UNIVERSITY OF CAPE COAST

EFFECT OF SEEDS AND FERTILIZER SUBSIDY COMPONENT OF THE "PLANTING FOR FOOD AND JOB" ON THE OUTCOMES OF MAIZE FARMERS IN THE AGONA WEST MUNICIPALITY OF THE CENTRAL REGION – GHANA

ERIC NFAAFUL

2023

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BY

ERIC NFAAFUL

Thesis submitted to the Department of Agricultural Economics and Extension of College of Agriculture and Natural Sciences, University of Cape Coast, in partial fulfilment of the requirements for the award of Master of Philosophy Degree in Agricultural Extension.

MAY, 2023

DECLARATION

Candidate's Declaration

I hereby state that the work herein presented is the result of my own investigations. Except for other people's work which has been duly acknowledged, this thesis has never been presented to this University or elsewhere for any degree

Candidate's Signature: …… Date……

Name: Eric Nfaaful

Supervisors Declaration

I hereby declare that the thesis preparation and presentation were supervised in accordance with the University of Cape thesis supervision criteria.

Supervisor's Signature: …… Date……

Name: Prof. Martin Bosompem

ABSTRACT

Maize is one of the most consumed food crops in Ghana. However, its production has been declining due to poor quality seeds and inadequate fertilizers. To deal with this challenge, the Ghana Government, through the Ministry of Food and Agriculture, introduced a flagship programme; Planting for Food and Jobs (PFJ) with the aim of increasing productivity. Little empirical knowledge is known about how the intervention has improved the yields of maize farmers, especially in the Agona West Municipality. The main objective of the study was to examine the effect of seeds and fertilizer subsidy component of the PFJ programme on yield of maize farmers in the Agona West Municipality of the Central Region of Ghana. Two hundred and seventy-seven beneficiaries were randomly selected and interviewed using structured interview schedule. Descriptive statistics, dependent and independent sample t-tests and correlation coefficients were used to analyze the data. The results of the study showed that most (88%) of the respondents perceived the seeds and fertilizer subsidy component of the PFJ programme to be 'very highly effective' in improving their yields. Also, 86% of the respondents 'strongly agreed' to the overall perceived attributes of the PFJ programme. Majority (94%) of the maize farmers agreed to the fact that the PFJ policy have had comprehensive impact on their yield and income after the intervention. The dependent sample t-test shows significant increase in yield (about 154%) from 408mt/ha to 1038mt/ha at 0.05 alpha levels before and after the adoption of the PFJ programme respectively. The correlation analysis shows that marital status and Voluntariness had significant relationship with maize yield at 0.5 alpha level. Income also improved from GH₵5500 to GH₵9000 per hectare before and after the adoption of the seed and fertilizer subsidy respectively. Major challenges beneficiaries faced were their inability to follow repayment arrangements and ever-changing terms and conditions of the access to the input subsidy. It is recommended that government of Ghana should not discontinue the intervention programme since it has the potential to improve food production, income and the well-being of beneficiary maize farmers.

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DEDICATION

To my lovely wife Priscilla Buabeng and my children, Justice Nfaaful and Osbert Nfaaful

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LIST OF ACRONYMS

APRM	African Peer Review Mechanism
BFCP	Block Farm Credit Programme
CAADP	Comprehensive African Agricultural Development Policy
CIMMYT	International Maize and Wheat Improvement Center
CSIR	Center for Scientific and industrial Research
DFIDs	Department of Foreign and International Developments
DOC	Development of Cooperation
DOI	Diffusion of Innovation
ECOWAP	ECOWAS Agricultural Policy
ECOWAS	Economic Community of West African States
FAO	Food and Agriculture organization
FASDEP	Food and Agricultural Sector Development Policy
GAPs	Good Agricultural Practices
GDP	Gross Domestic Product
GIDA	Ghana Irrigation Development Authority
GIZ	German Development Cooperation on Agency
GLSS	Ghana Living Standard Survey
GSGDA	Ghana Shared Growth and Development Agenda
GSS	Ghana Statistical Service
GSSP	Ghana Strategy Support Programme
ICM-FFS	Integrated Crop Management Farmer Field School
ICT	Information and Communications Technology
IFJ	Investment for Food and Job
ILO	International Labor Organization

IPM	Integrated Pest Management
ISM	Integrated Soil Management
ISSER	Institute of Statistical, Social and Economic Research
MAG	Modernization of Agriculture
MCC	Millennium Challenge Corporation
METASIP	Medium Term Agricultural Sector Investment Plan
MFEP	Ministry of Finance and Economic Planning
MLGRD	Ministry of Local Government and Rural Development
MMDAs	Metropolitan, Municipal and District Assemblies
MoFA	Ministry of Food and Agriculture
MTNDP	Medium-Term National Development Policy Framework
MYA	Mean Yield After
MYB	Mean Yield Before
MYD	Mean Yield Difference
NGOs	Non-Governmental Organizations
NPK	Nitrogen Phosphorus and Potassium Development
OPV	Open Pollinated Variety
OYF	Operation Feed Yourself
PEOU	Perceived Ease of Use
PERD	Production for Export and Rural Development
PFJ	Planting for Food and Jobs
PPRSD	Plant Protection and Regulatory Service Directorate
PT	Primitive Technology
RFJ	Rearing for Food and Job
SPSS	Statistical Package for Social Sciences

SSA	Sub-Saharan Africa
SWC	Soil and Water Conservation
TAM	Technology Acceptance Model
ToC	Theory of Change
TY	Total Yield
TYA	Total Yield After
TYB	Total Yield Before
UNEP	United Nations Environment Programme
YIAP	Youth in Agricultural Programme

CHAPTER ONE

INTRODUCTION

Overview of the Chapter

This chapter covers the background of the study, the problem statement, the main objective, the specific objectives, the hypothesis in relation to specific objectives, the significance, the research questions, the limitations, the delimitations, and explanation of key terms used in the study.

Background to the Study

One of the main food crops grown in Ghana is maize. In most rural areas, maize (Zea mays L) cultivation employs close to 97 percent of the population and generates 8.9 percent of the nation's GDP (MoFA, 2018). It is estimated that each person consumes 62 kilograms of maize a year (SRID-MoFA, 2016). “Despite the economic benefits of maize farming, Ghana has one of the lowest rates of maize production worldwide”. According to the Institute of Statistical Social and Economic Research, the contribution of arable crops, maize inclusive, declined from 31.8 percent in 2009 to 20.2 percent in 2015 (ISSER, 2017). One of the primary factors contributing to the low yield is the low soil productivity brought about by weak and declining soil fertility as well as poor seed quality (CSIR, 2016). To fulfill the food demand of everyone, the government of Ghana spends more than US $22 million on the importation of food and food products, including maize (MFEP, 2016). Since 2009, agriculture has increased labor employment and raised the living standards for many people. By 2030, the population of Ghana is projected to increase to 45 million. (GSS 2020). As a results, crop production particularly food crops, is also anticipated to increase in parallel to

fulfill food demands, for people in places where food unavailability is prevalent (MoFA, 2016). Again, MoFA (2016) indicated that smallholder farmers dominate maize production, which is predominantly based on rain-fed agriculture, with little usage of fertilizers and other inputs. The authors added that high cost of fertilizers, improved seeds, land preparation services and other inputs such Agro-chemicals militate against optimal production of maize in the country. To enhance production, the Ghanaian government has taken number of steps to boost maize production. Typical example is the supply of improved seeds and quality fertilizers at a reduced price to smallholder farmers (MoFA, 2016). Fertilizers and seeds which are major farm input plays an important role in productivity enhancement. Increased fertilizer use is thought to be responsible for roughly half of agricultural growth and productivity (Toenniessenn et al., 2008), that result in greater farmer incomes, well-being, and long-term welfare of smallholder farmers. For instance, fertilizer happens to be one of the elements of strategies for Soil Water Conservation (SWC) and has helped Americans and Asians to accomplish the green revolution (Ogheneruemu & Abdul-Hammed, 2017).

Again, seed is one of the essential inputs in agricultural productivity and improvement. One cannot overstate the importance of seeds in crop production system (Etwire et al 2013). There are basically two main types of seeds; traditional seeds and non-traditional seeds. Unlike the traditional seeds, non-traditional seeds are regulated and are normally referred to as hybrid and improved seed (PPRSD, 2010). According to Louwaar and De Boef (2012), over 80% of small-scale farms in Africa obtain seeds from the traditional sector by either using their own seeds, buy the seeds or do “seed exchange”.

However, the Plant and Fertilizer Act in 2010 spell out how seeds are regulated and distributed across the country. All agricultural intervention programmes which involve seed subsidy comply with those policies of which PFJ is of no exception. In order to address the problems in the agricultural industry and to increase agricultural productivity over the long term, Ghana has developed a number of agricultural interventions. For instance, Ghana's economic performance was significantly influenced by the Comprehensive Africa Agricultural Development Policy (CAADP) and African Peer Review Mechanism (APRM), two integrated frameworks for supporting agricultural growth, rural development, and food security in Africa (Zimmerman et al., 2009).

A comprehensive foundation for modernizing Ghana's agricultural industry was provided by the first Food and Agriculture Sector Development Policy (FASDEP), which was implemented in 2002. To speed up the implementation of the new agricultural strategy, sector investment plans were created (METASIP). These are the Medium-Term Agricultural Sector Investment Plan (2011-2015) and METASIP II (2014 - 2017). According to the Maputo and Malabo declarations, METASIP was created to force the Ghanaian government to devote 10% of its GDP to the agricultural sector. The agriculture industry is anticipated to grow by 6% during the planned period as a result of this amount of government spending. FAO figures show that these interventions had some degree of success. For instance, during the 2008–2012 era of fertilizer subsidies, the total amount of land used for the production of rice and maize rose by 74 and 32 percent, respectively (FAO and MoFA, 2015). The CAADP proposal is also made in the ECOWAS

Agricultural Policy (ECOWAP), which is implemented in the Sub Region. It's worth noting that the CAADP and the ECOWAP both had a plan for agricultural reform on the African continent. These continental policy frameworks provided the backup for Ghana's government to launch new agricultural programme "Planting for Food and Jobs" (PFJ). The PFJ programme was launched in 2017 with the goal of improving Ghana's agriculture by increasing food production and increasing job possibilities. Between the 2018 and 2019 planting season, for example, 183,000 metric tons of inorganic fertilizer, 30,000 metric tons of organic fertilizer and 7,600 metric tons of maize seeds were supplied across the country (MoFA 2019).

The delivery of subsidized inputs to farmers was expected to result in an enhanced production of cereals and was estimated to yield an output of 1.2 million metric tons in 2019 (MFEP, 2017). One of the municipalities that benefited from the PFJ programme is the Agona West Municipality of the Central Region of Ghana. The Municipality has a total population of 160000 out of which 99200 are into farming as their main occupation (MoFA, 2016). Th Municipality lies between latitude 50.30^0 and 5050N between longitude 00.35' and 00.55'W. It has a total agricultural land of 3200ha to 20,153ha for arable crop production Including maize with annual rainfall of 1000mm to 1400mm (MoFA, 2016). Dry season within the municipality is from December to March with highest mean temperature of 30.80^0 C (between March to April). Two main rivers drain the area; Ayensu and Akora rivers. Arable crops, maize inclusive, predominate in the region. The goal of this study is to evaluate the impact of seed and fertilizer subsidies under the

Planting for Food and Jobs initiative on maize yield and revenue of maize farmers in the Agona West Municipality of Ghana's Central Region.

Statement of the Problem

Maize (*Zea mays L.*) is a significant annual cereal crop that is a member of the Poaceae family. In many regions of the world, it is regarded as a staple food (MoFA, 2016). After rice and wheat, it is the third-largest crop in the world (Sandhu, Singh, & Malhi, 2007). In Ghana an average of 1.7 mt/ha is produced annually and the major maize growing regions in Ghana are, Northern, Eastern, Western, Brong Ahofo, Ashanti and the Central region (MoFA 2016). Maize production in the country is declining. There are some problems impinging on its production in most rural communities. These problems include lack of improved seed varieties, insufficient nutrients to increase production, bad road system, lack of irrigation infrastructure just to mention few. The Ghanaian government launched the "Planting for Food and Job" intervention program in 2017 to enhance maize output to fulfill the need of the expanding population and to decrease maize importation. The PFJ program consists of five basic pillars: (i) supply of subsidized improved seeds; (ii) supply of subsidized fertilizer; (iii) agricultural extension services; (iv) construction of markets; and (v) e-agriculture.

According to MFEP, (2017), these pillars are anticipated to boost maize output by 40% (From 1.7 mt/ha to 2.7 mt/ha) by the conclusion of the fourth year, which is 2020. The Ghanaian government provided an initial budget of US$140.1 million (GH840 million) for the first year of operation of the programme in 2017. Through the provision of improved seeds and fertilizer at discounted prices, the PFJ programme is anticipated to alleviate

the financial strain placed on smallholder farmers. The modalities are such that the Ghanaian government contributes up to 50% of input market prices (fertiliser and seed). Farmers then pay the remaining 50% on the basis of some agreement. (a 25% down payment at the time of input collection and the remaining 25% of the total input cost after harvest). Since the implementation of the intervention programme, literature has proven beyond every reasonable doubt that quite a number of studies have been carried out by some researchers in the country to evaluate the PFJ programmes. For instance, Adutwum (2018) studied some of the elements that influence farmers' involvement in the planting for food and job programme in Ghana's Upper West Region

Iddrisu (2019) conducted a survey in the Northern Region to examine the impact of the programme on livelihood of arable crop farmers. In his report, maize production increased from 1.5 mt/ha to 1.9 mt/ha a year after the adoption of the PFJ programme in the northern region of the country, Addae (2019), also assessed the impact of the five key pillars of the Planting for Food and Jobs programmes in the Ashanti Region of Ghana and reported that the mode and criteria for distributing the input subsidy must be modified since the target population is not actually benefiting much as anticipated. Although studies have been done to evaluate the impact of the programme on crop productivity and also to assess farmers willingness to adopt the intervention programme in some districts and municipalities in some regions of Ghana, it appears there are no studies conducted on the programme in the Central Region of Ghana. In view of this the research was conducted to evaluate the effect of the seeds and fertilizer subsidy component of the intervention

programme on the beneficiaries in terms of the beneficiaries' perceived attributes of the programme, perceived effectiveness, impact of the projects on yield and income especially in the Agona West Municipality of the Central region of Ghana, since no comprehensive study has been done within the region.

Main Objective of the Study

The main objective of the study was to find out the effect of seeds and fertilizer subsidy component of the Planting for Food and Job on crop yield and income of maize farmers in the Agona West Municipality of the Central Region of Ghana.

Specific Objective of the Study

The specific objectives of the study are to;

1. Identify the beneficiary farmers' perceived attribute of the seeds and fertilizer subsidy component of the PFJ;
2. Identify the farmers' perceived effectiveness of the seed and fertilizer subsidy components of the PFJ;
3. Compare the yield of maize farmers before and after adoption of the PFJ.
4. Compare the impact of PFJ on yield of male and female headed households.
5. Identify the relationship between impact on yield and farmers' demographics and their perceived attribute of the seed and fertilizer subsidy components of the PFJ;
6. Identify the challenges facing the implementation of the PFJ.

