industries as raw materials (ACET 2017).

However, African soils have been documented as one of the poorest in the world due to long years of unsustainable mining (African Union [AU], 2006). Every year, an equivalent of \$4 billion worth of soil nutrients are lost in Africa, thereby weakening its ability to sustain plant life (Fearon et al., 2015). Given the depleted nature of African soils coupled with poor farm management practices, there is no doubt that significant increase in the application of fertilizers is a necessary condition to replenish and maintain the fertility level to boost productivity.

Over the years, nutrient deficiencies in Ghana, and the consequent low crop yields experienced by farmers have been a matter of grave public concern. These losses, which are invariably estimated to range from 30% to 80% of achievable crop yields, does not only pose a threat to especially household and national food security needs of the country, but also reduces the income levels of food crop farmers (MoFA, 2013). Empirical studies have shown that conventionally, fertilizers are main inputs that are utilized to address soil infertility and soil nutrient deficiency problems for increased crop productivity. However, farmers in Africa, and for that matter, Ghana, are not able to afford to buy and apply fertilizer on their farm lands because of cost implications or unavailability of the input. For instance, Mokwunye (2012) reported that the cost of fertilizer in Sub-Saharan Africa is the most expensive in the world. Aside from the cost and physical unavailability of the input, farmers may not use it because of their inability to perceive the benefits of fertilizer utilization (Druilhe and Barreiro-Hurlé, 2012). Thus, while African soil nutrients are depleting, fertilizer utilization is low, making it one of the poorest in the world with an application rate of about 7kg/ha compared with more than 150kg/ha in Asia (Druilhe and Barreiro-Hurlé, 2012). Under such circumstances, one of the ways to address such market failures and provide incentives for farmers to increase fertilizer application rate and boost crop productivity is through subsidy programmes.

Many countries (e.g., Kenya, Tanzania, Malawi, and Zambia) in Sub-Saharan Africa embarked on large-scale subsidy programmes from the 1960s through the late 1980s in an attempt to boost crop productivity, particularly food crops (Dorward 2009). Under these programmes, smallholder farmers were supplied with farm inputs at controlled prices, as well as heavily subsidized credits. Though these programmes succeeded in increasing farm inputs utilization and boosting agricultural productivity in many cases, they were prone to high inefficiencies arising from high administrative costs and political manipulations (Banful 2010). Hence, these subsidy programmes were discontinued, and inputs market liberalized as part of the structural adjustment process (Crawford et al. 2006). The Structural Adjustment Programme (SAP) and market liberalization in the 1980s and 1990s led to the suspension of fertilizer subsidy programmes in Africa, including Ghana.

However, with the subsequent effect of low production, declining soil fertility, and rising food insecurity, the fertilizer subsidy programmes were revived as a significant tool to reverse the increasing gap between biological and actual agricultural productivity on the African continent. Hence, the organization of the Africa Fertilizer Summit in Abuja in 2006 to address the situation. The Summit led to the “Abuja Declaration on Fertilizer for Green Revolution”. The declaration was for member states to resolve to increase fertilizer application to 50 kg/ha by 2015 (AU, 2006). To achieve this, a *smart subsidy* was proposed where 10% of the country’s national budget allocated to agriculture was to be invested in fertilizer subsidy to increase productivity by 6% or more. With the subsequent effect of low production, declining soil fertility, and rising food insecurity, fertilizer subsidy programmes were revived as a significant

tool to reverse the increasing gap between biological and actual agricultural productivity on the African continent.

For African countries where fertilizer subsidy has been implemented, the impacts on yield vary from one country to another. For instance, Druilhe and Barreiro-Hurlé (2012) analysed differences in average yields of selected crops between pre-subsidy period (1995-2007) and post-subsidy period (2008-2010) and observed that Ghana, Mali, Senegal, Zambia, Rwanda and Malawi had significant increase in targeted crops. According Druilhe and Barreiro-Hurlé (2012), fertilizer subsidy in Ghana resorted in an increased in the yields of maize, sorghum and millet and that of Mali recorded an increase in the yield of rice, maize and cotton. A research by Wiredu et al. (2015) showed that fertilizer subsidy programme in Ghana led to an increase in land productivity, but a reduction in labour productivity because more family labour was used in weeding and harvesting. The above observations are in line with the success story of some countries that have implemented similar programmes and achieved more significant results (Morris et al., 2007) and Kato and Greeley (2016). Though Dorward et al. (2010) indicated that farm input support programme introduced in Malawi resorted in an increase of maize yield by about 54% in 2008/09, Messina et al. (2017) findings did not support this claim. The differences in the findings resulted from the different sources of data.

In Kenya and the United Republic of Tanzania, though areas devoted to targeted crops increased due to fertilizer subsidy, crop yields decreased (Kato and Greeley (2016). Druilhe and Barreiro-Hurlé (2012) suggested that “the observed yield decreases could possibly be interpreted as an indirect effect of allocating less suited soils to subsidized crops but this cannot be tested for with the data available”. Also, before and after analyses showed that while maize, millet and sorghum yields increased in Nigeria, rice yield decreased. Burkina recorded a decrease in maize yield.

As a result, the government of Ghana re-introduced the fertilizer subsidy programme in July 2008 to boost production and productivity in line with its commitment of reducing food insecurity and improving the standard of living of the rural livelihoods. The subsidy programme was expected to boost the fertilizer application rate to at least 50kg/ha by the end of 2015 as recommended by the Abuja summit. The programme started with 600,000 bags of 50kg fertilizer at a subsidized cost of \$15 million, where farmers obtained subsidy through an acquisition of fertilizer-specific and/or region-specific voucher (Banful, 2009). Table I reports a summary of the investment made in the fertilizer subsidy for the period 2008–2012.

Table I: Annual quantity and cost of fertilizer subsidy programme in Ghana (2008 – 2012)

Year of Distribution	2008	2009	2010	2011	2012	Total
Quantity ('000' tons)	43.2	72.8	91.2	176.3	173.8	557.3
Cost of Subsidy (GH¢)	20, 654	34, 400	30,002	78,746	117, 437	202, 493

Source: SRID, MoFA 2013

Available records indicate that there was no fertilizer subsidy programme in 2014. However, at the beginning of the year 2015, another fertilizer subsidy was launched, involving all types of compound fertilizer and urea as the two main types of fertilizer in the subsidy programme. This was again within the national development agenda to promote the agricultural sector to transform the structure of the economy. For the compound fertilizer valued at GH¢115 per 50kg, the government subsidy absorbed GH¢26.00, pegging the selling price to farmers at GH¢89, representing 22.6% in price reduction. For urea, there was a price reduction of GH¢21 bringing the price per 50kg from GH¢105 to GH¢86, representing 20% in price reduction.

There are reports that this was a massive investment in a fertilizer subsidy programme, and that it was one of the most liberal fertilizer subsidy programmes in South Sahara Africa, with local private enterprises engaged in the input supply, distribution and retailing (Baltzer and Hansen 2012). However, there were some challenges with the implementation. There were reports of hoarding even by farmers and some politicians at the district level who had no intention or capacity to use the fertilizer (Baltzer and Hansen 2012). Since the programme was announced in advance, farmers postponed the purchase of their input in anticipation of the subsidy. However, the fertilizer arrived at community levels very late to benefit the major season in the southern part of the country and plantings in the northern regions, which significantly reduced its effectiveness. A study conducted by Yawson et al., (2010) reported many other implementation challenges that adversely affected the smooth running of Ghana's fertilizer subsidy programme. These included the availability of inputs at the right time, lack of technical support and extension advice on Good Agronomic Practices during the implementation stage.

There have also been the issues regarding the sustainability of the subsidy programmes over the years. Table I indicates that the annual cost of subsidy increased from GH¢ 20.6 million in 2008 to GH¢ 117.4 million in 2012, representing about 468%.¹ This situation has been experienced in many other African countries, such as Malawi, putting enormous fiscal pressure on the national budget, thereby, leading to an array of implementation challenges such as diversions, displacements and market distortions (Chinsinga 2008; Druilhe and Barreiro-Hurle 2012). Moreover, some researchers have argued that, in a perfectly competitive market, subsidies are less efficient in transferring incomes to farm households leading to welfare losses (Crawford et al., 2006; Filipski and Taylor 2011). This is because, apart from the programme being so expensive, it distorts input markets leading to abuse of the usage, and also ends up benefiting the wrong people. Thus, how much of the subsidized amounts get to the intended farmers as against how much ends up in private pockets is yet to be addressed.

2.3.4 Agricultural Extension Policies

Agricultural extension services have been one of the critical routes for increasing productivity and production. Agricultural extension has long been used to enable farmers to obtain information and technologies that can improve their livelihoods and food security needs through increased farm productivity and efficiency. Thus, agricultural extension programmes have been one of the leading conduits of addressing rural poverty and food insecurity. This is because, it has the means to transfer technology, support rural adult learning, assist farmers in problem-solving, and getting farmers actively involved in the agricultural knowledge and information system (Christoplos and Kidd, 2000: 11). The Food and Agricultural Organisation (FAO) (2010) defines extension as 'systems that should facilitate the access of farmers, their organizations and other market actors to knowledge, information and technologies; facilitate their interaction with partners in research, education, agri-business, and other relevant institutions; and assist them to develop their own technical, organizational and management skills and practices'. This definition suggests that extension service delivery is to make agriculture and its related activities more efficient and effective to meet the needs of the rural poor. Agricultural extension programmes can also be regarded as a tool to safeguard the quality of agricultural products. Bonye et al., (2012) argued that extension provides a source of information on new technologies for farming communities which, when adopted, can

¹ Inflation rate for Ghana was 7.1% in 2012, decreasing from 16.5% in 2008.

improve production, incomes, and standards of living, and has been promoted in Ghana's agriculture since the nineteenth century.

2.3.4.1 Agriculture Extension Service delivery system in Ghana

In Ghana, MoFA is the primary provider of agricultural extension services, though not the sole provider. Even though MoFA extension agents are found in all the districts, their number is inadequate. MoFA extension programmes are supervised by National Extension Directorate.

The Agricultural Extension Service delivery in Ghana has undergone a paradigm shift, from the approach of export commodity development before independence in 1957, to the stimulation of local food crop production and productivity to ensure food security and improve rural livelihood (Hill 1970). The primary goal of this shift in focus was to modernize the Ghanaian farming practices, transfer technology and resources, and train agents that will address the extension needs of smallholder farmers (Donkoh, 1989).

In 1978, a ministry-based general extension approach was adopted by the government of Ghana. However, this approach was viewed as a top-down and pro-urban and believed to pay more attention to progressive farmers, while neglecting poor and peasant farmers, and hence was intensively criticised. This was due to some challenges such as lack of coordination amongst various departments within MoFA, poor management of the extension approach, lack of well-trained workers and poor infrastructure, etc. In response to these criticisms, a review was made to the general extension system, and a new approach called Unified Extension System (UES) was adopted in 1992 with funding support from World Bank. Aside from the UES, Ghana's extension service delivery has been subjected to other reforms such as; decentralization of extension management and delivery adopted in 1997; merger of cocoa extension with the general extension of the MoFA in 2000, and the increased function of the private sector in financing and providing extension services. The following subheadings discuss some of the reforms about food production.

2.3.4.2 Unified extension system – modified training and visit

The modified Training and Visit (T&V) approach for extension management also referred to as Unified Extension System was adopted in 1992 with the main aim of training extension staff and visits to farmers. This approach has the farmer group as the primary focus, instead of the individual farmers as contained in the classical T & V system. It also regulates the training of extension agents to once a month or in some cases, once every two months. Agricultural Extension Agents (AEAs) have the responsibility to deliver all information regarding agricultural technology and other farm management practices to farmers, with support from Subject Matter Specialists (SMS). Under the modified T & V system, Research Extension Liaison Committees established at the zonal levels are to develop a close relationship with AEAs and the farmers. The role of the Research Extension Liaison Committees is to review the relevance of the extension programmes to agricultural development in the zones. The Modified T&V achieved two main aims: (1) The public extension system was rationalized, thereby removing the previous duplication of extension activities by the various departments within MoFA, and (2) Farmers were empowered through education and technology transfer.

Although the UES was built on adoption of new agricultural technologies, a review of the system suggests the adoption rate of less than 30%, albeit, most farmers were aware of the technologies (DAES, 2001). The inability of the UES to increase adoption rates to the

expected level was partly ascribed to the removal of the government subsidy programmes on agricultural inputs. The removal of subsidies on agricultural inputs coupled with other economic indicators, such as high inflation levels, were great disincentives for farmers to purchase agricultural inputs, hence, hampered adoption.

2.3.4.3 Decentralization of the public extension system

The agricultural extension system in Ghana was structured and implemented in a top-down manner. Programmes were planned, and targets set by the MoFA head office and all staff in other regions were part of the Directorate of Agricultural Extension Services at the head office. This centralized system of delivering extension services was criticized for its contextual relevance and its effectiveness to deal with location-specific problems. MoFA, therefore, decided to decentralize its operations to the regional and district levels in 1997. The process of decentralization saw the 110-district directorate of agriculture involved in the planning and implementation of extension programmes, which was accompanied by staff rationalization. The various departments such as crops, livestock, policy planning, monitoring and evaluation, plant protection and regulatory services, fisheries, veterinary services, and agricultural engineering services were merged into a single directorate headed by the district director of agriculture. In this case, the district directorate now plans their extension activities and prepare their budget independent of the national directorate.