Hypotheses of the Study

The study was guided by three main hypotheses. These hypotheses were tested at 0.05 alpha levels. The hypotheses were:

1. **Hypothesis 1:**

H_O: There are no statistically significant differences between yield of maize farmers before and after the implementation of seeds and fertilizer subsidy component of the PFJ. i.e., objective 3

H_1: There is a significant difference between yield of maize farmers before and after the implementation of seeds and fertilizer subsidy component of the PFJ programme. i.e., objective 3

2. Hypothesis 2

H_O: There is no significant differences between the impact on yield on male and female.

H_1: There is a significant difference between the impact on yield on male and female.

3. Hypothesis 3

H_O: There is no significant relationship between the demographic characteristic of beneficiary farmers impact on yield and the farmers' perceived attribute of the seed and fertilizer subsidy component of the PFJ.

H_1: There is a significant relationship between impact on yield and the farmers' perceived attribute of the seed and fertilizer subsidy component of the PFJ.

Variables of the Study

Dependent variable: Outcomes (Yield and Income)

Independent variables: The independent variables of the study were:

(a) Demographic and farm related characteristics

(b) Attribute of the seeds and fertilizer subsidy component of the Planting for Food and Job

Significance of the Study

1. This research outcome might help to identify the PFJ programme's limitations and obstacles in implementing the seed and fertilizer subsidy component of the PFJ policy. Findings from the research seek to help future researchers to better understand how farmers feel about the programme's implementation.

2. Additionally, the results of the study hope to provide policy makers concrete data to help them understand how the PFJ programme has affected the yield and income of maize farmers in the municipality. In order to successfully implement the seeds and fertilizer subsidy component of the Planting for Food and Job programme in all regions of the country where arable crop production is predominant, extension agents, policy makers, and crop breeding institutions will need to use the research as the foundation for their future tool and method development.

3. Finally outcome of the study on predictors of yield and income would serve as the basis for future development of new agricultural intervention programme.

Research Questions

1. What are the perceived attributes of the seed and fertilizer subsidy component under the PFJ programme?

2. What are the factors driving beneficiary maize farmers perceived effectiveness of the seed and fertilizer subsidy components of the PFJ programme?
3. How has the programme impacted on the crop yield and income of farmers in the study region be investigated?
4. What are the impacts of the programme on yield on male and female headed household?
5. What are the main implementation challenges of the PFJ programme?

Delimitations

1. Maize growers who had adopted the seeds and fertilizer subsidy components of the Planting for Food and Job programme in the Agona West Municipality of the Central region of Ghana from 2017 to 2020 cropping seasons were the focus of the research.
2. Considering the theories, the study focused on the outcome and the impact component of the Theory of Change and the attribute of innovation component of the Diffusion of Innovation Theory.

Limitations

1. The reconnaissance study into the area shows that the seeds and fertilizer subsidy component of the PFJ programme has gain more grounds in the area and little is known about the other three (Extension service delivery, E-Agriculture and marketing).

2. In the lack of adequate proper record-keeping by maize farmers, the study relied on the farmers' ability to recollect data, particularly when it came to

production and income. Farmers' memories may have an impact on the accuracy of data on maize yield and revenue as well as the amount of input used prior to and throughout the intervention period.

Definition of key Terms

This part gives the operational definition of terms used in the study.

Adoption: The mental process by which a person progresses from first hearing about an idea to its eventual application is known as adoption.

Challenges: Something that requires a lot of concentration or energy, testing one's physical or mental stamina in the process.

Perceived effectiveness: The subjective chance that the adoption of the Planting for Food and Jobs program's seed and fertilizer component will have a persuasive influence on maize farmers' livelihoods in the research area.

Livelihood: These include the knowledge, abilities, and actions required for the means of survival.

Sustainable Livelihood: A livelihood is considered sustainable if it can withstand stress and shocks, recover from them and maintain or increase its capabilities and asset in the present and future without endangering the base of the natural resources. (Chambers & Conway, 1991)

Diffusion of Innovation: The process through which new idea is gradually spread among people in a social system via particular channel.

Theory of Change: A theory of change is a purposeful representation of how a project, policy, strategy, programme, contributes to the desired outcome through a series of preliminary and intermediate outcomes.

Knowledge: It is the condition of knowing something with familiarity gained through experience or association.

Modernization of Agriculture: Agriculture is in the process of transitioning from traditional labor-based agriculture to technology-based agriculture. The Ghanaian government, in collaboration with the Canadian government, implemented the Modernization of Agriculture programme to revitalize the country's food production.

Planting for Food and Job Programme: The PFJ aims to promote a more serious and profitable approach to farming in Ghana while generating employment opportunities for the youth. Its main components include the provision of subsidized seeds and fertilizers, agricultural extension services, market construction, and the implementation of e-agriculture initiatives.

Rearing for Food and Job: Rearing for Food and Jobs (RFJ) is one of the modules in the government's major agricultural effort, Planting for Food and Jobs (PFJ). The RFJ will run for five years, from 2019 to 2023. The RFJ's goal is to build a more competitive and efficient livestock industry that boosts local output, reduces imports of livestock products, and helps to create jobs and improve the livelihoods of livestock value chain actors and the national economy.

Investment for Food and Job: Ghana's crop production is being reshaped under the IFJ agenda (2018-2021), that is designed to operationalize the mission and vision of the Government of Ghana as stated in the Medium-Term National Development Policy Framework (MTNDPF), Achieving Prosperity and Equality for All (2018-2021).

Comprehensive African Agricultural Development Policy: The Comprehensive Africa Agriculture Development Programme, which was carried out in Mozambique, is the policy framework for Africa's efforts to

modernize its agricultural sector and bring about wealth creation, food security and nutrition, economic growth, and prosperity for all.

Yield: Quantity of produce that is harvested per square foot of land. Yield derived as a result of the programme

Income: The income derived as a result of the seeds and fertilizer subsidy component of the PFJ.

Perceived Attribute of the Seeds and Fertilizer Subsidy for Planting for Food and Job Programme: What maize farmers in the Agona West Municipality understand and are aware of in relation to the intervention programme.

Organization of the Study

The introduction, problem statement, general and specific objectives, significance of the study, study limitations, and the study's delimitations are all covered in the first chapter. The second chapter examines the literature that is pertinent to the study. The design and processes for conducting the research are detailed in chapter three. The demographic and farm related characteristics, sample size, sampling procedure, and technology are all discussed. The strategies for data collection and analysis were also discussed in this chapter as well. After the data was collected, the presentation and discussion of findings based on data analysis has been represented in chapter four. The study's findings, conclusions, suggestions, and recommendations for future research are summarized in the fifth chapter.

CHAPTER TWO

LITERATURE REVIEW

Introduction

This chapter makes an effort to integrate contemporary theories in order to provide context for the study's theoretical underpinnings. With a focus on the implementation of a component of the intervention programme (Seeds and Fertilizer Subsidy) and its impact on yield and income of maize farmers in the study area, this chapter's objective is to analyze pertinent studies on various components of the PFJ programme. Research on other topics including Ghanaian food and agriculture, Crop yield in relation to food availability, Maize in Ghana, Information dissemination and its impact on maize production, Fertilizer and improved seeds usage and its impact on yield and income of maize farmers, demographic and farm related characteristics, Planting for Food and Job and its impact on maize production, Seeds and fertilizer subsidy component of the Planting for Food and Job programme among others were comprehensively reviewed. Finally conceptual framework was developed to serve as a guide to the study based on the theoretical frameworks, empirical review and reviewed literatures relevant to the study.

Theoretical Framework

The main theoretical pillars of the study were The Theory of Change by Carol Weiss (1995) and Diffusion of Innovation (DOI) by Everett M. Rogers (2003).

The Theory of Change (ToC)

The Theory of Change is an international model that illustrate how a project, policy, strategy, programme, or other activity may contribute to the

desired goal through a series of early and intermediate effects. Change theory helps to evaluate the complexity of societal change that occur with time.

Critiques of the Theory of Change

The first objection is that the theory appears to be linear and usually makes the assumption that inputs lead to outputs and that outputs lead to outcomes. Periodically, this occurs. However, systems thinker, on the other hand, will be skeptical of linear answers, particularly when it comes to complicated societal issues like homelessness, poverty, or isolation.

The second criticism is that change theories may suffocate learning opportunities.

Origin of the Theory of Change

A clue as to when the term "Theory of Change" initially appeared can be found in the enormous amount of theoretical and practical development in the assessment profession (Weiss 1979). For decades, Peter Rossi and Michael Quinn Patton worked on how to apply programme ideas to programme assessment as both evaluation theorists and practitioners. According to the literature, "Theory of Change" is a collection of presumptions that explain how programme activities relate to the results that are attained along the way and how small actions might lead to a larger objective. Carol Weiss said it initially in 1990. “In order to improve their overall assessment processes and provide themselves the opportunity to claim responsibility for the outcomes predicted in their theory, Carol Weiss urged complicated community-based project designers to be transparent about the theories of change that direct their work”. Weiss advocated for a seemingly simple technique: lay out the expected sequence of outcomes as a result of an

intervention, then design an assessment approach around tracking whether these expected outcomes are actually realized. Although there is much variation in how ToC evaluations have been performed, they have proven to be a popular technique for evaluators of complex social policies and interventions. The Theory of Change, according to Mason and Barnes (2007), is basically a detailed explanation and demonstration of how and why a desired change is predicted to occur in a specific environment. Different organizations may have vastly different theories of change, both in terms of the development process and the appearance of the end result. However, there are several features that are included in many change theories. Creating a Theory of Change usually entails a thorough examination of the elements that have the ability to influence any intended outcomes (Jones 2010). The Theory of Change has five main components. They are input, activity, output, outcome and impact. The resources or investments required to make the activities happen are referred to as inputs. For the purpose of this evaluation, improve seeds, quality fertilzers, skilled extension trainers serve as the input. Activities come next. In this stage, we respond to the query, "What activities are required for each outcome to occur?" Giving individuals high-quality training by extension agent and farmer-based organizations with the anticipation of projected output and outcome is one of the actions taken into account in this study. The outcomes cannot be attained without the outputs, which are the direct results of our actions or products. Consider these as proof that the results are on track. As per our seeds and fertilizer example, one output could be the “increase in the number of bags of maize with respect to training obtained from extension agent in the PFJ programme like IPM,

GAPs, Control of fall army worm using neem extract technology. The intended and unforeseen changes that stakeholders are experiencing or could experience are known as outcomes (Stein, 2012). In other words, outcomes are the broader benefits we work to achieve. Three types of outcomes should be included in a well-designed Theory of Change: long-term, intermediate-term, and short-term. You have a greater chance of enlisting the assistance of other parties, such as the government or public and private partners, to expand your mission as you show a noticeable increase in your outcomes. The systemic transformation you anticipate long-term is the impact. Although impact typically takes several years to materialize, making it challenging to evaluate, it does provide us with an excellent basis to identify the outcomes that are within our control to influence and track.

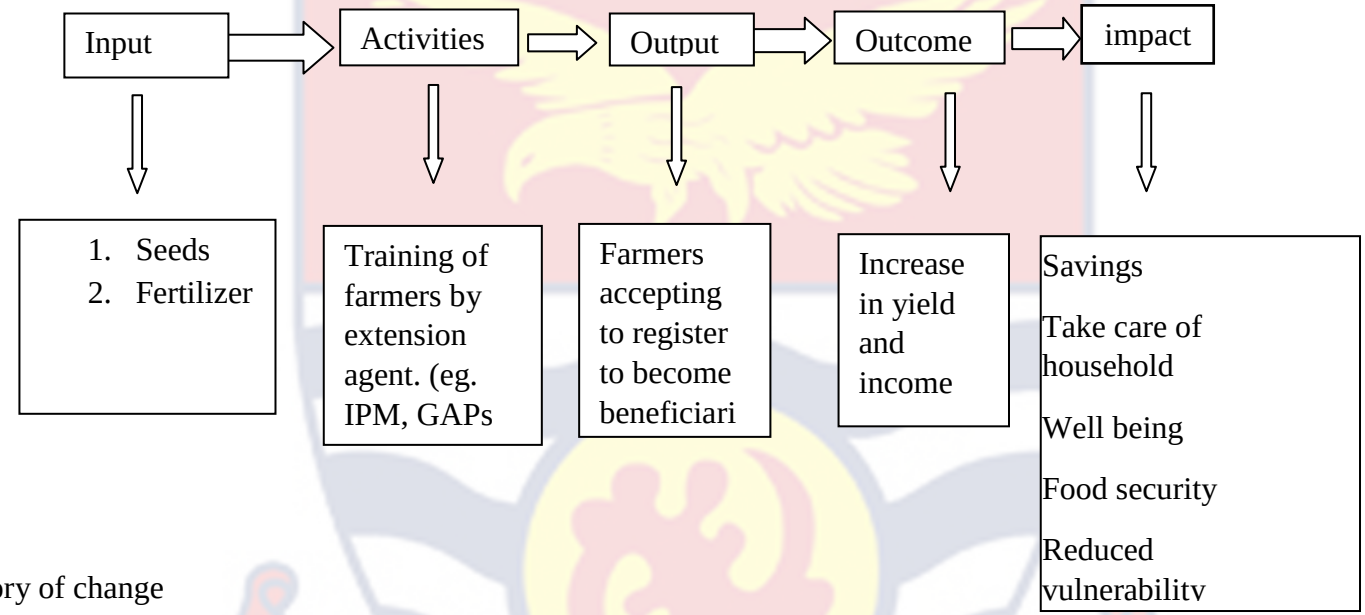


Figure1. The theory of change

Source: Adopted from Weiss, (1990)

The theory of diffusion of innovation (DOI)

Diffusion is derived from the Latin word "diffundere," meaning "to flow out." The expression, which applies to both social and natural scientific disciplines, describes how an innovation radiates through time to members of a social system via a multiple channel. Rogers is a well-known name in the industry since 1983. According to Rogers (1983), the adoption rate shows how quickly members of social system adopt a new idea. From literature, the adoption rate is influenced by five unique factors; "(1) perceived features of the innovation, (2) type of innovation-decision, (3) the characteristics of the communication channels disseminating the innovation at various stages of the innovation-decision process, 4) the characteristics of the social system in which the innovation is diffusing, and 5) the intensity of change agents' promotion activities. in the innovation diffusions" (Rogers, 2003). The adoption choice of maize farmers on the PFJ programme will now be examined in light of perceived innovation features, specifically relative advantage, compatibility, complexity, trialability, and observability. According to Rogers (1983), the decision-making process for innovations also includes "information-seeking and information-processing activities, in which an individual is motivated to eliminate ambiguity regarding the benefits and drawbacks of an innovation." The five steps of the innovation-decision process are knowledge, persuasion, decision, implementation, and confirmation (p. 172). [Figure 3]

These stages frequently occur in a chronological order. "A reasonably stable, socially built, innovation-dependent feature that reflects an individual's willingness to change his or her familiar routines," Braak (2001). Rogers'

knowledge of the desirable and main conduct in the innovation-decision process was aided by his innovativeness.

Moore and Benbasat expanded theory of Rogers

Moore and Benbasat (1991) state that research has revealed a variety of measures of the qualities' predictive value, and some findings demonstrate that not all attributes have an impact on adoption because the variations rely on the innovation and the time period in which they are used. The acceptance and utilization of innovations have continually been impacted by their perceived qualities. Consequently, it is suggested that the model contain all of the properties (Heet al., 2006). The relative advantage attribute calculates how much an innovation is deemed to be better than either its predecessor or the one it replaces.

This can be measured in terms of profitability, reputation, ease of use, and satisfaction for the particular innovation. The individual must be capable of identifying the innovations (Rogers, 1983). An innovation's expected rate of providing benefits can be used as a stand-in for relative advantage. Numerous studies that have presented characteristics connected to the acceptability of technological innovation have shown the positive influence of relative advantage on adoption and utilization. (Agarwal & Karahanna, 2000; Davis et al., 1989; Plouffeet al., 2001; Venkatesh & Davis, 2000; Venkatesh et al., 2003; Compeau; Meister; Higgins, 2007; Venkatesh & Davis, 2000; Venkatesh et al., 2003)

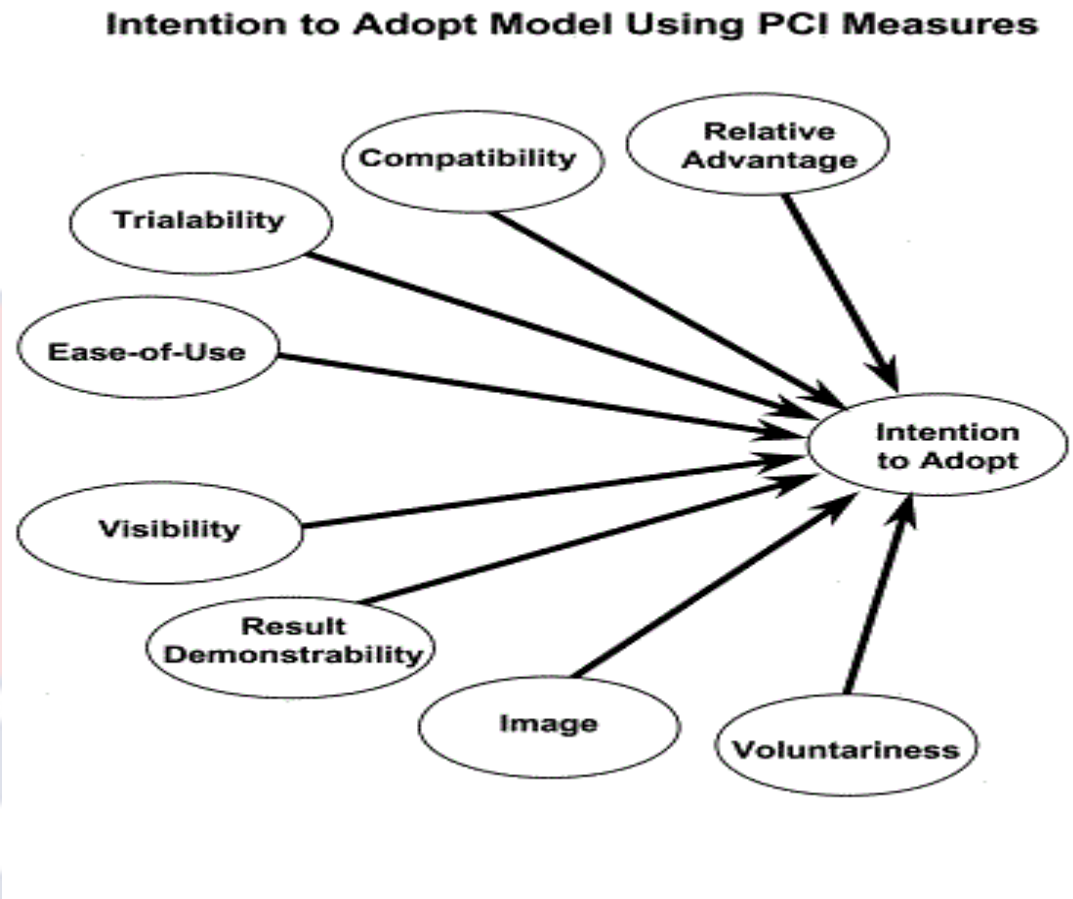


Figure 2 Source: Moore and Benbasat 1991

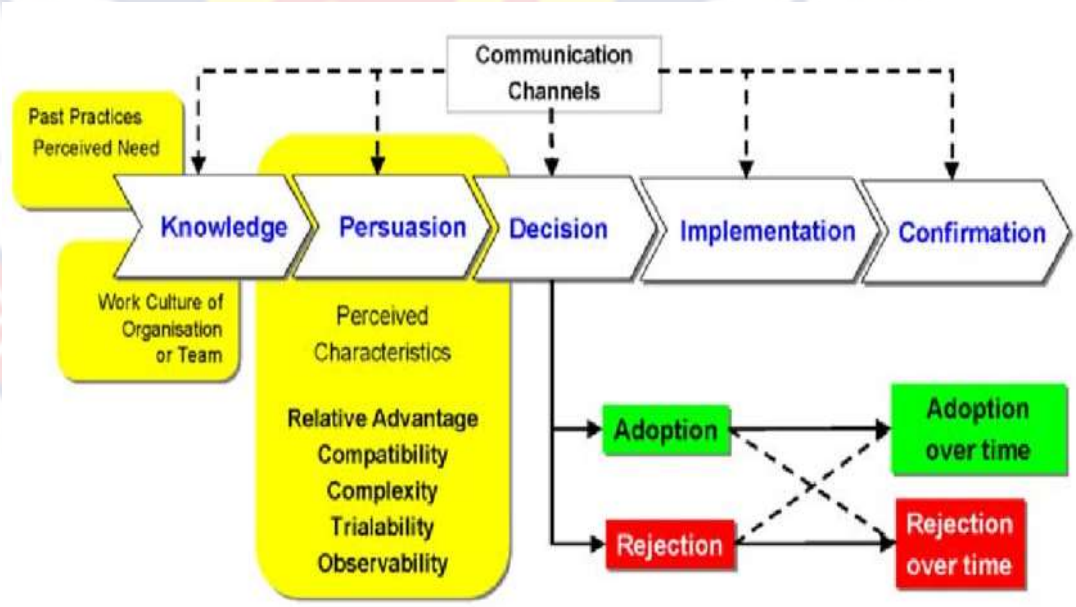


Figure 3 Source: Rogers (2003).

Food and Agriculture in Ghana

Generally Ghanaian agriculture is done on small-scale, family-run farms utilizing antiquated technology (ISSER, 2009). Statistically 80% of total agriculture is done on a subsistence basis using primitive technologies in the country (Ministry of Finance, 2002). "According to the 2000 census, agriculture employs 4.2 million people representing 50.6 percent of the labor force". More than 90% of all farms are on land that is smaller than 2 hectares in size (ISSER, 2009). The most prevalent crops farmed on larger farms and plantations are oil palm, rubber, cocoa and coconut, followed by maize, rice, and pineapples. Despite the fact that 6,000 farm operations across the country utilised some type of irrigation, agricultural productivity is mostly dependent on rainfall. (Musah, 2019). "The Ghana Irrigation Development Authority (GIDA) is responsible for irrigation development in Ghana". GIDA technology produces approximately 80% of Ghana's total agricultural output (MoFA, 2002). Approximately 90% of arable and cash crop farm land are less than 2 hectares in size. Oil Palm, Cocoa, Rubber and Coconut happens to be the major cash crops produced with maize, rice, and pineapples coming in second. Around 500,000 hectares of land, including inner valleys, were thought to be suitable for irrigation, but only about 11,000 hectares of land were formally irrigated in 2002.

Crop yield in response to food availability

Food availability describes a condition in which a person has access to food in both sufficient quantity and quality. "Food security entails the ability to purchase enough food to live comfortably according to life sciences research carried out in the United States in 2006". A person shouldn't have to

fight to get food, neither should he/she have to endure an unpleasant situation that jeopardizes his personal safety or dignity in search of food. (FAO, 1983). But since 1974 the definition of food security has undergone a significant change as a result of the realization that agricultural production cannot be disregarded when defining it.

The World Food Conference (1974), which established food availability as the definition of food security, gave rise to the phrase in the middle of the 1970s. “Availability of sufficient world food and supply of fundamental foodstuffs at all times in order to maintain a steady expansion of food consumption and offset changes in production and prices are better explain by the food security parameters”. FAO (1983) defined food security as "ensuring that all people have physical and economic access to the basic food that they require at all times. This idea recognized that the equation for food security also includes demand-side considerations in addition to supply-side influences. “The idea of food security analysis expanded to include study at the individual, household, regional, and national levels”. (Amartya, 1981) attributed food security to the impact of personal entitlements resulting from food access, availability, use, and stability. “These four dimensions become the four pillars of food security initiatives”. From the angles of human rights and ethics, food security was also taken into account.

Maize in Ghana

In Ghana, maize is one of the most important grain crops for most rural communities (MoFA, 2008). It is estimated that the country obtains about 20% of their calories from maize, meanwhile about half of what they grow is sold. It also has the largest planted area than any food crop in Ghana

(Braimoh and Vlek, 2006; Morris, 1999). Despite the significance of maize in Ghanaian agriculture, Ministry of Finance data shows that present yields only average 1.7 mt/ha, or approximately a fourth of its yield potential (MoFA, 2010). Ghana's average maize yields per hectare are lower than those of Africa, and Southeast Asia combined. They are also less than half of the worldwide average. Since maize is so crucial to Ghanaian agriculture, raising maize yields would be advantageous for the entire country. Maize is grown throughout the world and has long been a mainstay of the diets of most people. Ghana relies heavily on maize as a food supply. According to a Ministry of Food and Agriculture assessment, it has almost fully supplanted the country's traditional mainstay crops, sorghum and pearl millet, in northern Ghana (SRID-MoFA, 2011). Maize makes up more than half of Ghana's agricultural production, and reports suggest that yields are improving by about 1.1% year (IFPRI, 2014).

Constraint on maize production in the district

Several factors affect the productivity of maize cultivation in Ghana, and the central region is no exception. However, in order for Ghana to boost maize yield and achieve self-sufficiency in maize production, these barriers must be addressed (Oteng, 1997). These difficulties come in both natural and artificial perspectives. Natural obstacles include the widespread prevalence of groundwater laterites, which account for around 25% of the country's soils and 50% of the region's soils (Adu & Stobbs, 1981). “These shallow, poorly drained, light-textured soils are found above ferruginous gravelly clay and mudstones. Poor extension services, lack of improved seeds of different types, low use of agrochemicals (mostly because of high cost of agrochemicals), and

low level of farm mechanization are examples of artificial restrictions". According Donkoh , (2010), rain-fed ecology controls 75% of Ghana's total rice acreage, efforts should be made to enhance its production method in order to significantly alter maize output in Northern Ghana. Maize, a commodity that is essential to Ghana's economy and is one of the chosen crops for the Planting for Food and Jobs (PFJ) initiative, provides work and money for many Ghanaian farmers. "All the major ecological-climatic zones of Ghana; the Interior Savannah zone, the High Rain Forest Zone, the Semi-deciduous Rain Forest zone, and the Coastal Savannah zone produced maize". The Interior Savannah zone, which encompasses practically the whole northern belt of the country and covers over about 9.32 million ha, has the largest potential for maize and rice production (Amikuzino, 2012).

Information dissemination and its impact on yield and income of farmers

Information sharing and skill development are essential for increasing agricultural output in Sub-Saharan Africa, Ghana inclusive (Faruq et al 2003). In order to achieve the astounding feat of high output, extension operations are essential. These operations typically come from governmental and non-governmental groups, as attested to by Basher et al. (2010), who claim that they have a favorable effect on crop productivity. Ghana's agricultural industry is still in its infant stages, approximately 70% of the population is currently involved in farming and over 65% of small-scale farmers—whether they work part-time or otherwise—dominate the rural agricultural scene (Titilola & Akande, 1998). Due to their limited resources, conservatism, use of primitive farming tools, reliance on family labor, low educational attainment, and subsistence lifestyle, the majority of farmers are

underproductive and, more importantly, lack access to the right extension contacts (Adegeye & Dittoh, 1985). Information dissemination and showcasing new technology is important for closing the gap between potential and actual productivity in farm output.

Demographic and farm related characteristics

A population with particular characteristics is referred to as a demography. Greek words "demos," which means "people," and "graphy," which means "image," are the origin of the name. Examples of demographic features include age, race, gender, religion, earnings, education, home ownership, sexual preference, ethnicity, family size, marital status, ability to support oneself, and general health (Asantse, 2008). However, it is believed that factors such as sex, marital status, age, educational background, farming experience, household dependents, the size of the farmland, fertilizer usage, the source of financing, labor, yield, farmers income, and other demographic characteristics had an impact on farmers' adoption of seeds and fertilizer subsidies in 2008 cropping season (Bandiba, 2003; Maheswari & Ashok 2008, Bosompem, 2015).

Although agriculture continues to contribute less to Ghana's GDP, it employs about half of the nation's workforce (FAO, 2015c). Most maize growers in Ghana are small-scale farmers with modest farm holdings who primarily cultivate maize for their own consumption and a small amount for sale to supplement their income. Small-scale farmers in Ghana generate 90% of the nation's food (MOFA, 2011). The operation is frequently carried out on a shoestring budget. Nevertheless, the rural population's ability to secure enough food depends on the smallholder sector. Governments and their

private sector partners in underdeveloped nations already confront major obstacles when it comes to retaining and creating new jobs. The International Labour Organization (ILO) forecasts an increase in unemployment of about 1.6 million persons in developing countries over the next two years. The World Bank estimates that there are approximately 75 million unemployed youngsters worldwide (World Bank, 2019; ILO, 2020). Therefore, neglecting the smallholder agriculture sector, which supports a significant portion of the people in rural areas, will only aggravate their social and economic circumstances, leading to a huge exodus from rural to urban areas. For instance, Mwaniki (2006) stressed that as part of a bigger production improvement strategy, enhancing farmers' agricultural output capacity requires the incorporation of adequate information about the farmers' socio-economic characteristics. Due to their geographic and socio-economic factors, which have an impact on the levels of their production output, many producers frequently miss out on subsidies. The wealthy are easily identified because they have voices that can be heard, whereas the poor are voiceless and powerless.

Sex and marital status of farmers

According to surveys, men have dominated Ghana's production of arable crops (GIZ, 2011). According to a GIZ survey performed in 2007, men make up more than 65 percent of farmers who grow arable crops in the central and western regions of the Republic of Ghana. In the western part of Ghana, men produce 65% of the arable crops, compared to women's 35% production, claims Asare (2012). Again, Adusei (2012) discovered that 70% of the 500 farmers of arable crops studied in the Central Region were men, with the

remaining women. In contrast, Eduamoah (2014) discovered that 72% of the 200 farmers of maize in Ghana's Western North District were men. Men instead of women so dominate the cultivation of arable crops in Ghana's central and western regions. Studies on the adoption of agricultural advances by Akudugu show that men are frequently more likely than women to accept new technologies in Ghana (2012). This has been attributed to the fact that males typically make production decisions in families because they own the majority of the production resources, such as land, labor, and capital, which are necessary for the adoption of new technologies (Akudugu, Dadzie, and Guo 2012). Gender (1=males, 0=females) and the usage of agricultural technology by Ghanaian farmers were shown to be strongly correlated, according to Akudugu et al. (2012). This suggests that male farmers are more likely than female farmers to adopt the planting for food and jobs technologies' seed and fertilizer subsidy component.