2.3.4.4 Private sector service providers

One of the significant reforms that has been undertaken is to strengthen the private sector funding and delivery of extension services. In this strategy, various companies operating commercial or profitable production agricultural enterprises are to help in the delivery of extension services. For example, in subsectors sectors like cash crops (oil palm, rubber, cotton, pineapple and vegetables), extension services are expected to be financed and executed through processing companies under contract with farmers (Attengdem, 1999). Agrochemical companies and dealers are also to provide extension services to farmers on their products through training and field demonstrations.

The major challenge with the provision of private sector extension and NGOs is that these private sector providers rely on the use of MoFA staff. Most NGOs operating in the rural farming communities do not have their extension staff (Fiadjoe, 1999). These NGOs usually use MoFA staff without any formal approval or planning with MoFA authorities (Amezah and Hesse, 2002). MoFA resolved this unofficial use of public officers by the creation of agricultural service providers' fora at the regional and district levels, to discuss and inform MoFA to ensure proper planning and coordination between the two parties. With this, MoFA believes it will enhance cooperation among agrarian service providers and also promote efficiency and effectiveness in the extension service delivery.

2.3.5 Ghana Seed Policy

Agricultural production depends heavily on inputs. Seed is a critical input in agricultural modernisation and productivity improvement. The importance of seed to any crop-based production system cannot be overemphasized, as it is the fundamental source of life for any crop production system (Etwire et al., 2013). There are two types of seed systems in Ghana, namely, the formal system and the traditional or informal system. Unlike the traditional or informal seed system, the formal seed system is regulated, and the seeds are improved. According to Maredia et al. (1999) and Louwaars and De Boef (2012), over 80% of smallholder

farmers in Africa obtain seeds from the informal sector by using their own seeds, do seed exchange or purchase of seeds from the local market.

The Ghana seed sector has evolved. The Plants and Fertilizer Act enacted in 2010 spells out how the seed sector should be organised. The Act covers processes related to seed in the establishment of the National Seed Council and not introduced production and certification policy. The law aimed at sanitising the activities of producers of improved crop seed ultimately has the objective to improve agricultural production in the country through the introduction and adoption of modern technologies. Through the implementation of the law, it was expected that the seed industry will be stimulated to produce reliable seeds for farmers to increase agricultural production.

Alongside the Plants and Fertilizer Act (2010), MoFA developed the National Seed Policy which aims at supporting the private sector to champion the production and supply of improved seeds to farmers. The National Seed Policy clearly states the regulatory framework for variety release, licensing of varieties, accreditation of seed quality control functions, and simplification of seed import and export processes (GoG, 2013). This framework is to help streamline seed production in Ghana. However, as shown in Table 2, certified seed production for maize, rice, soybean, cowpea, sorghum and groundnut has been fluctuating over the years. This can be explained by the fact that seed production is usually supported by projects, and the donor funding for most of these projects are not continuous.

Table 2: Quantity (MT) of certified seed produced in Ghana from 2001 to 2011

Year	Maize	Rice	Soybean	Cowpea	Sorghum	Groundnut
2001	996	732	87	34	7	-
2002	1,498	457	190	28	15	-
2003	1,341	407	179	27	36	9
2004	1,356	495	-	47	36	9
2005	2,035	233	356	30	14	63
2006	1,672	516	218	35	5	23
2007	1,677	344	92	57	1	3
2008	2,474	550	154	38	5	7
2009	3,789	2,378	295	16	6	9
2010	4,424	3,906	354	27	5	18
2011	2,670	2,367	189	14	1	-

Source: Plant Protection and Regulatory Services Department

Despite the efforts of government in developing a formal seed distribution system and create a conducive environment of seed commercialization, one cannot deny the fact that these efforts have not yielded impact. This is because more emphasis has been placed on breeding new seed varieties, multiplication, processing, storage and marketing, rather than addressing key institutional issues that can assist the system to perform effectively (Niangado, 2010). It is a well-known fact that while some of the producers of improved certified seeds are registered and regulated, many others who are unregistered produce seeds with low germination rates when farmers have planted them on their fields. Despite the efforts and arrangements of government to have sufficient improved and certified seeds produced, improved seed availability and affordability for farmers is still very low. This has resulted in a situation of excess demand over supply leading to higher prices beyond the reach of the farmers. These issues are not the seed issues facing farmers. Farmers have difficulties in obtaining good quality improved and certified seeds due to inadequate selling centres. The

interaction and communication among various actors within the seed delivery chain in northern Ghana, for instance, is weak, with less than 20 percent of the seed requirement of farmers being met (Etwire *et al.*, 2013; and Tripp and Mensah-Bonsu, 2013).

The availability of improved and certified seed for farmers living close to urban centres is not much the problem, as compared to their counterparts staying in typical villages. Often, large- to medium-scale farmers are able to access much information on where to acquire improved and certified seed. According to Tripp and Mensah-Bonsu (2013), information on which varieties are potentially offered in the formal seed system is scarce for the average Ghanaian farmer. The situation has been aggravated by the upsurge in demand for improved and certified seed by MoFA to supply to farmers for the implementation of Planting for Food and Jobs (PFJ) programme. A programme such as the PFJ encountered challenges with respect to the supply of seeds.

As a study by Tripp and Mensah-Bonsu (2013) indicates, there are many unanswered questions that need to be addressed for Ghana to develop a viable commercial seed industry capable of supplying farmers with affordable seeds. Fundamentally, the ability of seed producers to produce enough improved and certified seed depends greatly on availability of breeder seed from National Agricultural Research Institutes (NARIs), which for a long time has become a function of donor project support (*ibid*). Overall, Ghana's commercial seed sector faced with regulatory, technical and capital investment challenges is yet to develop **as** required.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This chapter presents the general approach to conducting the research. The chapter is organized into the following sub-headings: research design; survey instrument, sampling technique and sample size; pre-testing of data collection instruments, methods of data analysis and ethical considerations.

3.2 Research Design

This study employed a mixed research design which encompassed a qualitative and quantitative approaches. The use of the two research designs helps to triangulate the information gathered and to come out with comprehensive conclusions.

3.3 Survey Instruments, Sampling Techniques and Sample Size

Both primary and secondary data were collected. Primary data were obtained using a semi-structured questionnaire with both opened and closed-ended questions as well as checklists. Focus-group-discussions were held for stakeholders [all levels of MoFA staffs, Non-Governmental Organizations (NGOs), government agricultural research institutions, FBOs, women groups, youth groups] to come out with their views regarding each of the five pillars of the programme. For the focus group discussions, a checklist was used. Key informants such as directors of MoFA (sectional, district regional, etc.), and agricultural extension agents were interviewed. Also, agro-input dealers, seed producers, aggregators, farmers, etc. were individually interviewed, to get the in-depth knowledge about their level of understanding of the packages involved, and the requirements for enrolling onto the programme. All these key actors were also requested to explain their views regarding the challenges, potentials and ways forward of the programme in its first year of implementation to inform a successful implementation of the programme in the subsequent years.

MoFA statistics (2016) indicated that Brong-Ahafo, Volta and Northern Regions are the leading producers of maize, rice, and soybean respectively. Hence, these regions were chosen for this study. In each region, three districts were selected based on the highest, median and lowest production figures in 2015 cropping season. Based on these criteria, Kintanpo North, Sene, and Atebubu-Amantin districts in the Brong-Ahafo region; Ketu North, Krachi East, and North Dayi districts in the Volta region; and Yendi, Saboba and Sawla-Tuna-Kalba districts in the Northern region were selected. Communities with PFJ beneficiaries were chosen purposively. In purposive sampling, the goal is to select cases that are likely to be information rich with respect to the purpose of the study (Gall et al., 2007). Lastly, four communities were randomly selected from each of the districts and farmers and other key stakeholders randomly sampled and interviewed.

According to GSS (2015), agriculture employs 50 percent of the economically active population (14,040,893) who are aged 15 years to 64 years. This suggests that the number of active population engaged in agricultural production is 7,020,447. Since the PFJ is aimed at creating 750,000 direct and indirect jobs, the sample frame for the study was 7,770,447 (thus 7,020,447+750,000). Slovin's sample size determination formula as applied in Visco (2006) was used to calculate the sample size (n) and presented below,

$$n = \frac{N}{1 + Ne^2} \quad [1]$$

N = Population (number of farmers in Ghana) = 7,770,447

e =margin of error = 5%

$$n = \frac{7770447}{1 + 7770447(0.05)^2} = 400$$

Twelve farmers were selected from each community (totaling 432 farmers) using simple random sampling technique.

3.4 Pre-Testing of Research Instruments

The data collection instruments i.e. questionnaire, and the checklist were pre-tested to enable the researchers to understand the clarity, the scope and depth of the data collected, and to find out whether the instruments needed some revision to meet the research objectives.

3.5 Quantitative Methods of Data Analysis

3.5.1 Awareness and understanding of packages of PFJ pillars

The Likert scale developed by Rensis Likert is a powerful psychometric scale tool that this research adopted to determine the degree or extent of people's attitudes, perception and agreement quantitatively (Likert, 1932) about their awareness and understanding of packages of pillars of PFJ. In order to measure farmers' awareness levels of the packages involved in each of the pillars quantitatively, Table 2 shown below was used. In the table, a question "Are you aware of the packages that are available for you as a participant of PFJ under the various pillars; subsidized and improved seeds, subsidized fertilizer, agricultural extension services, establishment of markets and e-agriculture" were asked. Farmers were asked to score 1, 2, 3 and 4 for options "not aware", "somehow aware", "aware" and "highly aware" respectively. Similarly, scores of 1, 2, 3 and 4 which are used **to indicate** "do not understand", "somehow understand", "understand" and "highly understand" respectively were used on the Likert-scale to measure farmers' level of understanding of the packages in each of the five pillars of PFJ (see Table 3).

Table 3: Measurement of Awareness and Understanding of Packages of PFJ Pillars

Are you aware of the packages that are available for you as a participant of PFJ under the following pillars?	Not aware (1)	Somehow aware (2)	Aware (3)	Highly aware (4)
i. Subsidized and improved seeds				
ii. Subsidized fertilizer				
iii. Agricultural extension services				
iv. Establishment of markets				
v. E-agriculture				
Do you understand the processes you have to go through to access the packages that are available for you as a participant of PFJ under the following pillars?	Do not understand (1)	Somehow understand (2)	Understand (3)	Highly understand (4)
i. Subsidized and improved seeds				
ii. Subsidized fertilizer				
iii. Agricultural extension services				
iv. Establishment of markets				
v. E-agriculture				

In order to estimate a single weight measuring the percentage level of awareness of packages of pillars of PFJ, weighted average formulae were used. Equation (2) measures the percentage level of awareness of packages of pillars of PFJ by i^{th} farmer whereas equation (3) measures the percentage level of awareness of packages of j^{th} pillar by all the farmers.

$$PLA_i = \frac{\sum_{j=1}^{j=5} AS_{ij}}{4 * 5} \times 100 \quad [2]$$

$$PLA_j = \frac{\sum_{i=1}^{i=n} AS_{ji}}{4 * n} \times 100 \quad [3]$$

Where:

PLA_i = percentage level of awareness of packages of pillars of PFJ by i^{th} farmer

PLA_j = percentage level of awareness of packages of j^{th} pillar by all the farmers

AS_{ij} = awareness score for i^{th} respondents across all j^{th} pillars

AS_{ji} = awareness score for j^{th} pillar for all i^{th} respondents

j = j^{th} pillar

i = i^{th} respondent

n = sample size

Similar analysis was done in measuring farmers' percentage level of understanding of the pillars of PFJ by i^{th} farmer on one hand and farmers' percentage level of understanding j^{th} pillar by all farmers. From the estimation, the higher the percentage score, the higher the level of awareness of pillars of PFJ. Similarly, the higher the percentage score, the higher the level of understanding of the pillars of PFJ. It is expected that, farmers who are much aware and understand the packages of the various pillars of PFJ will welcome the programme and fully participate to attain higher yields than their counterparts who do not have so much awareness and understanding of the programme, *ceteris paribus*.

3.5.2 Differences in level of awareness and understanding of PFJ pillars

The differences in the levels of awareness between any two pillars of PFJ were tested using Paired t-test. Paired t-test (also called dependent sample t-test) in this study is used to test whether or not two sample means of awareness levels are significantly different. In paired t-test, the awareness levels are estimated for each respondent for any two pillars of PFJ. The pillars of PFJ are paired when doing the estimation for one sample. The paired t-test is given as:

$$\text{Paired } t - \text{test} = \frac{\overline{AS}_j - \overline{AS}_k}{s_d / \sqrt{n}} \quad [4]$$

Where \overline{AS}_j and \overline{AS}_k are the awareness scores for jth and kth pillars respectively. S_d is the standard deviation for awareness scores and n is the sample size

The assumptions underlying the paired t-test are:

- the variables should be continuous, thus should be ratio or interval variables
- the variables (pillars) should be independent of each other
- the variable should be normally distributed
- the dependent variables should be outliers free

The normality assumption will be tested by drawing a histogram and observing the skewness of the data. Using a boxplot, the study will be able to ensure that the data is free from outliers. The hypotheses to be tested and validated are stated below:

H_0 : There is no statistical significant difference between the awareness levels of any two pillars of PFJ

H_1 : There is statistical significant difference between the awareness levels of any two pillars of PFJ

The same paired t-test and analysis was done to ascertain whether or not there is statistical significant differences between farmers' understanding of the packages involved in any two of the pillars of PFJ.

3.5.3 Correlation among the levels of awareness and understanding of PFJ pillars

The existence of correlation between variables is not meaningful but rather, the degree of the correlation. It is important for the study to estimate and interpret the level of correlation between farmers' awareness and understanding of any two pillars of PFJ. This will enable us to know how farmers' participation in any two of the pillars are related. It will also help policy makers on how they can design differentiated sensitization programme to increase farmers' level of awareness for all the pillars. The best statistical tool for this estimation is the Spearman's rank correlation coefficient. This is because of the fact that awareness and understanding scores are rank variables. Therefore, Spearman's rank coefficient (ρ_s) between the ranked variables is given as:

$$\rho_s = 1 - \frac{6 \sum d_i^2}{n(n^2 - 1)} \quad [5]$$

Where d_i is the difference between the rank of farmers' awareness levels for j^{th} and k^{th} pillars for each of the observations. It is important to make it known that some of the ranks are identical and their subtractions will give zero values. To avoid this, Dodge (2010) indicated that each of the identical values should be assigned fractional ranks which are average of the positions in ascending order of the values. The sign of Spearman's rank correlation coefficient indicates whether or not the trend between the two variables are increasing. The interpretation of the correlation coefficient is illustrated in Table 4.

Table 4: Interpretation of correlation coefficient

Range	Interpretation
If $r = -1$	Perfect negative correlation or linear relationship
$-0.75 \leq r < -1$	Strong negative correlation
$-0.25 \leq r < -0.75$	Intermediate negative correlation
$0 < r < -0.25$	Weak negative correlation
$r = 0$	No correlation
$0 < r < 0.25$	Weak positive correlation
$0.25 \leq r < 0.75$	Intermediate positive correlation
$0.75 \leq r < 1$	Strong positive correlation
If $r = 1$	Perfect positive correlation

3.5.4 Participation of major stakeholders in pillars of PFJ

The participation of stakeholders in the pillars of PFJ will be analysed using descriptive statistics such as frequency and percentage distribution tables. The study will also use multiple column bar charts. With multiple or compound column bar charts, five columns will be used to represent the percentage of stakeholders participating in each of the five pillars. The stakeholders who would be considered are farmers, AEAs, research institutions, senior MoFA officers, agro-input dealers, aggregators and NGOs. The pictorial presentation and discussion of the results using multiple column bar charts will better appeal to the minds of readers of this study for faster and better understanding. With this, readers will be able to identify and understand the relationships between the level of participation of stakeholders in all the five pillars of PFJ. This will make it easy for comparison.

3.5.5 Potentials of PFJ

The potentials of the PFJ programme will be analysed using both stakeholders' perceptions and empirical data. Using a Likert scale, stakeholders will be asked to indicate the changes that have taken place regarding the number of the youth, adult males and adult females engaged in agriculture after one-year implementation of PFJ (see Table 5). The youth are those within the age bracket 15 -24 years (FAO, 2012)

Table 5: Measurement of potentials of PFJ

Groups	Increased [1]	Did not change [2]	reduced [3]
Youth (15-24years)			
Adult Women (25years and above)			
Adult Men (25years and above)			

The potential of the programme in reducing unemployment, poverty and food insecurity was assessed using the Likert scale illustrated in Table 6 below. The stakeholders were asked to

score 1 if PFJ has no potential of reducing, 2 if it has a potential of reducing and 3 if it has a big potential of reducing unemployment, poverty and food insecurity.

Table 6: Potentials of the PFJ programme

	<i>It has no potential of reducing .. (1)</i>	<i>It has a potential of reducing .. (2)</i>	<i>It has a big potential of reducing .. (3)</i>
Unemployment			
Poverty			
Food insecurity			

The study used empirical data, such as crop yields and a number of agricultural extension visits for 2016 and 2017, to measure the potentials of PFJ in changing agricultural productivity and agricultural extension service delivery. Also, the potential of the programme in increasing fertilizer application rates among farmers was assessed using the amount of fertilizer applied per acre for 2016 and 2017 cropping seasons. For statistical validation of the potentials of PFJ in increasing gender participation in agriculture, fertilizer application rate, agricultural extension service delivery, adoption of improved seeds, agricultural productivity, and reducing unemployment, poverty and food insecurity, the study used paired t-test as stated in equation (4).

3.6 Quantitative Method of Data Analysis: Implementation Challenges

The implementation challenges of PFJ was analysed using a qualitative approach. The PFJ programme is a complex agricultural intervention system involving many interconnected entities (provision of subsidized and improved seeds; subsidized fertilizer; agricultural extension services; establishment of markets; and e-agriculture), which operate under diverse conditions. Therefore, explaining the issues at stake (implementation challenges, and ways forward) by a mere study of the PFJ programme as one domain without looking at the interconnectivity may not be sufficient for policy implications due to many autonomous stakeholders operating under diverse conditions, with varying perspectives and interests (Bezuidenhout et al., 2013). The study, therefore, employs the domain and network analysis approach that considers the entire PFJ programme and how individual pillars (provision of subsidized and improved seeds; subsidized fertilizer; agricultural extension services; establishment of markets; and e-agriculture) within the programme interact. The network analyses can describe such a complex agricultural intervention (PFJ programme) and depict the interactions among the essential pillars (pillars) within the system (Sterman, 2006).

According to Hanneman (2001), a network is a set of nodes (domains) that shows the relationships among one another. It is a method used to identify, map and analyse relationships among human and non-human actors (Assimakopoulos and Yan, 2017). This method gained prominence as a result of many researchers' attempt to use mathematical, statistical and computer tools to establish relationships and this dates back to 1950s (Mitchell, 1969). The theoretical underpinning of network analysis is that a social system is made of several units which are related and linked to each other. The linkages may be few or many. As noted above, the challenges facing PFJ are many and two or more are linked to each other. The way the challenges to be identified are related to each other is important. For this study, two primary networks would be developed, system domain network (studying the entire PFJ programme and their interconnectivity) and a theme network (a more detailed study of the individual themes).

Under the system domain network, implementation challenges, potentials and ways forward for the entire PFJ programme will be cataloged. With the theme network analysis, implementation challenges, potentials and ways forward for each of the pillars would be identified, assessed, analyzed and presented. This would help to simplify and understand the complexities in the implementation of the PFJ programme to enable identifications of areas to be improved (Bezuidenhout et al., 2013).

The effectiveness of the methodology used by the district technical committee in targeting women and youth, the participation of women and the youth and the innovations that could be introduced to efficiently target these groups will be quantitatively estimated using a Likert scale. The identified implementation challenges, effectiveness, and ways forward of the programme would be triangulated through thematic analysis, and the results presented using descriptive statistics such as charts and graphs.

3.7 Data Analysis Softwares

The recorded interviews with key informants are transcribed with the aid of Microsoft word. The reproduced data are categorized into themes and sub-themes guided by the research objectives and discussed alongside the trend of information in the reviewed literature. Both data were coded and entered into a computer using the SPSS version 20. The data was cleaned and validated. With the help of bar graphs, pie charts, histogram, frequency tables, etc., the data was analyzed, presented and discussed. Descriptive statistics such as mean, modes etc. was used. Inferential statistics were also used for the analysis. Network analysis software was employed as explained in section 3.6 above to qualitatively analyse the implementation challenges of PFJ.

3.8 Ethical Consideration

It was very important for the investigator to consider ethical issues in order to avoid some of the problems in the study. In this study, the investigator respected the authorities and the protocols. Permission was sought from the various authorities' concern. The respondents were assured that their privacy would be maintained. The confidentiality of the information will be the principal ethical consideration.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter of the report presents the results of the research. It starts with the descriptive statistics of the respondents and the variables. The analysis and discussion of the achievement of each of the objectives are present in the chapter as well.

4.2 Descriptive Statistics of Respondents and Variables

This section summarises the data and the variables used in the analysis.

4.2.1 Percentage distribution of respondents

Table 7 illustrates the frequency and percentage distributions of the categories of respondents that were interviewed in the Northern, Volta and Brong-Ahafo Regions. To be able to get information from the national level, some categories of respondents from Greater Accra were also interviewed.

Since the major stakeholders in PFJ and this research are farmers, they constitute the highest number of respondents. Out of 626 respondents, 70.0% were farmers. The numbers of farmers included in the study from Northern, Volta and Brong-Ahafo Regions are 146, 147 and 145 respectively. The second largest category of respondents was agricultural extension agents. They were the second largest (7.7%) because, they were highly involved in PFJ. They have direct contact with farmers and most of them were engaged in the distribution of inputs. Therefore, they can give reliable information on the operational challenges and successes of the programme. An equal number of AEAs were selected from the three regions.

Table 7: Percentage distribution of respondents

	Northern Region		Volta Region		BrongAhafo Region		Greater Accra		All	
	Freq	%	Freq	%	Freq	%	Freq	%	Total Freq	%
Farmers	146	68.5	147	72.4	145	71.4		0.0	438	70.0
AEAs	16	7.5	16	7.9	16	7.9		0.0	48	7.7
Researchers	5	2.3	2	1.0	2	1.0	3	42.9	12	1.9
Senior MoFA Officers	4	1.9	4	2.0	4	2.0	2	28.6	14	2.2
Agro-Input Dealers	12	5.6	12	5.9	12	5.9		0.0	36	5.8
Aggregators	12	5.6	10	4.9	12	5.9	2	28.6	36	5.8
Senior Officers of NGOs	6	2.8	3	1.5	3	1.5		0.0	12	1.9
Seed Producers	5	2.3	2	1.0	2	1.0		0.0	9	1.4
FBOs	3	1.4	3	1.5	3	1.5		0.0	9	1.4
Non-MoFA members of DTC and RTC	4	1.9	4	2.0	4	2.0		0.0	12	1.9
Total	213	100	203	100	203	100	7	100	626	100

It is important to include non-MoFA members of technical committees at the district, and regional levels. The researchers, senior MoFA officers, agro-input dealers, aggregators, seed

producers and senior officers of NGOs were also interviewed. This was done to help us identify the divergent views about the challenges, successes and potentials of the programme. In total, 14 senior officers of MoFA were interviewed at the district, regional and national levels. At the national levels, 2 senior MoFA officers (one member of national technical committee and one non-member). At the regional level, one senior MoFA officer who is part of the RTC was included in the study. Similarly, one senior MoFA officer who is part of the DTC was interviewed. The percentage of senior MoFA officers who were interviewed is 2.2%. Seed producers and FBOs formed the smallest percentage of respondents with each recording 1.4%.

Out of 626 respondents, 5.8% each were agro-input dealers and aggregators. Senior officers of NGOs and non-MoFA members of DTC and RTC formed 1.9% each. In all, Northern, Volta, Brong-Ahafo Region and Greater Accra respectively recorded 213, 203 and 203 respondents. This follows a national trend where there are more stakeholders in agricultural production in the Northern Region than any other region.

4.2.2 Percentage distribution of sex, marital and educational status of farmers

Table 8 depicts the percentage frequency distribution of sex, marital and educational status of farmers. In the table, 84.7% of the farmers interviewed are males whilst the rest are females. Brong-Ahafo had the highest number of females (18.6%) followed by Volta (17.0%) and Northern (10.3%) regions in that order. This is not surprising since women face challenges in accessing land in Ghana with Northern Region being pronounced. These findings confirmed the work of Quaye et al. (2017, p50) who indicated that “females do not inherit land from a deceased parent but have to farm through the benevolence of the husband if married or through father or male family head”.

Table 8: Percentage distribution of sex, marital and educational status of farmers

	Northern Region		Volta Region		Brong-Ahafo Region		All	
	Freq	%	Freq	%	Freq	%	Freq	%
Sex:								
Male	131	89.7	122	83.0	118	81.4	371	84.7
Female	15	10.3	25	17.0	27	18.6	67	15.3
Marital Status:								
Single	22	15.1	25	17.0	26	17.9	72	16.7
Married	124	84.9	122	83.0	119	83.1	368	83.3
Education:								
No education	81	55.5	30	20.4	73	50.3	184	42.0
Primary school	14	9.6	40	27.2	21	14.5	75	17.1
Middle school/JSS/JHS	26	17.8	27	18.4	6	4.1	59	13.5
Voc/Sec. Tech/SSS/SHS	15	10.3	23	15.7	18	12.4	56	12.8
Teacher/Nursing Colleges	7	4.8	16	10.9	15	10.3	38	8.7
Polytechnic/University	3	2.1	11	7.5	12	8.3	26	5.9
Age range								
15-24 (Youth)	4	2.7	9	6.1	13	9.0	26	5.9
25-70 (Adult)	142	97.3	138	93.9	132	91.0	412	94.1

Marital status is another critical variable which has over the years been used in most research. Typical of many agricultural related research in Ghana, out of 438 farmers, 83.3% are married. Northern Region recorded the highest number of farmers who are married and this follows the national trend as reported by GSS (2014). It is not also surprising to observe from the

results that the highest percentage (55.5%) of farmers who had no formal education are in the Northern Region of Ghana. In Brong-Ahafo Region, 50.3% of farmers interviewed do not have formal education. The smallest number of farmers (20.4%) without formal education came from Volta Region.