Age of farmers

Few young people in Ghana are interested in practicing agriculture in general or producing maize or other arable crops. The slightly aged (35-55) and elderly have typically dominated the maize growing industry (above 60). (MoFA 2008). The majority of farmers that grow crops in Ghana's Central and Western regions are over 50 years old, according to Nyamekye (2010). (55-70 years). Age of farmers, levels of formal education, and years of experience all significantly influenced their decision to adopt new technology, according to Adrian (2013), who conducted a thorough assessment of the literature on the factors influencing the adoption of agricultural technology around the world. The adoption of high-tech ideas or practices, such as

computer use, has been demonstrated, for instance, to have a negative connection with age. As a result, it is critical in agricultural activities (Gloy & Akridge, 2000; Batte & Arnholt, 2003). Age for instance has been found to have both direct and indirect proportionalities to work output. (Batte, 2003). Older farmers, according to Robert (2012), “have less incentive to change, are less exposed to advanced agriculture equipment, and have shorter planning horizons”. As a result, younger farmers are more ready to experiment with agricultural innovations than their elders.

Educational levels of farmers

The Oxford Dictionary defines education as "the act or process of imparting or learning general information, increasing thinking and judgment abilities, and generally intellectually preparing oneself or others for mature life." Education helps people get better at gathering, analyzing, decoding, and understanding information. Despite their level of education, Okorley et al. (2014) found that 78 percent of cocoa farmers in Western Region of Ghana had formal education, and Matamorous (1991) also noted that 70% of cassava farmers in western Nigeria had formal education. (67 percent have completed at least middle school or junior high level). In rural areas where farmers predominate, only 29.3% of those chosen had a formal education, according to Aryeetey (2004). Dankwa (2002) and Kumi (2003) both made similar claims. Early adopters of technology, according to Rogers (2003) have more years of formal schooling than late adopters. In addition, literate are more inclined than illiterate to accept new technology. “As a result, it is projected that maize farmers level of formal education will be positively (hypothetically) associated to level of technology adoption and sustainability

of the adoption level" (Tey and Brindal 2012). This is due to the fact that successful execution of "PFJ" requires greatly on knowledge-based interpretation and strong technological and analytical abilities (Tey & Brindal, 2012). When it came to the adoption and use of agricultural innovations and technology by farm operators, Again, Tey (2012) made extensive observations about Canada's formal education system. Again, Walton, (2008) discovered an association between education and the use of precision soil sampling among cotton producers in 11 southern US states. According to Brindal, (2008), a farmer's educational background has a positive effect on adoption. It was discovered that farmers' intentions to adopt intervention technologies were positively influenced by their degree of education.

Years of farming experience

The concepts of time perception theory is best fit to explain farming experience, and the duration of a farmer's involvement in crop production is no exception. The adoption of agricultural technology has been found to be highly influenced by farming experience. Since farmers may learn by doing, having more experience can result in better knowledge, understanding, and operational efficiency. Tey and Brindal (2012) conducted an empirical investigation that found that years of expertise have largely been disregarded in the implementation of agricultural technologies. However, Insgin et al. (2008) hypothesized that more seasoned farmers could feel less need for the additional or supplementary information provided by modernization of agriculture and that this could have a detrimental impact on their adoption. It has been discovered that there is a good correlation between experience and the use of variable rate applicators (Shimshat, 2012). However, bad prior

experiences with a technology that shares some of the PFJ's qualities can hinder the adoption of PFJ since bad past adoption experiences can make it difficult to accept new technologies (Antolini, Scare, & Dias, 2015).

Farm related characteristics

"The acceptance of the seeds and fertilizer subsidy component of the PFJ programme is affected by a number of farming-related variables, such as yield, income, farm size, number of farms, size of farms and size of their land, availability of credit, land tenure systems, cultural practices, labor availability, and extension delivery services". Farm size is a measure of the total area of land available for the production of maize and serves as a stand-in for economies of scale, which is important when implementing advanced technologies like PFJ (Taah, 2012). Due to the capital-intensive nature of PFJ and the method for accessing it, large-scale farmers are more likely to benefit from the intervention program than their small-scale counterparts. The bulk of Ghanaian farmers, particularly those who grow maize, operate tiny, dispersed farms. Generally speaking, between 0.9 and 4.0 hectares make up around 89 percent of all maize farms in the nation (Asare, 2008). The difficulties in securing land for commercial enterprises in Ghana might be partly blamed for the absence of several large-scale commercial agriculture ventures. Land tenure issues can make it difficult to purchase land for large-scale or commercial projects. For instance, according to MoFA (2006), just 18% of farm holdings in Ghana have more than 4.0 hectares per farmer, while roughly 37% have less than 1 ha. According to Kusi (2008), the average amount of land in the central region of Ghana used for growing arable crops is 15 acres (6 ha), whereas the majority (63 percent) of this land is used for

growing maize. All of the arable farmers examined in the Ashanti region of Ghana was between 0.4 and 4.0 hectares, Taah et al. (2000). Many PFJ supporters are dubious about the viability of PFJ for small-scale farmers. Nevertheless, (Wongnaa, 2006) found that despite several government intervention programs, farmers of arable crops are reluctant to adopt the majority of agricultural intervention programs because of a misunderstanding about the use of inorganic products such hybrid seeds and fertilizers (2012). A probit analysis by Walton et al. (2008) showed that land size was a positive significant predictor of adoption of government intervention programmes. Pierpaoli Adusei et al., (2013) also reported that there is "generally positive significant relationship between land size and intension to adopt agricultural intervention programme, if farmers have highest land rights (for example if they buy or inherited) they are more likely to adopt PFJ since they have the advantages of enjoying their own farm management practices and investments. Age of maize farmers, fertilizer application, yield and income" It is unknown how many maize farmers there are in Ghana. In Agona West Municipality, there are thought to be between 1000 and 400,000 maize farmers. Ghanaian farmers produce 1,000,000 metric tons of maize on average each year (MoFA 2006, CSIR, 2010). The average national yearly production in Ghana is 350 kg/ha, or 140 kg/acre, according to Oppey (2004).

Innovation adoption

Different authors refer to innovation in a variety of ways. The actual application of ideas that result in the introduction of new goods and service is referred to as innovation (Schumpeter 1983). On the other hand, various definitions of adoption have been provided by various authors. For instance,

Loevinsohn (2013) coined adoption as the process of integrating a new idea or technology into an established practice. A certain amount of "trying" and adaption usually come before it. According to Bonabana Wabbi (2002), “adoption is the conceptual process that a person goes through from the moment they learn about an invention until they actually utilize it”. The two types of adoption are adoption intensity and adoption rate. Time is one of the tenets of adoption rate, which assesses how quickly farmers embrace innovations. On the other side, adoption intensity refers to how frequently the innovation is used, and represents the level of use of a given technology through time (Bonabana Wabbi 2002). To put it another way, the definition of the reaction, which has values ranging from zero to one, depends on whether the farmer embraces technology or not (Challa, 2013). The scenario determines whether each strategy is appropriate (Doss, 2003). Several studies examine farmers' acceptance of new technologies using a simple dichotomous variable method. This technique, according to Kirubakaran, 2009), is necessary yet insufficient because the dichotomous response shows only awareness of enhanced technology rather than actual adoption. As a result, researchers should properly define the term (technology adoption) so that appropriate techniques to measure it may be devised.

Determinants of agricultural innovation and factors influencing adoption of an innovation

Numerous socio-psychological studies have been undertaken in the past to determine the elements influencing farmers' attitudes toward implementing agricultural and environmental practices (Fischer, 2002). According to Loevinsohn (2020), factors affecting the acceptance of

agricultural innovation have been extensively studied in the literature. According to Feder et al (1985), economic analysis of technology adoption has traditionally attempted to explain adoption behavior in connection to a person's endowments and personal traits, imperfect information, risk, and institutional restraints, as well as the availability of inputs and infrastructure. Learning and social networks have been categorized as elements influencing the adoption of technology in more recent study (Uaiene, 2009).

These factors are categorized in different ways in several research. For instance, institutional, social, and economic factors were separated into three groups by Akudugu (2012) while analyzing the factors that affect the adoption of agricultural technology. According to Kebede et al. (1990), cited by Lavison, the factors that influence the adoption of technology can be broadly categorized into three categories: social, economic, and physical (2013). Wetzstein, (1987) divided the factors into informational, economic, and ecological categories, while Wu and Babcock (1998) divided them into human capital, production, policy, and natural resource characteristics. McNamara and Douce (1991) categorized the factors into farmer characteristics, farm structure, institutional characteristics, and managerial structure. Although there are different classifications for the factors that affect technology adoption, none of the components within each category stand out clearly from the rest.

When categorizing, factors including the study's setting, the researcher's preferences, the technology under inquiry at the time, and even the needs of the clients are taken into account (Bonabana- Wabbi 2002). For instance, a farmer's educational background has been categorized in some

research as human capital and in others as a characteristic of households. This study will look at the institutional, household-specific, technological, economic, and technological aspects that affect the adoption of agricultural technology. This will provide a more thorough analysis of how each element affects adoption.

Technology factor: Specific properties of a technology must be present for it to be adopted. Trialability, or the ability of a potential user to test something out on a small scale before committing to it, is an essential element of technology adoption (Doss, 2003). For instance, Adesina and Zinnah's research discovered that farmers' perceptions of the qualities of new rice varieties influenced their decision to adopt it. Wandji et al. (2012) found a similar conclusion in their study on Cameroonian farmers' attitudes on the usage of aquaculture technology.

Economic Factors: How quickly a new technology is implemented on a farm is significantly influenced by its size. Numerous scholars have identified the size of the farm as a crucial determinant of technology adoption. The other adoption-related factors may have an impact on farm size, which may then have an impact on farm size (Lavison 2013). Because farm size is so critical in the adoption of some technologies, they are referred to as scale-dependent (Bonabana- Wabbi 2002). Additionally, in order to ensure profitability, lumpy technologies like mechanized machinery or animal traction require economies of scale (Feder, Just and Zilberman, 1985). The adoption of new agricultural technologies is negatively impacted by the size of a farm, according to various research. Small farms may be persuaded to adopt a technology, particularly if it involves a breakthrough that demands a lot of input, such a labor-intensive

or land-saving device. In lieu of boosting agricultural output, farmers with limited land may opt to utilize land-saving strategies, including greenhouse technology and zero grazing, among others (Yaron, Dinar and Voet, 1992; Harper et al, 1990).

Other studies have discovered a weak or insignificant correlation between adoption and other variables. IPM distribution may occur independent of the size of the farmer's operation, according to research by Grieshop et al. (1988), Ridgley and Brush (1992), Waller et al. (1998), Mugisa-Mutetikka et al. (2000), Bonabana-Wabbi (2002), and Samiee et al. (2009). Large land holdings, according to Kariyasa and Dewi (2011) research, had no discernible effect on the likelihood that the aforementioned studies take into account the whole size of the farm rather than the agricultural acreage that the new technology is used on. "Considering the crop acreage with the new technology may be a better way to estimate the rate and breadth of technology adoption because total farm size has an impact on overall adoption" (Loewenberg DeBoer, 2000).

Therefore, determining the percentage of total land area that is appropriate for the new technology can help to better understand how technology adoption affects farm size (Bonabana- Wabbi, 2002). The net gain to the farmer from adopting a new technology, taking into account all associated costs, is a crucial factor in determining acceptance (Foster and Rosenzweig, 2010). "It has been discovered that one barrier to technology adoption is the expense of implementing agricultural technologies". For instance, since the 1990s, the structural adjustment initiatives of the World Bank in sub-Saharan Africa have exacerbated this restriction by removing

subsidies on the costs of seed and fertilizer (Muzari et al., 2013). In past studies on the factors influencing technology adoption, the high cost of technology was also mentioned as a deterrent to adoption.

Institutional Factors: Engaging in social activities boosts social capital, trust, and the exchange of ideas and information (Mignouna et al., 2011). "Farmers in a social group share knowledge of the advantages and applications of a new technology". Farmers educate and inform one another about agricultural advancements, hence social network effects are important for individual decisions, claim Uaiene et al. (2009). Farmers were more likely to adopt new technology if they were more actively involved in community-based organizations and participated in social learning about it, according to research by Katungi and Akankwasa (2010). According to Foster and Rosenzweig's (1995) research, social network learning externalities improved adoption's profitability; farmers also seemed to benefit from their neighbors' expensive technological endeavors.

The acquisition of information about technology is another factor that influences adoption. Farmers' lives are made easier by the opportunity to learn about technology's existence and useful applications. Knowledge increases conviction about a technology's performance, which could eventually lead to a shift from a person's subjective to objective assessment (Caswell et al., 2001; Bonabana- Wabbi 2002). Nevertheless, not all farmers will use a plan they are aware of. This suggests that farmers might evaluate technology less objectively than scientists, to put it simply (Uaiene et al., 2009). The accessibility of information may also contribute to a decline in technological adoption. For instance, when the general public has little experience with a

technology, more knowledge tends to deter people from embracing it. This is probably because new information reveals an unevenly wide information gap, which raises the risk involved (Bonabana- Wabbi 2002).

Youth in Agriculture Programme (YIAP)

Unquestionable evidence indicates that Ghanaian farmers are aging, and this issue requires urgent intervention in order to ensure year-round food supply and sustainability and keep the cost of food imports to a low (Bosompem, 2015). "Young people are essential to the long-term viability of the farm business" However, the lack of interest in agriculture among young people worldwide is growing (Phyo, 2018). The proportion of individuals (15 and older) employed in the sector has declined from 55 percent in 2005/2006 to 46 percent in 2012/2013. This situation poses a grave threat to Ghana's agricultural future unless major action is taken to permanently resolve it. This problem seems to be particularly prevalent throughout Africa. The average life expectancy for farmers in Nigeria is 47 to 50 years old, according to NBS 2008 and Oboh et al. (2009). The average age of a farmer in Ghana is 55, and the average lifespan is 55 to 60 years (MoFA, 2010). The Ghanaian government launched the YIAP project to encourage young people to become more interested in agriculture, which has the potential to decrease unemployment rates, generate income, and improve food security. Six areas of food security and emergency preparedness are predicted to benefit from the YIAP: nutrition, diversity, food storage and distribution, early warning system, irrigation, water management, and automated services. Ministry of Foreign Affairs (2016). The YIAP provides selected youth with the inputs they need to build the farming-related skills they will need in the future. A

fundamental prerequisite for attaining and maintaining productivity improvements worldwide is youth participation in farming and other activities in the agriculture sector. Ironically, fewer young individuals than older or more seasoned members of society work in agriculture in Ghana.