From Table 8, it can also be observed that majority of farmers (94.1%) interviewed are adults and are in the age category of 25-70years. Comparatively, Brong-Ahafo had the highest percentage (9.0%) of youth engaged in agriculture followed by Volta Region (6.1%). Northern Region is the least with 2.7%. This confirmed the findings of FAO (2012) that rural youth are primarily employed as agricultural unpaid family workers and hence do not own farms. Some of the youth too do not see agriculture as a business and hence prefer to travel to cities in search of non-existing white-collar jobs.

4.2.3 Summary statistics of age and household size

Table 9 below provides a summary of the demographic attributes of the respondents in the three regions thus, Northern, Volta and Brong-Ahafo regions. The average ages of farmers are 45.6years, 39years and 40.3years for Northern, Volta, and Brong-Ahafo regions respectively. This suggests that the age distribution is fairly youthful (early old age), implying an active and vibrant workforce group. Similarly, the average household sizes for the various regions were quite moderate across, i.e., 7, 5 and 6 individuals for Northern, Volta and Brong-Ahafo Regions respectively. Though in extreme cases, fairly large household as well as very small household sizes were recorded. For instance, as small as a single person constituted an entire household, other households recorded up to 16 members. This large household size could be attributed to polygamous marriages or extended family relations.

Table 9: Summary statistics of age and household size

Variable	Obs	Mean	Std. Dev.	Min	Max
Northern Region					
Age	146	46.6	10.9	22	70
HHS	146	7.3	3.2	3	16
Volta Region					
Age	147	39.3	9.7	23	63
HHS	147	4.6	2.7	1	13
Brong-Ahafo Region					
Age	145	40.3	13.2	20	76
HHS	145	6.3	3.2	2	15

4.3 Awareness of Packages of Pillars of PFJ

This section is the beginning of the analyses for the achievement of the research specific objectives. The section analyses and discusses the distribution of farmers' awareness of packages of pillars of PFJ, the level of awareness of packages of the various pillars, the degree of correlation among the awareness and test the significant differences among the awareness.

4.3.1 Percentage distribution of farmers' awareness of packages of pillars of PFJ

Figure 3 below presents a compound horizontal bar chart showing the percentage frequency distribution of farmers' awareness of the packages of the various pillars of PFJ. The study revealed that farmers were more aware of the packages of fertilizer subsidy and subsidized

and improved seeds than the rest of the pillars. Out of 438 respondents, 60.5% and 56.2% of the farmers were highly aware of the packages of subsidized fertilizer and subsidized and improved seeds pillars of the programme respectively. For subsidised fertilizer, 31.1% and 7.8% were aware and somehow aware of the packages respectively. Subsidised fertilizer recorded the lowest percentage of farmers not being aware of the packages followed by subsidised seeds.

While the percentages of farmers' awareness of the packages of fertilizer and seed are in the decreasing order of highly aware, aware, somehow aware and not aware, that of agricultural extension service delivery is the reverse. Out of 438 farmers, 15.5%, 18.0%, 23.3% and 43.2% are highly aware, aware, somehow aware and not aware of the packages of agricultural extension services respectively. This is a clear indication that information on what agricultural extension officers are to do differently under this current PFJ programme are hidden from the farmers. Farmers are still not clear of the difference between the agricultural extension service delivery for the PFJ programme and the previous fertilizer subsidy programmes.

The awareness of packages of marketing of the agricultural produce did not follow a particular systematic order. Notwithstanding this, the majority (55.5%) of the farmers were not aware of the packages of the marketing pillar of PFJ. This is followed by somehow aware and highly aware with 20.3% and 16.2% respondents respectively. The lowest percentage of farmers (8.0%) were aware of the packages of marketing pillar. The order of percentage of farmers' awareness for marketing and e-agriculture are the same. For e-agriculture, not aware recorded the highest percentage (73.3%) of respondents, followed by somehow aware with a percentage of 13.2%.

Even though there is no significant difference between the percentage of respondents who are somehow aware and highly aware of the packages of e-agriculture, the latter is lower. Aware recorded the smallest percentage (0.5%) of respondents. It can therefore be observed that farmers are much aware of the packages of fertilizer and seed under PFJ. The reverse is true for agricultural extension services, marketing of agricultural products and e-agriculture. This implies that for farmers to demand the right packages of marketing, e-agriculture and information on agricultural extension, much sensitisation and education need to be done.

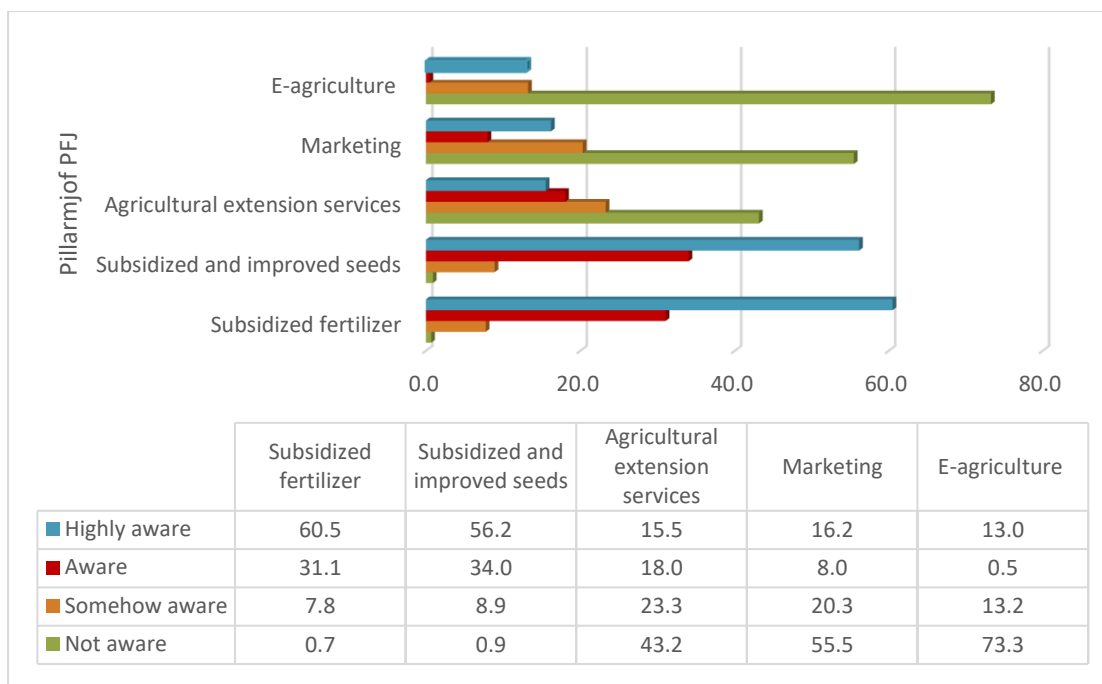


Figure 3: Percentage distribution of farmers' awareness of packages of pillars of PFJ

4.3.2 Level of awareness of packages of pillars of PFJ

Table 10 illustrates the summary statistics of level of farmers' awareness of packages of pillars of PFJ. Farmers were asked to score 1, 2, 3 and 4 for not aware, somehow aware, aware and highly aware respectively. From the results, seeds recorded the highest score (3.51) followed by fertilizer (3.45). This confirms the percentage of respondents who are aware of the packages of fertilizer and seeds. Also, the awareness level of agricultural extension services, markets and e-agriculture are 2.06, 1.85 and 1.53 respectively. It is clear from these scores that e-agriculture has the lowest level of awareness, followed by markets and agricultural extension service delivery. This observation is not different from what is shown in figure 3. On the average, farmers are *somehow aware* of the packages of PFJ. This is not a good indication for PFJ to achieve its intended objectives.

Focus Group Discussion with a Farmer Group at Gyato-Zongo in Atebubu Amantin District, Brong-Ahafo Region

Due to massive sensitisation, the youth groups were much aware of the pillars of PFJ and their packages. They knew that the pillars of the programme are subsidised and improved seeds, subsidised fertilizer, extension service and market linkages. They were however not aware of the fifth pillar which is the e-agriculture. They knew that, they were supposed to pay half of cost of inputs and pay the rest after harvest. They also knew that the government was to provide them with silos or build a warehouse and purchase their farm produce.

Table 10: Summary statistics of level of awareness

Variable	Obs	Mean	Std. Dev.	Min	Max	Level of Awareness
Subsidized and improved seeds	438	3.51	0.67	1	4	Aware
Subsidized fertilizer	438	3.45	0.69	1	4	Aware

Agricultural extension services	438	2.06	1.11	1	4	Somehow aware
Establishment of markets	438	1.85	1.12	1	4	Not aware
E-agriculture	438	1.53	1.02	1	4	Not aware
Average	438	2.48	1.20	1	4	Somehow aware

4.3.3 Differences in farmers' levels of awareness of packages of pillars of PFJ

To examine whether there was significant difference in the level of awareness between the packages of any two of the five pillars of the programme, a paired t-test was used for the analysis. Table II shows that, there was significant difference in the level of awareness between the packages of seeds and the rest of the pillars at significant levels of 1% for all. This suggests that the null hypothesis that there are no significant differences between awareness level of the packages of seeds on one hand and each of fertilizer, extension service, establishment markets and e-agriculture are rejected in favour of the alternate.

There was also a significant difference in the level of awareness between the packages subsidized fertilizers and the rest of the pillars. From the table, the difference between packages of fertilizer and each of the pillars is significant at 1% each. The study further reveals a significant difference in the level of awareness between the packages of extension service and establishment of markets and extension service and e-agriculture. Also, the awareness levels between the packages of extension service and e-agriculture are statistically significant at 1%. Generally, farmers' level of awareness between the packages of any two pillars differ.

Table II: Differences in farmers' levels of awareness of packages of pillars of PFJ

Variable	Obs	Mean	Std. Err.	t-test	P-Value
Subsidized and improved seeds	438	3.51	0.03		
Subsidized fertilizer	438	3.45	0.03		
Diff	438	0.06	0.02	3.34	0.001***
Subsidized and improved seeds	438	3.51	0.03		
Agricultural extension services	438	2.06	0.05		
Diff	438	1.45	0.06	25.83	0.000***
Subsidized and improved seeds	438	3.51	0.03		
Establishment of markets	438	1.85	0.05		
Diff	438	1.66	0.05	31.29	0.000***
Subsidized and improved seeds	438	3.51	0.03		
E-agriculture	438	1.53	0.49		
Diff	438	1.98	0.05	36.51	0.000***
Subsidized fertilizer	438	3.45	0.03		
Agricultural extension services	438	2.06	0.05		
diff	438	1.39	0.05	25.59	0.000***
Subsidized fertilizer	438	3.45	0.03		
Establishment of markets	438	1.85	0.05		
diff	438	1.61	0.05	30.54	0.000***
Subsidized fertilizer	438	3.45	0.03		
E-agriculture	438	1.53	0.49		
diff	438	1.92	0.05	36.55	0.000***
Agricultural extension services	438	2.06	0.05		

Establishment of markets	438	1.85	0.05		
diff	438	0.21	0.54	3.87	0.000***
Agricultural extension services	438	2.06	0.05		
E-agriculture	438	1.53	0.49		
diff	438	0.53	0.06	8.79	0.000***
Establishment of markets	438	1.85	0.05		
E-agriculture	438	1.53	0.49		
diff	438	0.32	0.05	6.63	0.000***

4.3.4 Correlations of farmers' levels of awareness of pillars of PFJ

It is important to examine whether or not there are correlations between farmers' levels of awareness of packages of any two of the pillars of PFJ. To determine the degree of the correlation between farmers' levels of awareness of packages of any two pillars, Spearman's rank correlation coefficients were estimated.

From Table 12, there is a strong positive correlation between the fertilizer and seed pillars of PFJ. This implies that as the awareness level of packages of fertilizer increases, that of seed also increases. Similarly, the awareness level of packages of fertilizer increases with increasing the awareness level of packages of seeds. This could be due to the complementarity of the seeds and fertilizer. Fertilizer and seeds are inputs that must go together as a package and hence the strong correlation in the awareness levels. It can also be attributed to the fact that they are the conventional inputs which are very important in agricultural production. Another important reason is the fact that seed and fertilizer are taken from MoFA and hence farmers are often than not educated on the importance of buying the improved seeds and recommended quantity of fertilizer per acre. Due to this strong positive correlation, farmers who are much aware of the packages of seeds and fertilizer have higher probability of getting maximum benefits from the two inputs.

The correlations between the awareness levels of the packages of markets and seeds; markets and fertilizer; market and agricultural extension service; and agricultural extension service and fertilizer; are each in the range of intermediate positive. None of the correlation coefficients is negative. The intermediate correlation coefficients are clear indications that as the awareness level of packages of one pillar increase the other increases at a much slower pace. There is weak positive correlation between the farmers' awareness levels of packages of agricultural extension service and seeds on one hand, and e-agriculture and seeds on the other hand.

Table 12: Correlations of farmers' level of awareness of packages pillars of PFJ

	Subsidized improved seeds	Subsidized fertilizer	Agricultural extension services	Establishment of markets	E-agriculture
Subsidized and improved seeds	1				
Subsidized fertilizer	0.8963	1			
Agricultural extension services	0.1677	0.2673	1		
Establishment of markets	0.3072	0.3662	0.4032	1	
E-agriculture	0.1106	0.1968	0.3252	0.5193	1
<i>r = -1 implies perfect negative correlation</i> <i>-0.75 ≤ r < -1 implies strong negative correlation</i> <i>-0.25 ≤ r < -0.75 implies intermediate negative correlation</i>					

$0 < r < -0.25$ implies weak negative correlation
 $r = 0$ implies no correlation
 $0 < r < 0.25$ implies weak positive correlation
 $0.25 \leq r < 0.75$ implies intermediate positive correlation
 $0.75 \leq r < 1$ implies strong positive correlation
 $r = 1$ implies perfect positive correlation

4.4 Participation in Pillars of PFJ

4.4.1 Level of participation of farmers in the pillars of PFJ

Farmers were asked to indicate their level of participation in each of the pillars by using a Likert scale. The scores of 1, 2 and 3 were used to indicate full participation, partial participation and non-participation respectively. The results for this analysis are reported in Table 13.

Farmers' participation varied from one pillar of PFJ to another. While subsidised fertilizer recorded the highest percentage (75.6%) of full participation of farmers, marketing of farm produce under PFJ had the lowest percentage (5.1%) of full participation. The pillar with the second highest number of farmers fully participating is seeds. Out of 438 farmers interviewed, 59.8% fully participated in this seed pillar. Virtually, all of the respondents participated in the fertilizer pillar either fully or partially. There was no one who did not participate in this pillar.

Even though the number of farmers who fully participated in E-agriculture was lower than that of establishment of markets by 0.4%, those that did not participate at all is higher in E-agriculture (76.5%) than establishment of markets (68.5%). This is because farmers who partially participated in the establishment of markets (26.5%) are more than those in the E-agriculture (18.0%). The order of increasing level of participation in the pillars of PFJ is establishment of markets, e-agriculture, agricultural extension services, seeds and fertilizer. This suggests that full benefits of participating in PFJ will not be realised due to low participation of farmers in agricultural extension service delivery, establishment of markets and e-agriculture.

Table 13: Level of participation of farmers in pillars of PFJ

Pillars of PFJ	Did not participate		Partially participated		Fully participated	
	Freq	Percentage	Freq	Percentage	Freq	Percentage
Subsidized and improved seeds	70	16.0	108	24.7	260	59.8
Subsidized fertilizer	0	0.0	109	24.9	329	75.6
Agricultural extension services	217	49.5	101	23.1	120	27.6
Establishment of markets	300	68.5	116	26.5	22	5.1
E-agriculture	335	76.5	79	18.0	24	5.5

4.4.2 Participation of major stakeholders in pillars of PFJ

Figure 4 groups the level of participation by 7 major stakeholders in the PFJ programme. From the figure, all the farmers participated in the fertilizer pillar of PFJ. This is probably because farmers practically engage in farming and thus require inputs such as fertilizer for production. Fertilizer is a major and critical pillar of PFJ and input as well for farmers. Without fertilizer, farmers may not be ready to take any package from any of the pillars of PFJ.

Focus Group Discussion with a Farmer Group at Weta in Ketu North District, Volta Region

A focus group discussion with a membership of six was organised at Weta in the Ketu North District of the Volta Region. The group members indicated that they were educated on the packages of PFJ. Half of the group took part in PFJ whilst the other half remained with Wienco and did not participate in PFJ because they did not want to bridge the contract with Wienco.

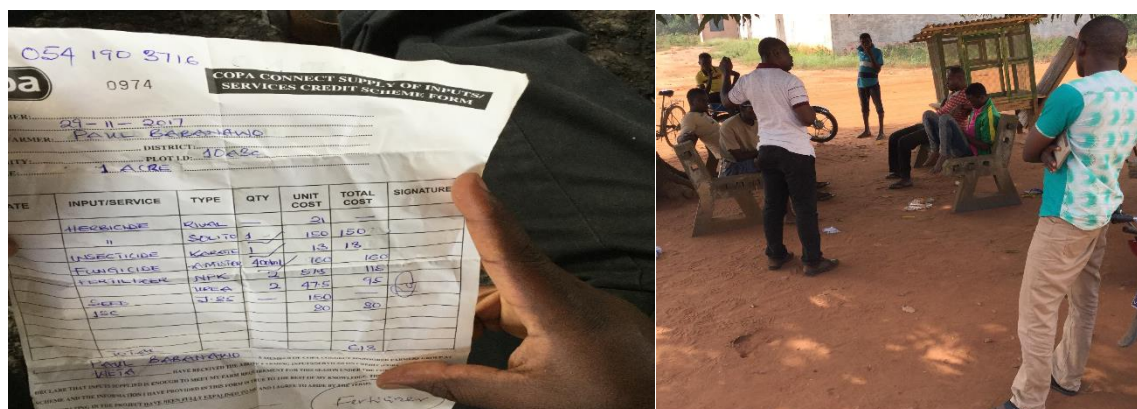


Plate 1: Focus Group Discussion with a Farmer Group at Weta in Ketu North District, Volta Region

As expected, 100% of AEA's participated in agricultural extension service delivery. AEA's were those engaged to implement the policy and it is not surprising to have realised their 100% participation in agricultural extension delivery. Out of 48 AEA's, 79% participated in the distribution and allocation of fertilizer to farmers. It can be inferred that just 8% were engaged in the marketing of produce under PFJ because that pillar is not their core duty.

Researchers were more involved in the seeds pillar of PFJ than any other pillar. Whilst 67% of the researcher interviewed were engaged in the seed pillar, 33% were engaged in e-agriculture. This makes sense because the supply of improved seeds for production requires research, of which these researchers play a major role in the development of foundation seed. Researchers in the Savannah Agricultural Research Institute (SARI) were engaged in the production of foundation seeds for propagation and they even propagated and supplied seeds to MoFA. Researchers were not engaged in agricultural extension delivery or training of AEA's. Most of the senior MoFA officers and aggregators were highly involved in the establishment of markets. From Figure 4, 43% of Senior MoFA officers were engaged in the establishment of markets. Aggregators were mainly engaged in the market pillar of the PFJ, at (17%), compared to the other pillars of the programme. About 22% of agro-input dealers participated in the subsidized fertilizer pillar. Finally, out of 20 senior officers of NGOs interviewed, 40% participated in the seed pillar.

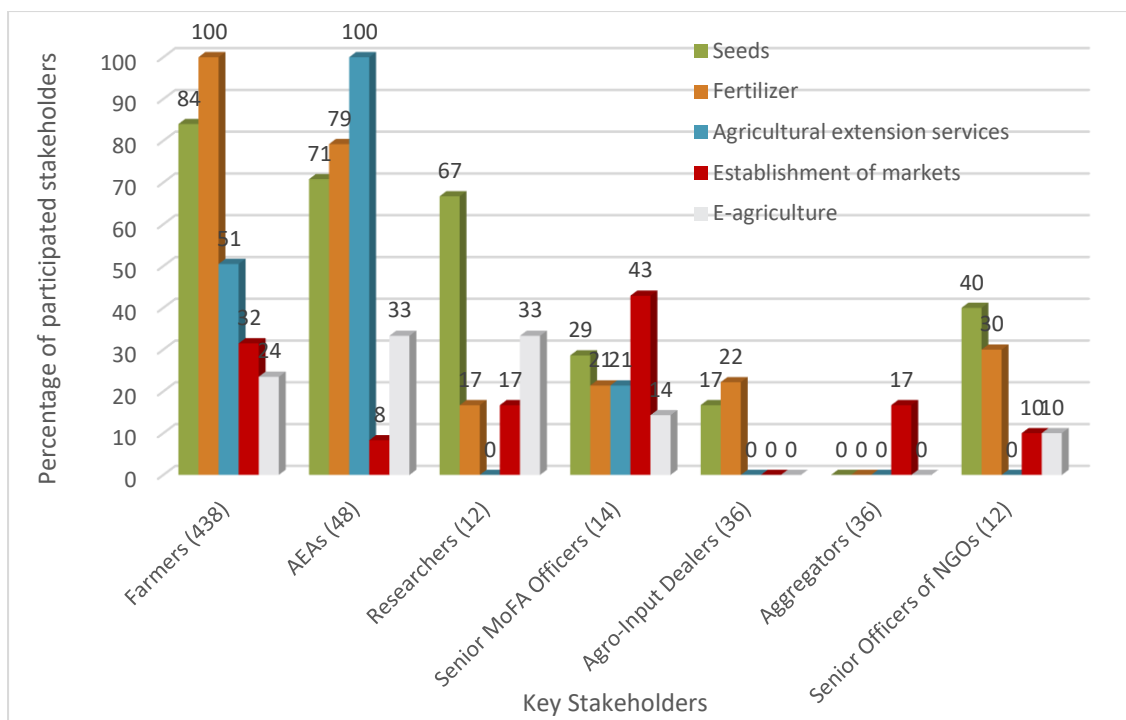


Figure 4: Participation of major stakeholders in pillars of PFJ

4.4.3 Agricultural extension service delivery

Though agriculture extension service delivery during the first-year implementation of PFJ (2017) was low, it was a little better than the previous year (2016) (see Figure 5). Whereas 219 of sampled farmers did not have contact with AEs in 2016, 217 did not have contact with AEs in 2017. A critical examination of the column chart shows that farmers had more extension contacts in 2017 than 2016.

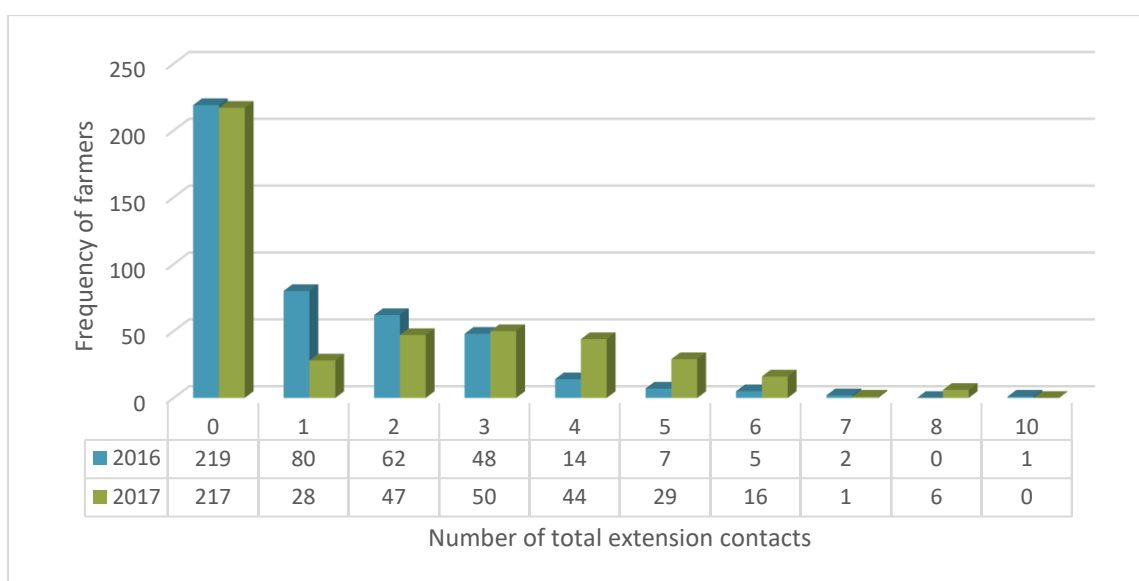


Figure 5: Distribution of extension contacts in 2016 and 2017

From Table 14, there is a statistical significant difference between the average number of extension contacts beneficiaries of PFJ farmers received in 2016 and 2017. The level of significance is as high as 1%. This is not unexpected, as almost all district MoFA officers especially AEAs had more interactions with beneficiary farmers in 2017 than 2016. The problem that prevented the district MoFA offices from achieving a higher number of contacts has been attributed to the fact that they are understaffed with AEAs. The non-professional AEAs that were employed under Youth Employment in Agriculture Model were not enough. Some even refused to report to the districts where they were posted. In the Ketu North Municipality for instance, out of 3 youth in agriculture AEAs that were posted, only two reported. In Saboba, out of 3 youth in agriculture AEAs posted to the place, none reported. In Yendi, out of four youth in agriculture AEAs that were posted, only one reported. The story is not different in other districts. The youth in agriculture AEAs who did not report had a way of getting themselves reposted to districts closer to urban areas. Also, all the districts visited indicated that they did not receive any professional AEAs employed from the agricultural colleges in 2017. These data on AEAs employed in 2017 and posted to the various districts are from secondary source obtained from District MoFA Offices.

Table 14: Test of differences between number of extension contacts in 2016 and 2017

<i>Crop</i>	<i>2016</i>	<i>2017</i>	<i>Difference</i>	<i>P-Value</i>
Obs	438	438		
Mean number of total extension contacts	1.13	1.70	0.57	0.000***
Standard error	0.07	0.10	0.10	

4.4.4 E-Agriculture

The E-Agricultural pillar of PFJ involves the use of ICT to profile the beneficiaries so as to ensure that the inputs are not diverted. Its main objective is to ensure prompt responsiveness, efficiency, transparency and accountability of both government and private agencies providing inputs and other services to the beneficiaries. The benefit of using E-agriculture has not been achieved, since the necessary platforms were not developed and used during the first-year implementation of PFJ. Farmers, researchers, agro-input dealers, aggregators, seed producers, FBOs, DTC, RTC and AEAs interviewed indicated that apart from Essoko taking profile of few farmers before the start of the PFJ, they have not use any electronic system to keep records and monitor and evaluate the acquisition of inputs, distribution of inputs, the delivery of extension service and performance of farmers.