Farmers perceived effectiveness in the Planting Food and Job programme

Despite the fact that different people have different definitions for the term, Van den Ban et al. (1996) defined perception as "farmers representatives' involvement in the structure of extension service, in decision making on goals, messages, procedures, and activity evaluation." It is becoming clearer and more widely accepted that human attention and participation are necessary for enhancing ecosystems. Participation in the introduction of innovation strives to change the emphasis from "planning for" to "planning with" the community by integrating the target audience and exploiting their intrinsic expertise (Zinnah, 1998). Zinnah (1998) asserts that involvement or participation signals a shift from "planning for" to "planning with," which ensures appropriateness, viability, and long-term viability. According to MoFA (2018), over 70% of all farmers in the nation have expressed interest in and benefited from the intervention program.

Expectations of seeds and fertilizer subsidy under the PFJ programme

According to Etwire et al. (2013), there is a connection between farmers' involvement in agricultural interventions, their nutrition, and poverty levels, as well as the efficiency of the agricultural sector and macroeconomic circumstances. Since the PFJ program's inception in 2017, no evaluation of its outcomes has been conducted to identify its strengths and flaws. “Since the PFJ is a long-term project, understanding its successes and failures is essential

for providing advice and directing policy implementation in the years to come". Such significant knowledge is what this study aims to produce. In order to determine how participation in the PFJ program affects maize productivity, the current study's goal is to do just that. According to Musah (2013) maize has a lot of promise, so we focus on it. A significant staple, maize also has a tremendous potential for raising the incomes of subsistence farmers. In evaluating earlier programs in the Ghanaian context, I consider the study of Donkoh et al. (2016), which evaluated the efficiency of Ghana's Block Farm Credit Programme (BFCP), to be beneficial. This study found that the BFCP was successful in raising farmers' production, but that there were still significant problems that needed to be fixed if the program was to be more successful. Even though this study significantly advanced our understanding of program performance in Ghana, the evaluation wasn't completed until much later, after the program had already ceased. Officials were unable to put the paper's profound teachings into practice as a result. In light of this, we think that an early assessment of important policy decisions and initiatives, like the PFJ, is necessary and advantageous, which is why we carried out this study.

Overview of the Planting for Food and Job programme

The flagship program "Planting for Food and Job" is an initiative by the government of Ghana to encourages farmers to use subsidized seeds and fertilizer, provides beneficiaries with the knowledge and skills to make the most of the subsidized input, increases the marketability of more food produced under the program, and effectively targets beneficiaries using information and communication technology (Ministry of Foreign affairs,

2017). The PFJ program is divided into five sections: (i) the distribution of subsidized and improved seeds; (ii) the subsidization of fertilizer; (iii) agricultural extension services; (iv) the creation of markets; and (v) e-agriculture. According to MFEP 2017, these pillars are anticipated to enhance agricultural yields of sorghum by 28%, rice by 49%, soybean by 25%, and maize by 30%. To be more precise, PFJ programme hopes to increase the yields of maize, rice, and soybean from their current levels of 1.7Mt/Ha, 2.7Mt/Ha, and 1.7Mt/Ha, respectively, by the conclusion of the fourth year, which is 2020. A starting sum of US$140.1 million (GH560.5 million) was allotted in the 2017 government of Ghana budget for the program's first year of implementation. Through the government's provision of fertilizer and seed input subsidies, the PFJ program is anticipated to decrease the financial strain placed on smallholder farmers. As a result, the Ghanaian government contributes 50% of the inputs' market prices (such as fertilizer and seeds). Then, farmers pay a down payment of 50% (or 25% of the entire cost) when they receive the inputs, and the remaining 50% (or 25% of the total cost of the inputs) when the crop is harvested.

Planting for food and Job in relation to yield and income

Livelihoods can be obtained from a variety of activities that take place on and off farms, which together offer a variety of methods for acquiring food and money. As a result, each household may have a number of potential entitlements that make up its means of subsistence. These privileges are determined by the household's resources and standing within the social, political, and legal system. The degree to which a household is vulnerable is determine by income, food, health, and nutritional insecurity. Therefore,

households' livelihoods are secure when they possess or have access to resources and income-generating activities, including reserves and assets, to reduce risks, diminish shocks, and prepare for emergencies (Chambers, 1989).

Empirical Review

The study also examined some related empirical investigations to establish the concept scientifically. Input subsidies benefitted 70% of registered farmers in western region of Ghana, according to MoFA (2018). Additionally, Addae (2019) reported on an evaluation of the five core pillars of Planting for Food and Jobs programme in the Ashanti region and found that 40% of small-holder farmers had trouble collecting input subsidies. Relative to broad programme aspects, such as beneficiary counts, subsidized input amounts, and programme budget, a review of PFJ implementation reports and supplemental data reveals information that is helpful for comprehending program design and implementation. According to estimates of national crop production, the use of hybrid seeds and fertilizer has an impact on 65% of crop yield. These show the agricultural sector's quick output increase, particularly in the cereals subsector. However, MoFA discovered that roughly 80% of farmers' inclination to utilize hybrid seeds is influenced by input subsidies. As a result, the majority of the published data on the marginal contribution of PFJ to the output of national crops is based on simulations that make significant assumptions about the rates of seeding, the application of fertilizer to different crops, and the effectiveness of input use on beneficiary farms. This evidence suggests that PFJ has significantly increased agricultural output growth, which is a result that is conceivable given the input amounts.

Income and living Strategies of maize farmers

According to Eldis (2012), income strategies are the actions people take to attain their objectives or as a source of support. These include labor-intensive pursuits, financial strategies, and reproductive decisions. People combine activities to suit their various demands in the choice of strategies, which is a dynamic process. For instance, farming households may engage in activities that are not exclusively agricultural in order to diversify their sources of income and meet household needs. One popular means of securing a living is to move, whether on a temporary basis or permanently. One technique in agriculture is to increase output for every parcel of land by investing in capital or hiring more people. Extensification, or using greater area for cultivation, is another approach in agriculture. The methods people use to make a living are significantly influenced by their access to resources as well as the laws, institutions, and procedures that limit their ability to use those resources to produce effective lifestyle outcomes (Eldis, 2012). The idea that development assistance meant to enhance the livelihood strategies of some should not burden others is crucial to livelihood approaches since people are frequently compelled to compete for few resources.

Poverty alleviations through agricultural interventions

Many different techniques can be used to find the poor. It is possible to select a region where poverty is thought to be rampant, make the assumption that the majority of residents there are poor by any reasonable standard, and then furthermore the choice by taking other aspects of poverty into account, such as proximity to major thoroughfares, membership in an ethnic minority, etc. The MRDP program in Vietnam, which is supported by

Sida, used this approach (Davies and Krantz, 1999). However, poverty is rarely distributed equally within a region. Although it's not always the case, the majority of development initiatives and programmes assume that communities are uniform, collective social units (Agrawal and Gibson 2009). Every community has some members who are more fortunate than others. Another option is to establish a "poverty line" depending on factors like income, food insufficiency, etc. This enables a more targeted identification of the poor (provided the criteria accurately reflect what constitutes poverty), but in addition to the practical challenges associated with 'intra-community' targeting as such, it calls for systematic data on the level of income and other variables for all the households, which is frequently lacking and difficult to gather. Another approach is known as "wealth ranking", which enables the community to choose appropriate criteria for wealth (or poverty) based on their perceptions and experiences before classifying the various families in the community in line with them.

This idea does away with the need for outside parties to conduct home surveys, but it must include a true cross-section of the community to avoid community leaders from swaying the results. Another standard states that the community may be completely impoverished or not at all poor, thus the classification will only apply to it and will depict relative poverty. None of the SL Approaches discussed here genuinely deal with the issue of identifying the impoverished as a prerequisite for targeted interventions. To achieve this, a number of methodological approaches, as described in the SL Guidance Sheets, should be utilized in combination with this approach, such as social analysis, participatory poverty assessments, gender analysis, stakeholder

analysis, institutional analysis, and so forth. This may be the greatest approach because there are many different aspects to the problem of poverty. Consequently, it might be crucial to develop a fundamental understanding of the whole economic, social, cultural, and institutional backdrop (Ruedin, 2007).

From the aforementioned justifications, it can be inferred that a person's livelihood outcome is ultimately determined by the results or repercussions of the livelihood methods that person employs. If a person's ambitions for their livelihood are accomplished, such goals then turn into outcomes, Ruedin (2007). These include higher revenue, better financial stability, increased wellbeing, less vulnerability, and more environmentally friendly use of natural resources.

Farmer Based Organizations (FBOs) in Ghana

Cooperation has always been essential to human society and is particularly important for the development of rural and agricultural areas (Onumah 2007). Before the official formation of farmer groups and cooperatives, Ghanaian farmers already participated in a number of group activities. Farmers have been working together since the pre-colonial era, when they helped each other out in their fields with labor, notably weeding, and were typically neighbors and family members (deGraft-Johnson 1958). In order to oversee cooperative development in Ghana's agricultural sector, the Ghanaian government formed the Department of Cooperatives (DOC) in 1994 within the Ministry of Food and Agriculture (Dadson 1988).

State-controlled cooperatives began to disintegrate in the late 1980s, possibly as a result of mounting international pressure structural changes.

Therefore, later administrations in Ghana chose a lax attitude to cooperative development, enabling the formation of other forms of rural and farmers' self-help organizations for the purpose of income-generating activities. These organizations are all collectively known as farmer-based organizations (FBOs). Ghana has seen a large number of governmental and private efforts over the past 20 years that aim to advance FBO development (Salifu 2010). In particular, as part of AgSSIP, the World Bank alone committed more than US$9 million between 2000 and 2007 in the development of FBOs (AgSSIP 2007). A five-year, US$547 million anti-poverty agreement between the Government of Ghana and the Millennium Challenge Corporation (MCC) was also approved in 2007, and a sizeable chunk of this money has gone toward developing FBOs. Around 10,000 FBOs are thought to exist in Ghana, according to Salifu et al. (2010), who also noted that the rapid growth of FBOs is partially a result of NGOs, government organizations, and private investors who are increasingly seeing rural collective action as a key strategy for achieving agribusiness development goals. There is not much information available about FBOs' characteristics, activities, and performance despite the increased public interest in and expectations that they will support smallholder agriculture. Ghana Strategy Support Programme (GSSP) carried out a survey in the Northern, Brong Ahafo, Central, Eastern, Volta, and Greater Accra regions of Ghana in March and April 2010 to fill in these knowledge gaps. The survey's objectives were to find out how FBOs are created, what they do, what influences their success, and how to improve them to assist smallholder agricultural development across the country. (Ostrom 2004). Members of a group can act autonomously, with the help or

encouragement of outsiders from governmental entities, non-governmental organizations (NGOs), or development initiatives.

In many African countries, farmers have a long tradition of cooperating in groups rather than alone to produce specific types of agricultural (Onumah et al. 2007). Ghana has long maintained informal labor unions and customary arrangements that permitted the exchange of labor for farm work, as was previously indicated (mainly for weeding fields). In the Akan-speaking regions of Southern Ghana, this type of arrangement is known as nnoboa. The nnoboa, according to Dadson (1998), is a traditional type of collaboration in Ghana that involves collective action and mutual aid based on local social, ethnic, and family elements. This arrangement is not only informal and voluntary, but also transient, with the group breaking apart after the task is finished. The nnoboa technique was widely applied to traditional farming as well as social projects including building wells, health facilities, and feeder roads (Dadson 1988). The Ghanaian government used the nnoboa system, a traditional method of farming mutual aid, as a template for rural development in the 1970s. According to survey findings, the top two motivations for joining nnoboa groups were: (a) labor exchange (87 percent); (b) access to resources. Adjetey (1978) stated the long-standing existence of local credit systems in Ghana, which are known as susu groups, in addition to the existence of informal labor exchange organizations (Adjetey 1978, cited in Aryeetey 2004). Susu is a system in which any number of individuals can agree to routinely pay small amounts of money into a pool that are then given to a participant at a predetermined time. With this method, participants continue to make their regular payments to the group, which effectively

serves as repayment for their loans (Aryeetey 2004). He said that these kinds of organizations were common throughout the nation, particularly in towns, and that market vendors and small business owners favored them.

Introduction of fertilizer and other input subsidy in Ghana

The Ghanaian government-initiated input subsidy programme in 2007 to encourage farmers to increase their yields and the availability of food (FAO, 2015). However, despite almost ten years of implementation, smallholder farmers' use of fertilizer is still remarkably low (FAO, 2015). The "PFJ" programme is a novel intervention strategy that the Ghanaian government has just unveiled. The PFJ program, which began in 2017, aims to modernize agriculture, boost yields, achieve food security, and increase agricultural production to make farming more viable for farmers (MoFA, 2017). The PFJ program is based on five major pillars, including the provision of improved seeds, fertilizer supply, specialized extension services, marketing, and e-agriculture to track farmers' activities. It is intended to be similar to the one-time "Operation Feed Yourself" (OFY) program that was implemented in the 1970s.

Reintroduction of fertilizer subsidy in Ghana

Agricultural extension agents provided vouchers in 2008 and 2009 that were region- and fertilizer-specific and was done as a partial payment for fertilizers at any merchant that would take them. The private sector is utilized by Ghana's fertilizer and seed subsidy programme for retail fertilizer sales (Baltzer and Hansen, 2012; Banful, 2010). The government ended the voucher scheme in 2010 in favor of paying directly for half the cost of fertilizer and covering all transportation costs after receiving harsh criticism for the voucher

distribution and efficacy (Banful, 2009, 2010, 2011). Despite the programme's initial shortcomings, since it was introduced, maize yields in Ghana have been rising significantly compared to other West African countries without subsidy programmes (Druilhe and Barreiro-hurlé, 2012). "In 2014, farmers were not entitled to fertilizer subsidies. In 2015, Ghana resumed fertilizer subsidies of 89,200 MT at a cost of GH44,850 million". The kind of fertilizers affected by the subsidies included NKP Urea and Liquid Fertilizer Begreen (LFB). When the fertilizer subsidy program was reinstated last year, maize productivity increased from 1.2 million MT to 1.5 million MT at the same time (MoFA, 2016). Despite the fact that the government and its development partners greatly subsidize fertilizer, the program's poor implementation drastically limits the number of farmers who may receive it. Farmers' access to fertilizer inputs is impeded by their low-income levels (MoFA, 2011). However, MoFA (2015) reported that Ghana's fertilizer subsidy programmes have raised average yields of several important crops, including rice. The subsidy program over the years has also improved the trade balance by lowering the cost of importing food. The profitability and sales of fertilizer trading companies have also expanded, as has the number of people employed across the fertilizer supply chain, including porters who assist with retail, sales, and transportation activities.