4.5 Implementation Challenges of PFJ

The objective of this section of the study is to demonstrate the use of network-analysis approach to analyze the implementation challenge network. This provides a guideline for systematically evaluating the network of the implementation challenges and identifying the critical points within the network where programme interventions can be targeted. The network system also plays a significant role in system visualization and assessing the structure of the system concerning the health of the programme under study (Cross et al. 2002). Figure 6 depicts the significant challenges and their interconnectivity obtained from the survey conducted from the study areas regarding the implementation challenges with respect to the five pillars. These pillars as stated earlier are the distribution of fertilizer, distribution of improved and subsidized seeds, delivery of extension services, creating output markets, and E-agriculture services.

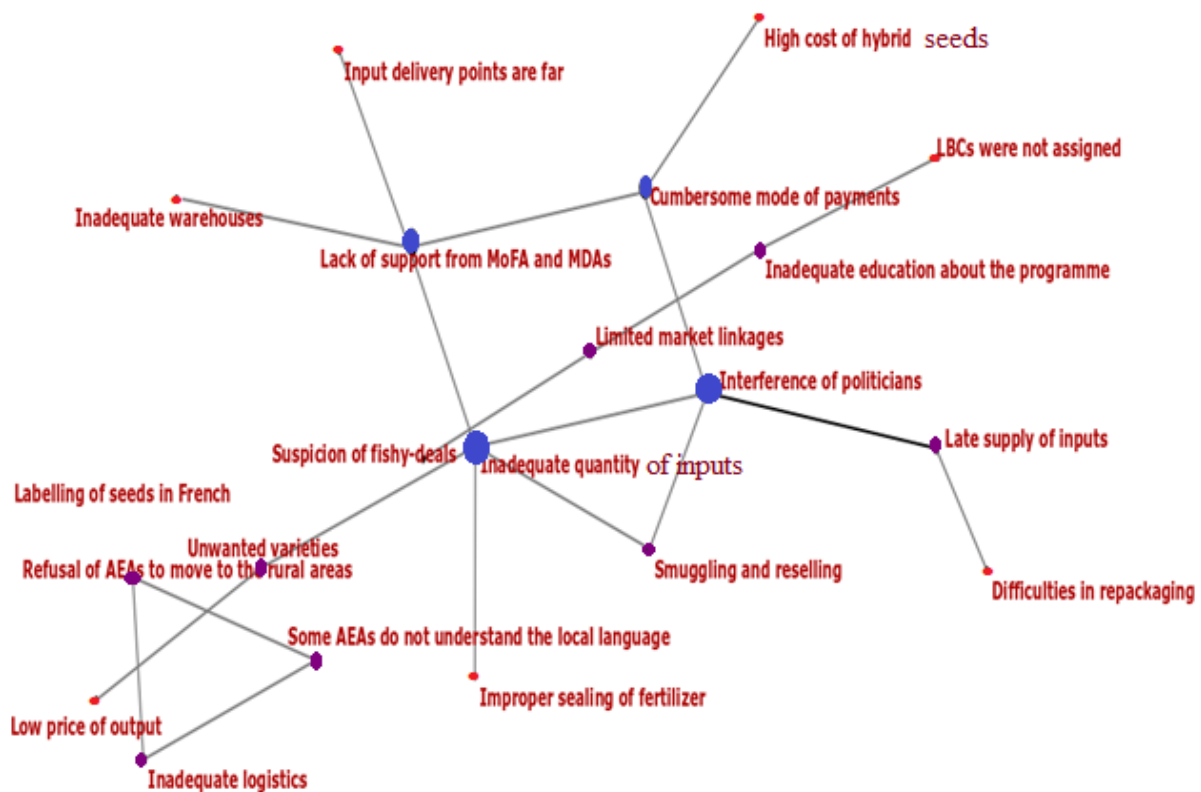


Figure 6: Network of significant system challenges and their interconnectivity in the PFJ

From Figure 6, larger vertices (e.g. blue, pink and red oval dot) represent subjective indications of the challenges that were more emphasized by the various stakeholders. The relative positions of different vertices can be used to identify systemic challenges. For example, inadequate quantities of fertilizer and seeds were identified as a major implementation problem reported by most of the stakeholders, and hence the largest and the most centralized vertex. As it can be seen from the network diagram, this vertex is connected with many other relatively important vertices such as political interferences, lack of support from Municipal and District Assemblies, and smuggling and re-selling. This implies that political interference, inadequate support from MDAs and smuggling and resale all result in inadequate quantities of seeds and fertilizers distributed to farmers. Likewise, “inadequate warehouses to store the inputs” and “farmers having to travel far to access the inputs” are connected to the vertex, lack of support from MDAs and MoFA, while the stakeholders believe the inputs are supplied late due to political interferences.

Release of inputs was generally late (after the farming season has taken off). Therefore, most farmers did not benefit fully from the seed component. Farmers used their own seeds before arrival of the PFJ seeds. In some cases, seeds were in short supply. Some farmers even paid for the seeds but did not get them. Some quantities of rice seeds supplied, however, were found to be of low quality, infested with diseases and pests with poor germination rate. Whilst some farmers preferred “AGRA” variety of rice, others preferred Jasmine 85. The quality of the seeds should be the priority of implementers. All varieties of improved seeds should be available for farmers to make their own choice based on the preferences.

The labeling of seeds was done in French and farmers could not read and understand. The hybrid seed is high yielding and was recommended by some farmers for use in subsequent

years, but was deemed to be highly expensive. Private sector engagement to drive and sustain most of the pillars was generally low. Researchers, FBOs, farmers, decentralised government agencies, AEAs, etc, were not properly engaged before the rolling out of the programme. Government should engage the private sector, especially agro-input dealers, aggregators, seed growers, NGOs, etc. Also, government agencies, i.e., MoFA and the MMDAs should be well engaged with, and sensitised, into the future.

Border patrols by security agencies should be intensified at certain known locations to apprehend smugglers of the inputs. State involvement in the programme should not be totally abandoned for the private-sector, as as smuggling is likely when input distribution is put in the hands of private-sector. There must be a balance between the involvement of the private sector and state, with the state providing a supervisory role.

4.6 Farmer Participation - Dynamics of Women, Men and Youth in PFJ

Figure 7 shows the frequency of participation in PFJ by gender. It was revealed that the male adults (25-76years) participated more in PFJ than all the categories of farmers. About 80% of the farmers interviewed were male adults as compared to 14% female adults. Also, more male youth (5%) participated in the programme than female youth (1%). In general, 85% of the farmers who participated in the programme are males whilst the rest 15% are females. Out of the 15% females that participated in the programme, 1% was female youth whilst 14% were male youth. The challenges that are peculiar to youth participation in the programme are lack of funds, and inadequate tractor service. On the other hand, female youth face the challenge of getting access to land for farming in general and participating in PFJ farming in particular. The established farmers are able to struggle and lobby their way to get tractors for ploughing as compared to the youth. Access to land is another critical challenge for the youth as well as the women.

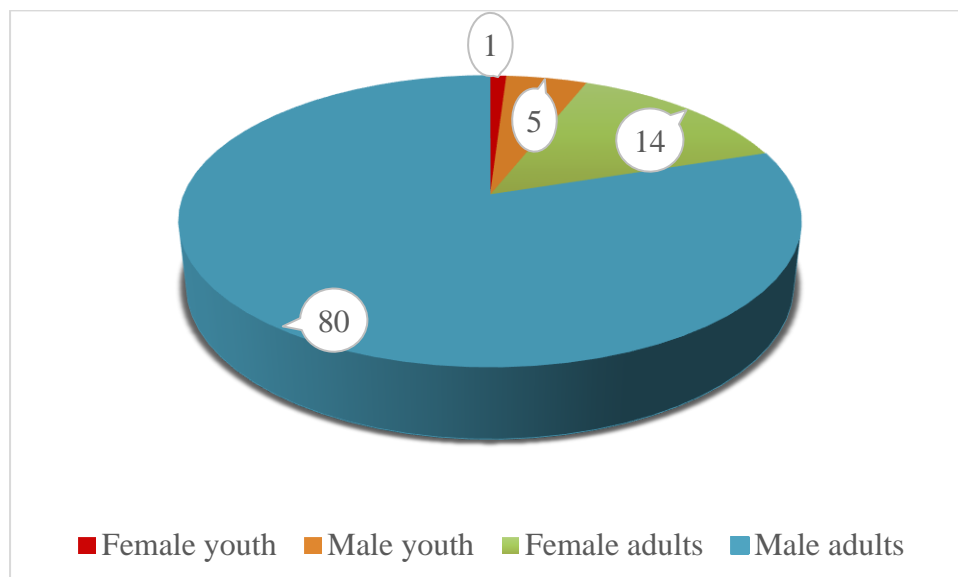


Figure 7: Participation dynamics by men, women and youth

*From the focus group discussion of eight members of **Wumborbiin Women's Group** in Saboba (see picture shown in Plate 2), they lamented that they have not seen or heard any special package for them as women. It was only men who were being registered. They also indicated that the package for the youth was not also in existence. Because of the fact that government did not put in measures to encourage youth and women to be part of the programme, their participations were very low. The social discrimination that exists in their community actually prevented them from taking part in the programme. That, as women, they do not own lands. They do not also have the free will to go and take inputs on credit, without their husbands' knowledge or consent.*

To improve the women participation in the programme, there should be a system to make women have access to lands. Certain percentage of the inputs should be allocated to women, especially those who are in vibrant women groups. There should be a way for them to pay the money using mobile money. Youth participation can only improve if they are given the necessary support, such as lands, training on the importance of farming etc.

Focus Group Discussion with a Farmer Group at Gyato-Zongo in Atebubu Amantin District, Brong-Ahafo Region

On youth and women participation, the members of the group agreed that the women and youth participation can be rated 5% and 30% respectively.

Focus Group Discussion with a Farmer Group at Weta in Ketu North District, Volta Region

The engagement of women in the programme is far below average (20%) while youth participation is rated 50%. The high rental cost by land owners at irrigation sites was a major challenge women and youth faced in participating in the programme as they had no access to irrigated land.



Plate 2: Focus Group Discussion with Wumborbiin Women's Group at Kujooni in Saboba District, Northern Region

4.7 Strategies to Target Women and Youth Participation in PFJ

Members of the DTC, farmers, senior MoFA officers, and other stakeholders in programme were interviewed to identify and assess the effectiveness of strategies that were adopted by DTC, if any, to target the youth and female beneficiaries. The interviewees indicated that the PFJ programme had no any special package to encourage youth and women onto the

programme. According to them, PFJ is general for everybody. According to their perception, the participation of the youth and women in the programme has been quite low.

Focus group discussions were organised for youth in the selected districts. Apart from Ketu North and Atebubu-Amantin District, all the youth groups interviewed lamented that they did not get any special encouragement from the DTC. For instance, a focus group of youth with a membership of ten informed the researchers that the sensitization of farmers on the PFJ that was carried out by the DTC in Atebubu-Amantin District was massive. They were always listening to the sensitisation broadcasts on programme on Star FM and Atobu FM, both of which are local radio stations in Atebubu. They specifically indicated that the District Chief Executive, the MoFA officers were instrumental in informing, and encouraging the youth to take advantage of the subsidised inputs. However, the radio cum community sensitisation engagements were too general to be considered as a strategy that targeted the youth and

***Focus Group Discussion with a Farmer Group at Weta in Ketu North District,
Volta Region***

We did not see any special package that was included in the programme specifically for women and youth. Women and youth were not sensitized as separate groups but the information that came was general.

women.

4.8 Making PFJ Attractive to the Youth

It is becoming increasingly difficult to sell agriculture as a profitable and meaningful venture to the youth of Ghana, who see other sectors of the economy as more attractive and means of getting rich quicker than venturing into agriculture. They indeed have real reasons for making such a decision. The youth view agriculture as laborious (labour intensive), tedious, risky, unrewarding and non-productive. Besides, they lack the necessary financial muscle to acquire critical equipment, inputs and land to launch a successful and thriving agribusiness in the country. Simple and smaller tools for production and processing should be made available to the youth to ease the laborious nature of agriculture in Ghana. Thus, the use of power tillers, rippers, etc would cut down the drudgery that is associated with farming, thereby making the enterprise attractive to the youth. They would therefore be leveraging on technology to build strong and viable agribusinesses. Land should be acquired by government and made available to youth for farming. The rent on the land should be paid in kind after harvest.

Platforms such as workshops and seminars should be organised, for success stories of young *agripreneurs* on the continent, including Ghanaian young *agripreneurs*, to share their success stories with the sceptics. This would help change the negative stereotypes in agriculture, inspire, empower and reinforce the message that young people can make giant and meaningful strides in agriculture. The current information and communication technology era has made it possible for new and improved agriculture technologies to be developed each day making the field of agriculture to be knowledge intensive. Efforts must be made to keep the youth updated on these developments.

Farmer Field Schools, innovation and vocational training centres must be established to train, support and meet the needs of the *agripreneurs*. These schools/institutions must be open to admit both graduates, and non-graduates for training for specific periods. Graduands would

then be attached to established farms/farmers for another duration and subsequently guaranteed by these farmers to secure assistance from financial institutions to set up their agribusinesses. Similar approaches could be adopted for agribusiness incubation centres.