Theory of Agricultural Input Subsidies

According to Chiwra & Doward (2013), the theoretical justification for the research on input subsidies is that recipients should have more assets since they save more as a result of lower input costs and hence have an advantage. Consider a scenario where a farmer needs to sell an asset to

finance a production investment in maize, but they are able to buy the input for just half the initial cost. In contrast to non-beneficiary farmers, their assets are spared. Beneficiary farmers would also be less risk-averse because the subsidy encourages them to embark on more lucrative and hazardous endeavors like investing in new assets or diversifying into high-value crops by sharing some of the associated risk. Regardless of the source of funding, they would have a larger profit margin and could therefore buy more assets. Chiwra and Doward (2013) also noted three conventional economic theories: "First, a subsidy can only produce a positive overall net economic return if there is a market failure and the downward shift in the supply curve exceeds the whole cost of the support. Second, the degree of the deadweight loss and how the benefits are distributed between consumers and producers are determined by the elasticity of supply and demand. Third, the inefficiencies caused by economic rents could be used to analyze the transfers to producers.

Modernization of Agriculture in Ghana (MAG)

Council for Scientific and Industrial Research (2018) states that the MAG program evolved from FABS and SFASDEP to address the decentralization of Ghana's agriculture sector implementation responsibilities to Metropolitan, Municipal and District Assemblies (MMDAs) of the Ministry of Local Government and Rural Development (MLGRD), taking into account lessons learned from the implementation of the earlier sector budget support programs.

To respond to the goals of the Ghana Shared Growth and Development Agenda, the Medium-Term Agriculture Sector Investment Program (METASIP), and the Food and Agriculture Sector Development

Policy (FASDEP), conditional budget support and technical assistance are intended to be provided to Ghana through the MAG Programme (GSGDA II). In order to add value to farmers' output and boost their earnings, it is intended to address productivity and value chain development management (MoFA 2016).

In order to boost productivity through intensive farming, the MAG Programme emphasis is placed on market-driven research and alternate service delivery methods for extension services. Households, farmer-based organizations, out-growers of nucleus farms, and other agricultural stakeholders spreads technology than other groups with the help of a strong and varied extension delivery system. According to (MoFA,2004), four key components were used to deliver the MAG Program in Ghana: Component 1: Assistance with value chain development, which will help local farmers become more productive; Component 2: Assistance with specialist agricultural services, which will help them connect with national markets and advance the efficiency of commodity development along value chains. Component 3: Assistance with agricultural research to bolster agricultural extension programs and raise agricultural output and Component 4: Helping Ghana become more competitive in global agricultural markets

Diversification of Sub-Saharan Africa's Smallholder Rural Economy

Historically, growing agricultural output in Europe and North America is found increase output, industrialization, and urbanization. (Timmer, 2009). The Green Revolution, led by the state, mediated by markets, and focused on subsistence farmers, transformed agriculture in Asia by increasing productivity through introducing high-yielding grain types. At the macro

level, the structural transformation process was characterized by a decline in the GDP and employment share of agriculture, movement from rural areas leading to urbanization, the growth of a modern industrial and service economy, and demographic change (Winters & Carletto, 2010). Agriculture continued to expand in absolute terms despite losing ground to other industries in terms of importance (Timmer, 2009). At the micro level, rural household agricultural activity participation has fallen behind non-agricultural activity participation (Winters et al., 2010). When the process first began, the majority of rural households were subsistence farmers who produced most of the farm and non-farm goods and services they required (Timmer, 2009). Due to improved market conditions and expanded transportation and communications infrastructure in rural areas, farm households diversified their income by engaging in non-farm activities. Because of higher income and living standards, people either choose to specialize in farming on larger, more consolidated farms or, eventually, started high-return nonfarm companies (Timmer, 2009). Recent research on land concerns in Sub-Saharan Africa have generally linked the region's diminishing farm sizes to rapid population expansion caused by high birth rates (Headey & Jayne, 2014; Jayne, Chamberlin, & Headey, 2014). “By 2050, it is anticipated that the number of people living in rural areas would decline in Asia and Latin America while increasing in Sub-Saharan Africa”. Farm size reductions and rapid population increase in Africa may have a severe influence on rural welfare and food security. Despite the lack of contemporary inputs, population density in high-density areas of SSA has already resulted in more intensive land use, indicating unsustainable intensification (such as fertilizer

or irrigation). The development of cultivated areas has been the primary cause of increased food production in SSA (Jirström et al., 2010; World Bank, 2013), which is currently being hampered by urbanization and shrinking farm sizes (World Bank, 2013). As a result of increased landlessness and diminishing farm sizes, unskilled farm labor is being forced into primarily low-return non-farm sectors (Haggblade, Hazell, & Jayne, 2014).

Soil Quality and Fertilizer Use in Ghana

Ghana's soil is no exception to the long-term decline in Sub-Saharan Africa's soil quality. All over Ghana, significant soil multi-nutrient (NPK) deficits have been found, and it appears that part of the reason for this is subpar agricultural practices. In comparison to soils with wild vegetation, permanently cultivated soils in the north have substantially poorer chemical and nutritional qualities (Braimoh & Vlek, 2004). Ghana is said to have one of the highest rates of SSA Fertilizer nutrient losses, with an estimated annual loss of nutrients of 60 kg/Ha NPK (Henao & Baanante, 1999; Stoorvogel et al., 1993). According to various studies, SSA's arable land needs to get much more fertilizer in order to stop the massive nutrient losses that have been happening (Morris et al., 2007; Crawford et al., 2007). SSA currently has the lowest fertilizer application rates of any region, at around 10 kg/Ha. Despite possessing 25% of the world's arable land, Africa only utilizes 1% of the world's fertilizer (Kariuki, 2011; Morris et al., 2007). Compared to the SSA average, Ghana used less fertilizer in 2010 (less than 6 kg/Ha) (FAO stat, 2014). Although prices have typically kept low, fertilizer consumption in Ghana has changed over time (FAO, 2005).

Fertilizer and yield response in Ghana

Despite the importance of inorganic fertilizer being emphasized frequently in national development goals, Ghana currently uses relatively little of it (Bationo 2018). The average amount of fertilizer used as of 2019 is about 20.9 Kgha-1, which is slightly over the SSA average of around 10 $Kgha^{-1}$ but below the 50 $Kgha^{-1}$ by 2015 aim set by the 2006 Abuja declaration and far below the global average of 118 $Kgha^{-1}$ (Hill & Kirwan 2015). "Although data on fertilizer use by crop is rare in Ghana, fertilizer use and application rates appear to be highest for cash crops such as cocoa, oil palm, and rubber". Arable crops receive middle-of-the-road fertilizer application rates. Only 31% of Ghanaian homes utilize fertilizers and its application differs from region to region (Bationo 2018). In comparison to those with more than 5ha, more than 20% of smallholder maize farmers use fertilizer, compared to less than 10% of those with less than 1.0ha. A paper on an analysis of fertilizer use on arable crops was also published by Ichami (2019). His study states that, independent of the quantity or kind of fertilization employed, fertilizer response refers to the improved crop output caused by fertilization. He emphasized how important it is to distinguish between soils that are responsive and those that are not. Non-response soil was split into two kinds by Kihara (2016). Kihara found out that soil that received adequate fertilizer experienced high yield as compared with soil with no fertilization.

Factors that affect the demand of fertilizer

Numerous studies have estimated the requirement for specific minerals or fertilizer (Nitrogen, Phosphorous and Potassium). The demand for fertilizer in industrialized countries is widely considered to be price inelastic. This can arise as a result of the lack of a cheap substitute for chemical fertilizer. Because there are easily available alternatives like manure and other organic resources, it is generally accepted that the need for fertilizer is more elastic in less developed countries. However, depending on aspects including cultural customs, climatic conditions, soil types, crops farmed, and farm organization, the requirement for fertilizer may vary from one country to another. This section tries to review some literature associated with the factors that affect the demand of fertilizer. "The demand for fertilizer as a main input in agriculture has been the focus of many studies over the years". Griliches (1958, 1959), Heady (2012), Yeh (2016), Carman (2014) and, Gunjal (2000), among others, contributed to the early studies. The focus has generally been on national or regional estimates of the total fertilizer or nutrient application on all crops.

The aggregate demand functions for fertilizer use on all crops in the United States were computed by Griliches (1958). He demonstrated that for the years 1911 to 1956, pricing fluctuations for both crops and fertilizer, as well as the consumption during the prior era, could account for the majority of the growth in fertilizer use. Although the model explained a significant portion of the variation in regional fertiliser use, Griliches (1959) calculated the functions of regional demand.

Importance of fertilizer application on crop yield

Smallholders, who mainly rely on rain-fed systems and who utilize few fertilizers and other inputs because of their expensive cost, produce the majority of the maize in Ghana (MoFA 2010). To increase productivity, one of the government of Ghana's key interventions is to offer smallholder farmers fertilizer at discounted rates (MoFA, 2016). Fertilizer is essential for increasing productivity. It is one of the SWC techniques' components that assisted Latin America and Asia in achieving the green revolution (Ogheneruemu & Abdul-Hameed, 2017). According to estimates by Toenniessenn et al. (2008), increasing fertilizer use accounts for around 50% of agricultural output and growth. This, in turn, boosts farmer incomes and well-being. Between 2007 and 2008, there was widespread concern about the state of the world's food supply. Different governments responded to this circumstance in various ways.

The adoption and execution of the fertilizer subsidy policy in Ghana in 2008 to boost local agriculture production was one of the measures used to fight this situation (Vondolia et al., 2012). In order to increase production, farmers were urged to use more fertilizer, especially on crops critical to the nation's food supply, like maize, rice, soybeans, and cowpeas, among others. The fertilizer subsidy scheme in Ghana has persisted under subsequent administrations through a variety of policy nuances. In contrast to Cote d'Ivoire, where the average rate of fertilizer application is 35 kg/ha, the average rate in Ghana is still fairly low, at roughly 7 kg/ha (Benin et al., 2013). Numerous countries on the African continent are putting in place fertilizer subsidy schemes. For instance, although fertilizer was offered as a

free input to farmers in Malawi, it was subsidized to farmers in Ghana at certain costs whilst the same input was subsidized in Senegal around 30 percent (Gayithri, 2019).

Maize Yield in Response to Fertilizer application

Given that Ghana currently has low fertilizer application rates and uses policy, it interests me to see how fertilizer influences yields. I am curious to know how fertilizer affects maize yields because of the importance of maize in Ghanaian agriculture in particular. Before deciding on a viable empirical strategy and defining key control variables, I first review and talk about relevant material. According to a study by Braimoh and Vlek (2006), the use of fertilizer, household size, distance from the major market, and the association between fallow time and soil quality are five factors that significantly affect maize yields in Northern Ghana. They discover that soil quality has a significant impact on maize productivity in Northern Ghana. Additionally, they contend that organic techniques alone cannot restore depleted soils and can only support a certain amount of crop production, necessitating the use of inorganic fertilizer to address the diminishing soil quality. Due to high costs and poor response rates, the authors of a study by Xu (2006) seek to know whether fertilizer application is advantageous for Zambian small farms or not. Xu et al. analyze the response of maize yield to fertilizer under various small farm circumstances to ascertain fertilizer profitability. They discovered that households who acquire fertilizer on time and prepare their ground with mechanical or animal draft generate more items with a marginal nitrogen content. In a policy brief on Malawi's Farm Input Subsidy System, Shively and Ricker-Gilbert (2013) investigate whether

increased fertilizer application had an influence on maize yields. They also discuss the effectiveness of the program to offer subsidies to promote the use of fertilizer. They discover that: (1) women typically use less fertilizer for corn than men do; (2) the use of chemical fertilizers is positively correlated with household wealth overall; (3) farmers who plant improved varieties of corn typically use about 50 kg more fertilizer than farmers who do not; (4) the subsidy program increases total fertilizer use for corn; and (5) plots with improved varieties of corn typically yield higher yields than plots with unimproved varieties. To assist me adjust for confounding factors and isolate the impacts of fertilizer, I also take into account literature on other yield drivers in addition to using the literature that looks at yield response to fertilizer. Based on the vast amount of material, it appears that farm size is a crucial factor to take into account.

Ghana Seed Policy System

A farmer's yield is greatly influenced by inputs. The ability to grow more seed is one of the important factors in boosting agricultural productivity. One cannot exaggerate the value of seed to any farm-based crop production system because it is a crucial source of income for all crop production systems (Etwire et al., 2013). The non-traditional system and the traditional system are the two main categories of seed systems in Ghana. The non-traditional seed system is governed, and the seeds were modified and hybridized, in contrast to the conventional seed system. More than 80% of smallholder farmers in Africa acquire seeds from the traditional sector, according to Boef (2012), by using their own seeds, buying the seeds, or trading seeds in rural communities. In accordance with the 2010 Plants and Fertilizer Act, seed

distribution and organization policies are set forth. The Establishment Of the national Council (NSC) is essential to the nation's seed distribution. Production and certification policies are excluded, though. The ultimate objective of the law is to boost agricultural productivity in the country by introducing and utilizing modern technologies. Its goal was to improve the corporate conduct of companies that make improved crop seeds. The implementation of seed control legislation was expected to promote the seed sector to create reliable seeds for farmers to increase agricultural output. the Crops and Fertilizer Act concurrently (2010). The Food and Agriculture Ministry created the National Seed Policy with the goal of aiding the business sector in promoting the creation and distribution of better seeds to farmers.

The National Seed Policy provides a comprehensive description of the legislative structure for variety release, variety licensing, accreditation of seed quality control responsibilities, and simplification of seed import and export procedures (GoG, 2013). This approach will help Ghana's seed production become more efficient. However, as shown in Table 1, the output of certified seeds for maize, rice, soybean, cowpea, sorghum, and peanut has changed over time. The fact that programs are frequently employed to aid in seed production and that the majority of these projects receive sporadic funding from donors can be used to explain this. The failure of government initiatives to create a formal seed distribution system and promote an environment supportive to seed commercialization cannot be ignored.

Although some of these manufacturers are registered and subject to regulation, it is a well-known fact that many unregistered makers of improved certified seeds produce seeds with low germination rates when farmers have

planted them on their fields. The availability of premium seeds seeks to boost the production of healthy foods (McGuire and Sperling 2010). For the supply of high-quality seed to be guaranteed, a solid and effective infrastructure will be essential. A seed system is "the whole of the formal, informal, and seed aid elements as well as the physical, organizational, and institutional components, their activities, and their interactions that regulate seed availability and consumption, in terms of both quantity and quality" (Scoones and Thompson 2011:8). It consists of a network of individuals and groups engaged in the development, production, multiplication, distribution, and sale of seeds throughout a certain geographical region. Ghana, like the majority of African nations, has two distinct seed systems: a formal seed system that was developed by the government and an informal system that is based on conventional methods of farmer seed exchange (Niangado 2010). Most small-scale farmers in Ghana obtain their seeds from the unofficial seed system (Etwire et al 2013). Farmer-held seed, unofficial seed exchanges, unofficial seed storage techniques, and the preservation of conventional seed knowledge are all included (Gill et al 2013). In contrast, the formal system requires seeds to pass a variety of regulatory tests including inspections (Etwire et al 2013). The formal seed system includes defined processes for the breeding, production, multiplication, certification, distribution, marketing, and storage of seeds in a designated location and is based on a well-organized framework that regulates the actions of significant parties (Gill et al 2013; Niangado 2010; Etwire et al 2013). The system has provided approved enhanced seed variants of a wide range of diverse crops, including maize, sorghum, rice, and groundnuts, over the years. The method makes seed quality control possible.