It would also be prudent for annual fora to be organised for the youth in agribusiness to meet, discuss and share experiences and challenges with their colleagues in the sector. Agriprenuers could also be given the opportunity to show their skills, creativity and innovativeness in the agriculture sector. Networking that would foster future collaboration would also be initiated. Interested youth/personnel in the sector could also attend to learn and be inspired by their colleagues. More so, online platforms that connect industry experts, both young and old, to share experiences and challenges while undertaking their businesses could be explored.

4.9 Potentials of PFJ for Reducing Unemployment, Poverty and Food Insecurity

The potential of PFJ in reducing unemployment, poverty and food insecurity was measured using Likert scale on the perceptions of respondents and the empirical quantitative data. The analysis was done on 626 respondents (438 farmers, 48 AEAs, 14 senior MoFA officers, 12 senior officers of NGOs, 12 researchers, 9 seed producers, 36 agro-input dealers, 36 aggregators, 9 FBOs and 12 non-MoFA members of DTC and RTC). From figure 8, out of 626 respondents, 53.6% opined that PFJ has potential of reducing unemployment in the country. This means that the highest percentage of respondents chose the option “*PFJ has a potential of reducing unemployment*”. This is followed by 25.3% of the respondent asserting that “*PFJ has no potential*”. The lowest percentage (21.2%) of respondents indicated that “*PFJ has a big potential of reducing unemployment*” in the country. It is important to note that the ability of PFJ in reducing unemployment in the country depends on whether the programme has been properly implemented or not. There are other factors which affects the effectiveness of PFJ in reducing poverty and since some of these factors are outside the context of the PFJ, it is not surprising to see that the least number of the respondents are attesting to the fact that PFJ has “*a big potential of reducing unemployment*”. This means that PFJ is not a panacea for curbing unemployment upsurge in the country.

The percentage of respondents perceiving that PFJ has a potential of reducing poverty is 50.3% and this is higher than the 39.6% of respondents indicating that PFJ has no potential of reducing poverty. The least number of respondents (10.1%) perceived that PFJ has “*a big potential*” of reducing poverty. Poverty reduction requires a lot of factors. PFJ alone cannot and would not be an effective programme to reducing poverty if not properly handled.

Lastly, the measure of respondents’ perception about potentials of PFJ in reducing food insecurity indicates that 64.9% are convinced that PFJ has *a potential* of reducing food insecurity. This is followed by 18.2% of the respondents who believe that the programme has *a big potential* of reducing food insecurity among farmers.

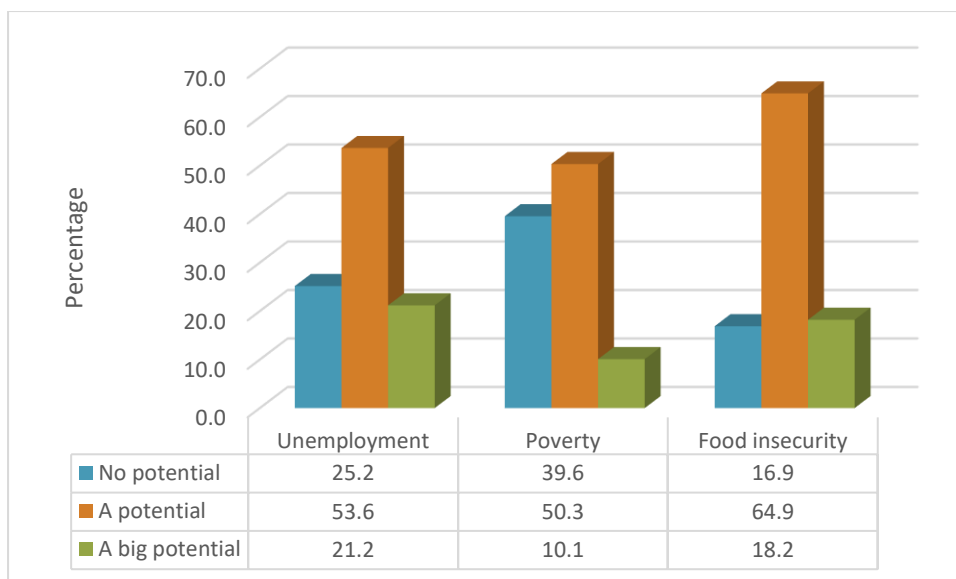


Figure 8: Potentials of PFJ in reducing unemployment, poverty and food insecurity

4.10 Potential of PFJ for Increasing Crop Yields

Increasing crop yields is critical to the implementation of PFJ. This section quantitatively measures the potential of PFJ in increasing maize, rice and soybeans yields.

4.10.1 Potential of PFJ for increasing maize and soybeans yields

Table 15 shows the quantity of maize harvested, area cultivated and the estimated percentage change in crop yield from 2016 to 2017 cropping seasons. For a better comparison, data on only farmers who cultivated maize for the two cropping seasons were analysed. As such, the sample size of the farmers included in this analysis for Northern, Volta and Brong-Ahafo Region are 112, 63 and 145 respectively. It is clear from the table that whilst Volta Region recorded a percentage decrease in maize yield, Northern and Brong-Ahafo Regions recorded a percentage increase. In the Northern Region, there has been 7.27% growth in maize yield. The Brong-Ahafo region, which is the leading producer of maize, recorded 8.23% percentage increase in maize yield and this is the highest. For Volta Region, the data on maize production were taken from Krachi East District. Due to the fact that the District has a favourable environmental condition for yam production and price of yam in 2016 was high, some farmers who used to cultivate maize in large quantities have shifted into yam production. Also, some farmers in Krachi East district found it difficult getting access to tractor service owing to the inadequacy of tractors in the district. As such, the cultivated land area for maize has reduced in 2017. Meanwhile, on the average, the percentage rise in maize yield for 320 farmers interviewed was 3.66%.

The percentage increase in maize yield for the Northern and Brong-Ahafo Regions outweighed the percentage decrease in maize yield for the Volta Region. Holding other factors constant, this percentage increase can be attributed to the implementation of planting for food and jobs. Assuming that weather conditions, labour productivity and capital productivity are constant, the percentage increase in yield suggests that PFJ has a high potential for increased maize productivity. The majority of farmers in the Volta Region attributed the low yield in maize, in 2017, to the severity of fall army worm infestation.

The number of farmers who cultivated soybean and benefited from PFJ was low. Due to the fact that soybeans farmers were already producing the crop under outgrower scheme with support from NGOs, they were not ready to buy inputs from PFJ. They did not want to breach the contract they have with their nucleus farmers and the NGOs. The few who benefited and used PFJ seeds and fertilizer had their yield increased by 7.54%.

Table 15: Percentage change in maize and soybeans yields

Maize		Quantity (Mt)		Area (Ha)		Yield (Mt/Ha)		% Change in yield
Regions	Sample size	2016	2017	2016	2017	2016	2017	
Northern	112	276.66	307.50	148.75	154.13	1.86	2.00	7.27
Volta	63	214.32	57.96	88.60	25.41	2.42	2.28	-5.70
Brong-Ahafo	145	454.20	605.34	231.29	284.82	1.96	2.13	8.23
All	320	945.18	970.80	468.64	464.36	2.02	2.09	3.66
Soybeans								
Brong-Ahafo and Northern	38	174.03	223.63	87.45	104.50	1.99	2.14	7.54

4.10.2 Potential of PFJ for increasing rice yield

From Table 16, the number of farmers who cultivated rice in both 2016 and 2017 and were interviewed in the Northern, Volta and Brong-Ahafo regions are 44, 146 and 14 respectively. These farmers cultivated a total of 302.8Ha and 324.8Ha of rice in 2016 and 2017 respectively. In total, 1229.76Mt and 1431.83Mt of rice were produced by 205 farmers in 2016 and 2017 cropping season respectively. The percentage increase in rice yield from 2016 to 2017 in the Northern, Volta and Brong-Ahafo regions are 9.44%, 7.24% and 11.68%, respectively. It is clear from the table that the Brong-Ahafo region recorded the highest percentage increase in rice, even though rice production in the region is low. Farmers in the Volta and Northern regions complained of the early flooding of their fields, thereby affecting rice yield. This means that they could have obtained higher yields than the actual yields in 2017.

Rice yield in the country is always low. Farmers interviewed obtained average rice yields of 4.06Mt/Ha and 4.4Mt/Ha in 2016 and 2017 respectively. These yield values yielded a percentage growth of 8.54% from 2016 to 2017. Holding other factors constant, it can therefore be inferred from the study that PFJ has the potential of increasing actual on-farm rice yield to catch up with the potential rice yield of 8.29Mt/Ha, which is an average value from the national research stations (FAOSTAT, 2012).

Table 16: Percentage change in rice yield

Rice		Quantity (Mt)		Area (Ha)		Yield (Mt/Ha)		% Change in yield
Regions	Sample size	2016	2017	2016	2017	2016	2017	
Northern	44	204.35	213.99	70.30	67.27	2.91	3.18	9.44
Volta	146	978.72	1158.06	209.07	230.68	4.68	5.02	7.24
Brong-Ahafo	14	46.69	59.78	23.43	26.87	1.99	2.23	11.68
All	205	1229.76	1431.83	302.80	324.82	4.06	4.41	8.54

4.10.3 Statistical significant differences in crop yields between 2016 and 2017

From Table 17, the test of differences between maize yields in 2016 and 2017 for the Northern and Brong-Ahafo regions met the *a priori* expectation. The test is statistically significant at 1% of each of the regions. The direction shows that maize yield under PFJ was higher than maize yield without PFJ. Even though the test for Volta Region is statistically significant, it does not meet the *a priori* expectation.

Similarly, rice yield under PFJ is statistically and significantly higher than rice yield before PFJ in all the three regions. This implies that the null hypothesis that there is no significant difference between rice yields in 2016 (without PFJ) and 2017 (with PFJ) is rejected in favour of the alternate. The higher rice and maize yields in 2017 can be attributed to PFJ *ceteris paribus*.

Table 17: Statistical significant differences in crop yields between 2016 and 2017

Region	Obs	Yield (Mt/Ha)		diff	P-Value
		2016	2017	Yield ₂₀₁₇ - Yield ₂₀₁₆	Pr(T>t)
MAIZE					
Northern	112	1.86	2.00	0.14	0.046**
Volta	63	2.42	2.28	-0.14	0.000***
Brong-Ahafo	145	1.96	2.13	0.17	0.001***
All	320	2.02	2.09	0.07	0.045**
RICE					
Northern	44	2.91	3.18	0.27	0.008**
Volta	146	4.68	5.02	0.34	0.001***
Brong-Ahafo	14	1.99	2.23	0.24	0.048**
All	204	4.06	4.41	0.35	0.0043***

4.11 Potential of PFJ for Increasing Fertilizer Application Rate

Over the years, the fertilizer application rate has been relatively low in Ghana and other Sub-Saharan African countries. Farmers in Africa face a double sword. African soils are low in fertility with the lowest application rate of 7Kg/Ha, compared with farmers in Asia with application of 150Kg/Ha (Druilhe and Barreiro-Hurlé, 2012). To reverse this trend, the Abuja declaration on fertilizer for Green Revolution mandated all African countries to increase fertilizer rate to 50Kg/Ha. For maize production, the recommended application rates of NPK 15-15-15, NPK 19-19-19 and NPK 20-20-20 fertilizers in Ghana are 250 Kg/Ha, 197 Kg/Ha and 187 Kg/Ha respectively (Aikins et al., 2010).

Table 18 shows changes in the fertilizer application rates for maize and rice from 2016 when there was no PFJ, to 2017 when farmers benefitted from PFJ. It is important to note that the farmers considered in this analysis have already been applying fertilizer on their farmlands. From the results, there has been 10.4% increase in application rate for NPK fertilizer for maize in the Northern Region from 2016 to 2017. The application rate of ammonia fertilizer for maize production in the Northern Region has increased from 82.1Kg/Ha to 95.3Kg/Ha resulting in a percentage increase of 16.1%. In the Volta and Brong-Ahafo Regions, the application rates of NPK fertilizer for maize production have increased by 27.1% and 3.8% respectively. Also, the Volta and Brong-Ahafo Regions recorded 13.8% and 11.9% appreciation in the ammonia fertilizer application for maize production, respectively.

Comparing the percentage increase in NPK application rate in maize production, it is clear that the Volta Region experienced the highest growth rate, followed by the Northern Region. Brong-Ahafo is the region with the lowest percentage change in NPK application rate for maize production. It is not surprising to see that the recommended application rate of Ammonium Sulphate fertilizer which is 125 Kg/Ha for maize (Aikins et al., 2010) was not attained by farmers. Most farmers do not usually do second application.

Table 18: Percentage change in fertilizer application rates

Rice			NPK (Kg/Ha)		NPK	NH ₃ (Kg/Ha)		NH ₃
Regions		Sample size	2016	2017	% Change	2016	2017	% Change
Northern	Maize	112	170.00	187.65	10.38	82.12	95.34	16.10
	Rice	44	87.68	113.82	29.81	42.00	49.45	17.74
Volta	Maize	63	142.00	180.45	27.08	72.44	82.44	13.80
	Rice	146	165.52	182.04	9.98	88.73	104.05	17.27
Brong	Maize	145	212.40	220.44	3.79	96.08	107.55	11.94
	Rice	14	78.55	98.47	25.36	32.40	48.55	49.85
Ghana	Maize	320	174.80	196.18	12.23	83.55	95.11	13.84
	Rice	204	110.58	131.44	18.86	54.38	67.35	23.86

The application of fertilizer to rice is gaining grounds. From 2016 to 2017, the application rate of compound fertilizer in rice production has increased from 87.68Kg/Ha to 113.8Kg/Ha among PFJ beneficiaries in Northern Region. This has resulted in a percentage increase in application rate of compound fertilizer by 29.8% in the region. While Northern Region recorded the highest increase in application rate of compound fertilizer in rice production, the Volta Region recorded the lowest with Brong-Ahafo being medium. For ammonia fertilizer, rice farmers in the Northern, Volta and Brong-Ahafo Regions recorded an appreciation of application rate by 17.7%, 17.3% and 49.85% respectively. It is important to mention that farmers included in this study are farmers who have over the years being using fertilizer already. Farmers included in the study are those who partook in PFJ and they are relatively well-endowed farmers.

Since farmers interviewed were already applying fertilizer but have now increased the application rate due to their participation in PFJ, it implies that PFJ has a potential of increasing fertilizer application rate to the recommended level. If this is achieved, agricultural productivity would be enhanced.

CHAPTER FIVE

FIELD OBSERVATIONS, KEY FINDINGS AND RECOMMENDATIONS

5.1 Field Observations and Suggestions

At the end of the study some observations were made on the field which were not part of the objectives of the study. These observations are briefly discussed here, with suggestions for improvement in the implementation of PFJ.

Specific days were assigned to specific activities and various stakeholders informed accordingly in some districts in Brong-Ahafo Region e.g. days for distribution of inputs to paid farmers. This enhanced the work of MoFA staff in particular, as they were able to plan and focus on a specific activity at a time because of the limited staff at post. It is therefore suggested that in view of inadequate MoFA staff and logistics, specific activities should be carried out at specific days. Storekeepers should be employed and posted to various District MoFA offices if the input distribution is still going to be in the hands of government.

DTC that were vibrant and active had a positive impact on implementation of the PFJ. Particularly those that had support from District Chief Executives and allowed MoFA to be at the forefront. Specific roles, assignments and targets were assigned to people during DTC meetings that were monitored during subsequent DTC meetings. It is important that a division of labour concept be adopted by all DTC to facilitate evaluation.

Some districts put in measures to forestall credit default by farmers. For instance, MoFA in certain districts of the Brong-Ahafo, Northern and Volta regions blacklisted some farmers who failed to pay up their indebtedness during the block-farm era. These farmers were made to pay up their indebtedness before chits were issued to them to access the PFJ inputs. Undoubtedly, this measure should be taken in all Districts to force defaulting farmers pay for the inputs. The records and proper tracking system for defaulting farmers are non-existent in some districts. Besides, there was undersupply of inputs in some district and oversupply in other districts nationwide. This was due to non-existence of data on the number of farmers in each district. It is important for MoFA to biometrically register farmers. With this, inputs advanced to farmers and their performance can be put on biometric platforms which can be tracked.

Another important factor was the direct supply of input from the national to the districts without the knowledge of the MoFA regional offices. Transfer of inputs from the national level straight to the districts without the knowledge of regional directorate should be avoided. Project implementation plan was not made available to DTC and RTC on time which resulted into ad hoc implementation of the project at the beginning. Regions and districts therefore had no targets to work towards. Some DTC were innovative to introduce measures that yielded results for the programme. Some districts and regions sensitized farmers and the general public about the programme, whilst others did little. Some DTC encouraged farmers to form groups and to access inputs in their groups, this approach made the tracking of repayment easy.

Some educational institutions took advantage of the programme to engage and expand their farms to support their institutions. More schools should be encouraged to do same. Special packages could be carved out for such institutions to access inputs on credit.

A number of dilapidated government warehouses (see Plate 3) were found in some districts that could be rehabilitated and leased out to aggregators to manage. These warehouses could serve as one-stop shops for sale/distribution of inputs, farmer training centres and farmer information centres. At the time of data collection, i.e. December 2017 to January 2018, few Licensed Buying Companies were engaged to offtake maize from farmers in some districts. Even for the few that were licensed, storage facilities to keep the produce were inadequate. Machinery for processing, grading and bagging of the produce were non-existent, or dilapidated. It is therefore recommended that more Licensed Buying Companies should be engaged to off-take farm produce from farmers in all the districts. These must make arrangements to have access to warehouses where preliminary processing of some of the produce can be done and stored at least in a *prococoons*. Government should partner private companies through Public-Private-Partnership (PPP) to repair old non-functioning processing machines or replace them with new ones.



Plate 3: Dilapidated warehouses at Sunyani



Plate 4: Processing plant at Sunyani



Plate 5: Field Packhouse at Vakpo

The fall army worm infestation was not anticipated, hence, adequate plans/measures were not put in place to deal with its occurrence. Messages were sent to appropriate authorities in Accra when the worms appeared in Northern and Brong-Ahafo regions which were swiftly responded to and pesticides made available for purchase by farmers. Some farmers, especially those in the Volta Region, were not able to get access to the pesticides, and others also indicated that the pesticides were not effective. Some resorted to the use of their own innovations such as the use of powdered detergents. It is important for the authorities to put measures in place to get enough and effective pesticides for any re-occurrence of fall army worm infestation.

5.2 Key Findings

On the whole, the study found that the PFJ programme has been well received and appreciated by all stakeholders. The key findings of our assessment of the PFJ programme are:

Awareness of the PJF programme

- Out of the five pillars of PFJ, farmers were more aware of the **subsidy on fertilizer** and **subsidy on improved seeds** than **e-agriculture, agricultural extension services** and **market linkages**. Interestingly, there is a strong positive correlation between awareness of fertilizer and seed packages; that is, farmers who are aware of the fertilizer subsidy are also aware of seed subsidy. This could be due to the complementarity of the seeds and fertilizer.
- Farmers are more aware of the **agriculture extension service** delivery package of the programme available to them as compared to information on establishment of **markets** and **e-agriculture**.
- Generally, farmers are **not aware of ALL the packages** available to them under the PFJ programme. This should be addressed if the programme is to achieve its intended objectives.

Participation in the PJF Programme

- The majority of the farmers who participated in the PFJ programme accessed subsidized **fertilizer**, followed by subsidized **improved seeds**. This was followed in ranking by access to **agriculture extension services, e-agriculture** and **market** in that order.

- All farmers that took part in PFJ accessed the subsidy on fertilizer offered by the programme
- 16% of farmers that took part in PFJ did not use improved seed supplied by the programme at all. This is because the seeds came at the time when farmers had already planted. Also, some of the farmers paid but they did not get the seeds due to shortage.
- Male adults are the majority participants in PFJ, whilst female youth are the least.
- Of the participants in the PFJ, just 6% are the youth, and only 15% of them are women.
- From the study, it is clear that there were no specific strategies adopted by the programme to target the youth or the specific needs of women.

For other stakeholders who participated in the implementation of the PFJ,

- researchers were most interested in the improved seeds component of PFJ
- agro-input dealers were most interested in supply of fertilizers
- aggregators were most interested in the establishment of markets
- senior MoFA officers facilitated the distribution of inputs, extension services and in the establishment of markets
- development partner's participation resulted in making improved seed available for PFJ

Potential of the PFJ Programme

The PFJ programme has the potential to:

- The PFJ programme has the potential to attain the optimum yields/ha for maize, rice and soybean in the short to medium-term of the programme. However, this target of actual farm yields reaching the optimum yield should be gradually paced. The study found significant differences between the respective yields of maize, rice and soybean obtained by the beneficiaries in 2016 when PFJ was unavailable and 2017 after the introduction of PFJ. - In this first year of implementation, the maize, rice and soybean yields/ha have increased by 3.66%, 8.54% and 7.54% respectively.
- The PFJ programme has the potential to reduce unemployment, poverty and food insecurity in the medium to long-term.
- A key and great potential of the programme is the opportunity to increase fertilizer application rate.

Implementation Challenges of the Programme

The five major implementation challenges that could negatively affect the success of the PFJ programme are:

- inadequate and untimely supply of inputs, especially seed and fertilizers,
- interference in the programme by politicians,
- cumbersome mode of payment for inputs
- Lack of support from some staffs of MoFA and District Assemblies.
- inadequate education and information about packages of the pillars of PFJ

Other challenges are:

- inadequate education and information about PFJ,
- supply of unwanted varieties of seeds
- limited market linkages, and unavailability of buying agents
- low prices offered for farm produce,
- inadequate warehouses for storage of agro-inputs and farm produce,

- inadequate logistics for MoFA extension staff,
- labeling of seeds and other inputs in languages other than English,
- refusal of AEAs to work in rural or remote areas, and
- smuggling and reselling of inputs.

5.3 Conclusions and Recommendations

From the findings of the study, the following conclusions and actionable recommendations are made for policy-makers to consider for adoption:

- Most stakeholders think that the PFJ programme has the potential to transform the agricultural sector. However, they are not clear about effective execution of the implementation strategies. Lack of information/awareness of the packages of the programme affected the farmers' participation in all the pillars. Some farmers were not aware of the full package of the programme; hence they could not take advantage of it. It is therefore recommended that much awareness should be created for all stakeholders. Farmers in particular should be educated for them to know what they are entitled to in each of the pillars. Implementers should adopt various forms of sensitization about PFJ on community radios, churches/mosques in local languages, etc., by spelling out details of the programme. The programme implementation plan should also be made available to all stakeholders as a guide.
- There were no specific strategies implemented to whip up enthusiasm and interests of the youth and women to get them onto the programme, and this affected their participation. Rice growing areas in the Volta region and maize growing areas in the Brong-Ahafo region had relatively more youth and women taking part in PFJ. There is the need for the PFJ programme and major stakeholders to come out with special packages for the youth and women. Since most of their concerns were no access to land, lack of capital and social discrimination, government and NGOs could come in to appeal to the chiefs and family heads to make land available for the youth and the women. Sensitisation on the importance of gender inclusiveness and empowerment should be rolled out. Mechanisation services should be included in the PFJ pillars, and women and youth should be given priority. Farmers especially women and youth should be supported to acquire simple machinery (power tillers, rippers etc) to facilitate the production process.
- PFJ will achieve the intended objectives if inputs are adequately supplied and timely released to farmers. Time of supply of inputs should be differentiated according to agro-ecological zone. Inputs should be made available all year round, especially in the southern sector where there are two cropping seasons in a year
- The cumbersome mode of payment for inputs by farmers should also be made simpler. This could be done through the use of mobile money payment systems.
- There were cases where followers of some political parties wanted the inputs to be supplied to them first before others. Some even wanted the inputs to be given to them free. Some technocrats in MoFA were also being intimidated by some government appointees and party executives thereby compelling them to yield to their demands. The PFJ programme should be devoid of interference by politicians to reflect a non-partisan, national character. This study therefore suggests that politicians and opinion leaders should educate farmers irrespective of their party affiliation to endeavour to

pay for the inputs, and refrain from their entrenched position that the inputs should be given to them for free. Technical experts, irrespective of their political party affiliation, should be put on the district, regional, and national technical committees.

- The private sector should be engaged to take full charge of the distribution and sale of the inputs with MoFA taking a supervisory role. This will make the inputs available to the farmers in their communities, thus reducing the distance farmers have to cover to make payments at the banks before accessing inputs.
- Logistics is a problem for the already inadequate MoFA extension staff. Yet MoFA staff were supposed to repackage the seeds in smaller quantities for farmers, as the seeds received from input dealers were not packaged in smaller quantities for easy distribution. This was much work for them. The logistics for MoFA staff to facilitate their movements should be made readily available and the seeds should be packaged in smaller and medium quantities (1.0Kg, 2.5Kg, 5.0Kg, 7.5Kg, 10Kg) by seed producing companies to facilitate easy sale/distribution.
- Agricultural extension service delivery has been low. Much of the problem has been attributed to inadequate professional AEAs, inadequate logistics and the refusal of non-professional AEAs employed under youth in agriculture model to work in rural districts. In order to deal with the issues of inadequate extension agents, as well as inadequate logistics for AEAs to carry out their mandate effectively, poor market linkages and poor tracking of inputs, comprehensive e-agriculture (e-extension via mobile phone platform, e-input tracking system, e-market linkages, e-payments for inputs, e-registration of farmers etc.) should be intensified and expanded to include more local languages. Also, authorities in charge of employing non-professional AEAs under youth in agriculture model should endeavour to recruit people from their catchment districts.
- It was observed that outgrowers schemes are much visible and working well in the three Northern Regions and some part of Brong-Ahafo Region. Therefore, for effective implementation of PFJ, different models should be adopted for different regions. Since farmers in the three northern regions and part of Brong-Ahafo Regions are much familiar with nucleus farmer-Outgrower scheme or FBOs or CBOs, PFJ should be implemented using these models. With that, the nucleus-farmers should be given the inputs for onward distribution to outgrowers. The outgrowers should be mandated to sell their produce to the nucleus farmer. The problem of defaulting in payment for inputs will be minimal as the nucleus farmers will ensure that outgrowers pay for the inputs either in kind or cash.
- Lastly, to avoid farmers defaulting on payment, the 25% down payment by farmers and paying off the rest at the end of harvest should be abolished and replaced with full payment of the subsidized 50% of the price of the inputs. If this is implemented, there is going to be 100% recovery rate and the government will get the needed funds to plough back into the PFJ programme in the subsequent years.

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