But the formal seed system's biggest problem is a lack of advertising and smallholder farmers' ignorance of new varieties (Etwire et al 2013).

Table 1: Ghana's production of certified seeds from 2001 to 2011

Year	Maize	Rice	Soybean	Cowpea	Sorghum	Groundnut
2001	969	732	87	34	7	–
2002	1,488	457	190	28	15	–
2003	1,214	407	179	27	36	9
2004	1,365	495	–	47	36	9
2005	2,035	233	356	30	14	63
2006	2,672	516	218	35	5	23
2007	1,407	343	92	57	1	3
2008	2,374	555	154	38	5	7
2009	3,799	2,378	295	16	6	9
2010	3,424	3,906	354	27	5	18
2011	2,770	2,367	189	14	1	_

Source: Plant Protection and Regula Service Department (2010)

Acceptance of the Planting for Food and Job Programme

According to Chirelstein Marvin (2001), acceptance is an outright declaration of agreement to the conditions of an offer in a fashion that is desired or required by the offer, which results in the creation of a binding legal contract. The former speaks about the rate at which farmers used available technologies to buy fertilizer subsidies as part of a new intervention program (BonabanaWabbi 2002). The adoption process, in the words of Rogers (1983), is the mental process that a person goes through from first hearing about the idea through final acceptance. Gershon, Just, and Zilberman (1985) proposed the notion that ultimate adoption by a farming household is "the degree of application of a new technology in the long-run equilibrium when the farmer has complete understanding of the new technology and its potential."

Farmers perceived attribute of the characteristics of the PFJ programme

Agricultural intervention can increase food production, improve nutrition, and improve overall health (Patterson et al., 2017). Farmers, particularly smallholder farmers, have over the years accepted agricultural innovations at a slow pace (Jack, 2013; Kabunga, Dubois, & Qaim, 2012; Llewellyn, Lindner, Pannell, & Powles, 2007; Moser & Barrett, 2006). Agroforestry innovations (Mercer, 2004), precision agriculture technologies (Tey & Brindal, 2012), agricultural management practices (Baumgart-Getz, Prokopy, & Floress, 2012), conservation agriculture practices by farmers (Knowler & Bradshaw, 2007), resource-poor farmers, etc. are a few examples of technologies that have been the focus of prior studies on the adoption of agricultural innovations (Pannell, Llewellyn, & Corbeels, 2014). Each agricultural invention must be given more consideration, and the contributions of these innovation-specific reviews must also be valued. Such a review was carried out by Feder and Umali in 1993, but it wasn't systematic, which is known to increase the risk of selection bias (Pace et al., 2012; Wong, Cheung, & Hart, 2008). The qualities that promote adoption have likewise received little clear-cut research attention. According to various research, some factors are essential in farmers' adoption decision-making (Arslan, McCarthy, Lipper, Asfaw, & Cattaneo, 2014, Pannell et al., 2014). Numerous studies have failed to demonstrate distinct drivers of adoption, which may be explained by the fact that different methodological approaches were used by the researchers and that the factors influencing farmers' decision-making interplay in varied ways (Aubert, Schroeder, & Grimaudo, 2012; Marra, Pannell, & Ghadim, 2003; Meijer, Catacutan, Ajayi, Sileshi, & Nieuwenhuis, 2015). The review

studies that are now available (Pannell et al., 2014; Prokopy, Floress, Klotthor-Weinkauf, & Baumgart-Getz, 2008) concentrate on a specific innovation, but many of them neglect to include the various methodologies that are used to explain farmer uptake. “This study attempts to perform a thorough analysis of how farmers have adopted agricultural advances. Due to the wide range of methodologies described in the literature on farmer adoption, our analysis particularly focuses on economic valuation studies, i.e. studies that elicit farmers' willingness to embrace the Planting for Food and Job campaign that they have accepted or are planning to implement”. Adoption of Planting for Food and Job is viewed as a key indicator of adoption or adoption intention for a product or innovation (Marechera & Ndwiga, 2015; Tey & Brindal, 2012), especially in the context of developing nations where (smallholder) farmers may have limited financial means. As a result, farmers' willingness and financial capacity are commonly needed for the adoption of agricultural technologies (M. Aydogdu & Yenigun, 2016; M. H. Aydogdu & Bilgic Binswanger & Pingali, 2016).

Livelihood Diversification Strategies for Rural Households

According to studies on sustainable livelihoods, many rural livelihood strategies value diversity (i.e., the exploitation of a variety of resources and revenue streams) as an essential quality (Warren, 2002). According to the DFID's sustainable livelihoods lexicon (DFID, 2001), "livelihood strategies" refers to one's combination of sources of income, use of assets, choice of assets to invest in, and ability to manage the preservation of current assets and income. According to Reardon et al. (1998), the average rural household in Africa and Asia today receives between 40 and 45 percent and 32 percent of

its income from non-farm sources, respectively. According to Escobal (2001), the corresponding percentages for rural Latin America and rural Peru are 40 and 51 percent, respectively. According to Barrett et al. (2001) and other scholars who hold a similar perspective, diversifying one's source of income is a key strategy for lowering risk for individuals and is commonly regarded as a type of self-insurance. Non-agricultural income diversification in Ghana doesn't just mean that households are engaging in non-agricultural activities; it also means that they are frequently pursuing multiple non-agricultural businesses concurrently or at various points during the year.

According to Bryceson (2002), the majority of the operations are extremely opportunistic in character and involve prompt adjustments to market supply and demand. “Off-farm activities are already widely practiced in Ghana, both in rural and urban regions, according to research”. According to the Ghana Statistical Service's estimation from 2007, “46.4 percent of families in Ghana are involved in non-farm activities”. This finding is supported by a case study of four rural villages in three agricultural zones of Ghana conducted by Oduro and Osei-Akoto in 2007. Numerous non-farm jobs were discovered to be held by locals, including carpentry, tailoring, brewing pito, food processing, trading charcoal, masonry, raising animals (including rabbits and grasscutter), sewing, teaching, and nursing. When Lay and Schuler (2008) examined the changes in the income portfolios of rural households in Ghana, they discovered that households with few assets which make up a significant portion of the rural population were more likely to be forced to engage in non-farm activities in order to meet their subsistence needs. According to the justification provided, it is clear that the term "rural

livelihood diversification" refers to the process by which rural households create a more varied portfolio of ventures and possessions in order to thrive and raise their standard of living. Policymakers therefore need to be more aware of the microeconomic constraints and incentives that influence livelihood diversification as well as the welfare effects of such choices, particularly for farming households. According to Chambers and Conway (1992), a straightforward description of a livelihood as a way to make a living sums up a reality that becomes more complex as its components are recognized and defined and as its structure is unraveled. They found four sorts of items in their study of household livelihoods. The core of a livelihood, according to Chambers and Conway (1992), is a living, and they characterized the portfolio of tangible and intangible assets as the most complex of the four components (that is: people, tangible assets, intangible assets and a living).

Conceptual Framework

The diffusion of Innovation (DOI) theory by Rogers (1983) and the Theory of Change by Weiss (1990) was factored in the conceptual framework of the study. The Weiss theory however explains how outcomes from adoption of an innovation like Planting for Food and Jobs programme can influence crop yield and income of people. The independent variables of the study were seeds and fertilizer subsidy component of the planting for food and jobs and the dependent variables of the study were; 1 Perceived attribute the seeds and fertilizers subsidy of the PFJ 2. Perceived effectiveness of the programme yield and income 3. Impact of the programme on yield and on income of maize farmers and 4. Challenges impinging on the implementation

of the seeds and fertilizer subsidy component of the PFJ as the dependent variable

a) The acceptance of the seed and fertilizer subsidy component under the PFJ.

b) Farmers' perceived effectiveness of the seed and fertilizer subsidy components of the PFJ.

c) The effect of the projects on yield and income of maize farmers in the study area

d) Farmers', yield before and after the adoption of the seed and fertilizer component of the PFJ.

e) Implementation Challenges

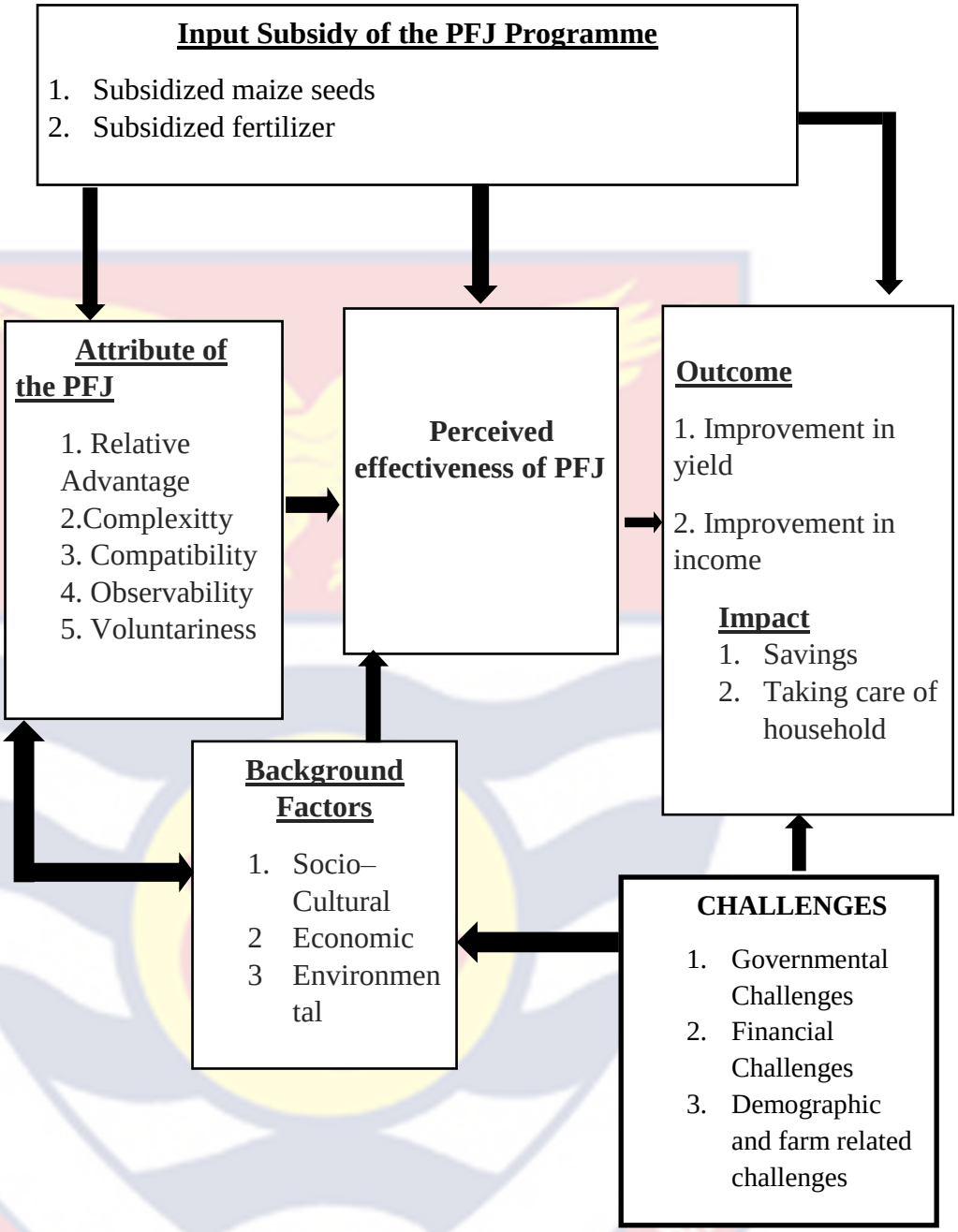


Figure 4: Conceptual framework of effect of the Seeds and Fertilizer subsidy component of the PFJ in the Central Region of Ghana

Author's Construct (Nfaaful, 2021)

A conceptual framework, according to (Miles and Huberman 2013), explains the essential things to be researched in graphical, schematic, and narrative forms, as well as how well those components relate to each other in the study. The goal of this study was to determine how perceived attributes of

innovations, such as relative advantage, complexity, compatibility of a technology with one's working environment, observability of innovation, and triability of a new programme, will increase yield and income through the use of the seed and fertilizer subsidy component of the programme (Rogers, 1983). From the diagram, institutional factor such as extension service delivery, Farmers Based Organizations seem to have influence on farmer's willingness to accept the seeds and fertilizer subsidy component of the intervention programme. As stated earlier in the literature, extension plays pivotal row in information communication and training of farmers on how to access any intervention programme if the need arises. Farmer Based Organizations can also not be over looked at as far as access to credit facility is concerned. Therefore, the whole idea of the diagram is explained by the fact that institutional factor as explain earlier will influence farmers to have change in behaviour in order to accept the input subsidy. After acceptance farmers go through comprehensive registration procedures to become beneficiaries.

After accepting and becoming beneficiaries, it is anticipated that there will be an improvement in yield and income of farmers and this will finally leads sustainable livelihood. The above stated impact as caption will help farmers to save and be able to take care of their household. Also, from the theory of diffusion of innovation module, Socio–Cultural, Economic, Environmental factor also seem to have reversible effect on farmers willingness to accept or reject a programme and so the background factors was linked to the acceptance reversibly. The study viewed problems of implementation of the seeds and fertilizer subsidy component of the Planting

for Food and Job programme as a challenge not necessarily as barriers. The study identified and categorized four (4) major areas of challenges that Planting for Food and Job programme (PFJ) needs to address before the programme can be successfully developed and implemented. These broader areas of the challenges were: (a) training challenge, (b) Financial challenges, (c) demographic challenge, (d) governmental challenge (Najafabadi et al., 2011)

CHAPTER THREE

METHODOLOGY

Introduction

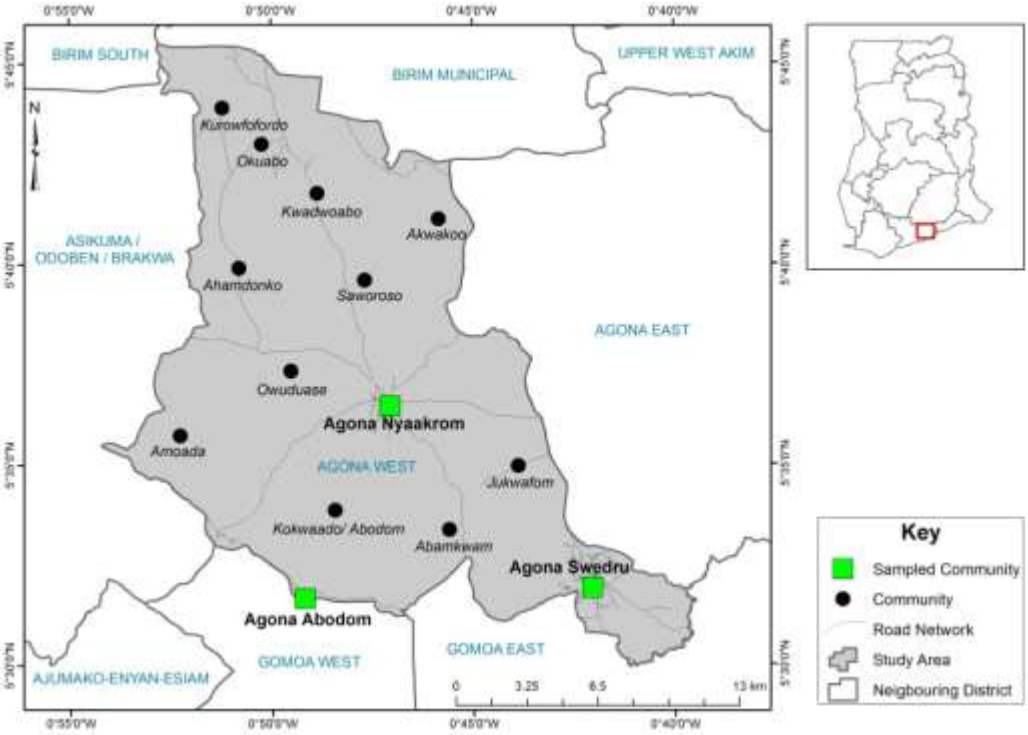
This chapter describes the procedures and methods used in data gathering, collection and analysis on the effect of seeds and fertilizer subsidy component of the Planting for Food and Job programme on yield and income of maize farmers in the Agona West Municipality of the Central Region of Ghana. The research design, population, sample size, sampling technique, instrumentation, data collection, data processing, and data analysis are the primary topics covered in this chapter.

Research Design

The study was conducted using quantitative approach. The study adopted the descriptive survey design because it focused on a population of maize farmers of distinctive characteristics (Asika, 2008). Descriptive survey enabled the study to compare and contrast objectives, opinions, perceptions, attitudes and other characteristics of the maize farmers who participated in the Planting for Foods and Jobs Programme (Bennette, 1979). Survey was deemed appropriate due to the need to collect data that is of interest to the study from the maize farmers (Nwankwo, 2010). Again, survey was used to describe the yield and income of the respondent of PFJ beneficiaries with the intension to generalize the result to the population (Bosompem, 2016). According to (Asante, 2005), Surveys are said to be flexible, easy to use and inexpensive as compared to other research designs.

Study Area

The study was conducted in three important maize-growing operational areas in the central region of Ghana: Agona Swedru, Agona Nyakrom, and Agona Abodom, where maize production dominates other arable crops. The Central Region borders the Ashanti Region in the north, the Eastern Region in the north-east, the Greater Accra Region in the south-east, and the Western Region in the west. It is bordered to the south by the Gulf of Guinea. The shoreline of the area is 150 kilometers long. According to the Ministry of Finance, the region is one of Ghana's smallest, being marginally larger than the Upper East and Greater Accra Regions (Lands Commission, 2010). There are currently 17 districts in the area, with three Agro-ecological zones in each district. The study was conducted in the moderate woodland and savanna municipality of Agona West, which has a higher proportion of farmers. Agona West Municipality has a population of 180000 people. The municipality is bounded to the east and west by Asikuma/Odoben/Brakwa and Efutu Municipal. The municipality is bordered on the northeast by Akim West Municipal, the northwest by Birim-South District, and the south by Gomoa Central District. With a few isolated hillocks in the northeast made primarily of granite rocks, the municipality of Agona West is primarily undulating and slopes from north to south. The area is drained mostly by the Ayensu and Akora rivers. The municipality is located in a humid, semi-arid region with a bi-modal rainfall pattern. The region is covered by a zone of moist semi-deciduous forest, which contains a number of important species including mahogany, sapele, and wawa that can be used to process timber.



F*igure 5*: Map of study area showing maize growing areas in the Agona West Municipality

Source: Geography and Regional Planning Department, (UCC, 2021)

Population of the Study

The population of the study was maize farmers who are beneficiaries of the PFJ programme in the Agona West Municipality in the Central Region of Ghana. The total beneficiaries of maize farmers as at 2017 in the municipal were 800 maize farmers. These farmers received fertilizer and seed subsidies under the programme.

Sample Procedure and Sampling size

The study employed simple random sampling procedure to select the respondent. The entire registered beneficiaries (populations) were 800 maize farmers. Krejcie and Morgan (1970) sample size table was utilized to estimate the sample size from a population of 800 farmers. According to the table, with a given a population of 800, a sample size of 260 is ideal for the research (See

Appendix B). To take care of low response rate, a 10 percent non-response rate was calculated and added to the sample size of 260. The 10 percent non response rate gave 26 farmers which was added to the 260 farmers. The total sample size used for the study was 286 farmers (i.e 260+26). The farmers were randomly selected using the lottery method. List of Maize farmers including the names, addresses, and contact information of each farmer who were beneficiaries of the seeds and fertilizer subsidy component of the PFJ were obtained from the Department of Food and Agriculture in the Agona West Municipality of the Central Region of Ghana. Next, we generated a random number sequence using a random number generator tool. We then used this sequence to select 286 farmers from the population list. We ensured that each selected farmer was not replaced and only sampled once. This ensured that the sample was representative of the population. After selecting the farmers, we contacted them to arrange for an interview. We conducted face-to-face interviews with the farmers using a structured interview schedule. The interview schedule covered topics such as farming practices, challenges faced, and opportunities for improvement. (Alumode, 2011; Vanderstoep & Johnston, 2009). In all 277 farmers were interview 9 farmers could not participate in the interview.

Instrumentation

Primary data for the study were gathered using a structured interview schedule. The instruments' face and content validity were both guaranteed. The supervisor ensured content validity of the set of instruments utilized for the study, while the researcher ensured face validity. Data from maize farmers who registered to participate in the PFJ programme from 2017 to 2020 was

only gathered using an interview schedule. The instruments consisted of six main sections. Section A: was made up of the demographic and farm-related characteristics of maize framers. Section B: dealt with the Perceived Attribute of the Seeds and Fertilizer Subsidy component of the PFJ programme. A five-point Likert type scale of 1= No agreement, 2 = Less agree, 3 = Fairly agree, 4 = Agree, 5 = Strongly agree. Section C of the instrument looked at the effectiveness of the Seeds and fertilizer Subsidy of the PFJ programme as perceived by the beneficiary farmers. A five-point Likert scale of 1 = Not effective, 2 = Low effective, 3 = Moderately effective, 4 = Effective and 5 = Highly effective.

Section D of the instrument looked at Seeds and fertilizer Subsidy of the PFJ programme as a source of yield and income. Section E of the instrument compared yield before and after the use of the seeds and fertilizer subsidy component of the PFJ programme. Finally, Section F looked at Challenges of the seeds and fertilizer Subsidy of the PFJ programme.

Open-ended, closed-ended, and somewhat closed-ended questions were used to evaluate the items in sections A and D. The majority of the items in Sections B, C, E, and F were scored on a Likert-type scale with a range of 1 to 5, with 5 representing the highest level of agreement.

Table 2: Interpretations of Likert-type scales used in the study

Rating	Range	Attribute of PFJ	Effectiveness of PFJ	Challenges of the PFJ
1	1.00 -1.44	Very low agreement	No agreement	Negligible Challenge
2	1.45 -2.44	Low Agreement	Low agreement	Low Challenge
3	2.45 – 3.44	Fair Agreement	Fairly agreement	Moderate Challenge
4	3.45 – 4.44	High agreement	High agreement	Substantial Challenge
5	4.45 – 5.00	Very high Agreement	Very high agreement	High Challenge

Source: Authors Construct (Nfaaful, 2021)

Pilot Study

In order to assess the prediction performance of the instruments for the maize farmers, a pilot study was undertaken in the Gomoa Central District, a nearby community where maize farming was also prevalent. Throughout the experimental programme, 40 farmers in total were employed. The pilot study was carried out over a period of three days. The study was completed in the first week of September 2021. Version 25 of IBM SPSS was used to code the responses. Cronbach's alpha dependability had a determined value of 0.868. This demonstrated to the researcher that every question utilizing a Likert-type scale had items that were internally consistent (Nunnelly, 1998). The major aim was to investigate if things on different dimensions and subscales shared the same fundamental concept. Table 3 however displays the results of the cronbach's alpha reliability coefficients of the instrument.

Table 3: Reliability Analysis of Subscale of the Research instruments and the calculated Cronbach's Alpha

Variables	Number of items	Cronbach's Alpha
Challenges of the PFJ		
Financial Challenge	3	0.833
Technical Challenges	4	0.852
Governmental Challenge	2	0.840
Demographic and Farm related challenge	5	0.860
Attribute of the PFJ		
Compatibility	2	0.855
Relative Advantage	2	0.854
Complexity	3	0.850
Observability	3	0.856
Voluntariness	5	0.840

n=40 Source: Field pilot data (Nfaaful, 2021),

Validity and Reliability of Instruments

Face validity of the instrument was determined by the student researcher to ensure that the research instrument measure the variable based on the objective of the study whereas content validity was determined by supervisor from the University of Cape Coast, Department of Agricultural Economics and Extension.

The interview schedule was piloted in the Gomoa Central district specifically Gomoa Abaasa, Abonyi and Afransi in the central region, where maize production is the most common crop. This allowed me to determine whether the interview schedule is self-explanatory. Computed Cronbach's Alpha reliability was between 0.850 - 0.883 indicating the subscale in the likert-scale was reliable (Pallant, 2016).

Data Collection

In order to introduce the student researcher to the study area, an introductory letter was obtained from the Head of Department, Agricultural Economics and Extension of University of Cape Coast to enhance the credibility of the research and also helps researcher to get information from respondents. The structured interview schedule was translated to the local language and the response were recorded in the interview schedule with the help two field assistant. The data was collected for 2017 to 2021 farming season. Out of the sample of 286, 277 respondents were reached indicating about 97% response rate.

Data Analysis

Field data gathered was coded and entered into SPSS version 25 for analysis and interpretation for all the needed discussions. The table indicate the statistical tools used in each of the objectives

Table 4 List of objectives with respective statistical tools for analysis.

Objectives	Statistical stool to be used for analysis
1. Perceived attributes of the seeds and fertilizer subsidy of the PFJ programme.	Frequencies, percentages, means, and standard deviations
2. Perceived effectiveness of the seeds and fertilizer subsidy component of the PFJ	Frequencies, percentages, mean, Standard deviation
3. Compare yield before and after the implementation of PFJ	Dependent sample t-test (H_0- No significant difference between yield before and after the implementation of the PFJ
4. Compare the impact of PFJ on yield of maize farmers of male and female headed household	Independent sample t-test (H_0- No significant difference between yield of maize farmers of male and female headed household.
5. Identify the relationship between the impact on yield and farmers perceived attribute and demographic characteristics	Pearson Correlation, Spearman, Biserial and Point Biserial (H2 – No significant relationship between impact on yield and income and independent variable i.e objective 4, 5 and demographic characteristic
6. Challenges of the PFJ programme	Descriptive

Source: Authors construct (Nfaaful, 2021)

Ethical Considerations

The consent of the District Director of the Department of Food and Agriculture was sought before proceeding to meet with farmers in the municipality. Furthermore, respondents were adequately informed about the motives and goal of the research by the AEAs in the three operational areas, and their agreement and willingness to participate was duly requested before the exercise was carried out. Other protocols like ensuring their right to anonymity, confidentiality, and the potential use of findings, among others were equally respected.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This chapter presents and discusses the results in relation to the specific objectives and hypotheses set for the study. In view of this, the chapter comprehensively discuss the demographic characteristics of maize farmers in the study area, beneficiary farmers perceived attribute of the seeds and fertilizer subsidy components of the programme, their perceived effectiveness of the and impact of the seeds and fertilizer subsidy component of the programme on yield and income and challenges regarding the implementation of the PFJ programme of maize farmers in the Agona West Municipality of the Central Region of Ghana.

Demographic and farm-related Characteristics of Smallholder Maize Farmers

The demographic characteristics of the maize farmers is presented in this section. The variables presented include sex, age, level of education, and marital status.

Table 5: Descriptive Statistics of the Demographic Characteristics of Maize farmers

Variables	Categories	f	%
Sex (n = 277)	Male	179	64.6
	Female	98	35.4
Age (yrs)	20 – 29	7	2.5
	30 - 39	22	7.9
	40 – 49	74	26.7
	50 -59	108	39
	Above 60	66	23.9
Educational level (n = 277)	No Formal	108	39.0
	Primary Education	66	23.8
	MSLC	74	26.7
	Secondary Education	22	7.9
	GCE 'O' Level	7	2.6
Marital Status	Married	223	80.5
	Single	33	11.9
	Divorce	21	7.6

n = 277 Source: Field data, Nfaaful, 2021

The findings of the study on the sex of respondents are presented in Table 5. According to the results, males made up the majority of maize farmers representing approximately 65% of the respondent with the remainder 35% being female. The interview result revealed that the majority of respondents (males) in the research domain were also the heads of their respective houses. This finding is comparable to findings by Adusei (2012) who found out that men made up 70% of the 500 arable crop farmers studied in the Central Region. Additionally, according to Eduamoah (2014), males made up 72% of the 200 maize farmers who were sampled in Western North District of Ghana. As a result, males predominate arable crop production in the Central and Western Regions of Ghana.

Table 5 again shows the age distribution of maize growers in the study area. Sixty-two percent (62%) of the maize farmers surveyed were 50 years of age or older. This situation depicts an ageing of maize farmers in the study

area and confirm a study by the Ministry of Food and Agriculture that the mean age of the arable crop farmers within every district or municipality in Ghana is approximately 53years (MoFA,2016). That report puts average age of farmers in Ghana to 55 years. Twenty-nine (29) maize farmers representing about 10% of the respondents interviewed aged below 39 years. This means that the youth in the study area who are into maize farming are relatively few. This result could be attributed to negative perception about farming as an occupation in general by the youth in Ghana. Asante (2005) reported that majority of youth in the Central Region of Ghana are not into farming and could be a major threat to food security in the Region in some years to come.

In terms of education, more than one third (39%) of the farmers had no formal education. The rest, representing 61% had formal education from primary to pre-tertiary (Primary education = 23.80%, Middle School Leaving Certificate = 26.70%, Secondary = 7.90% and GCE 'O' Level 2.60%). This imply that most of the maize growers within the municipality can access and use the seeds and fertilizer subsidy component of the intervention programme effectively since majority have had formal education. Farmers with formal education however can help educate their colleague farmers with no formal education on the importance of using hybrid seeds and fertilizer to improve productivity so as to ensure food availability in the country. The results are similar to the finding of Nyamekye (2015) that most arable crops farmers in Ghana can read, write and follow fertilizer application protocols because of formal education.

Findings from Table 5 also shows that majority of the respondent representing approximately 81% of maize farmers in the study were married whereas only 11.9% and 7.6% were divorced and single respectively. The 80.5% married couples in the study area seems encouraging and shows promising attitude of farmers in the study area since this will help both couples to take care of their household because according to USAID (2015), divorce or single parenting is the major contributor of way ward children in most rural communities.

Maize farmers perceived attribute of the seeds and fertilizer subsidy component of PFJ

The attribute of the seeds and fertilizer subsidy component of the PFJ programme considered under the study were Relative Advantage, Compatibility, Complexity and Voluntariness.

Table 6: Relative Advantage of perceived attribute of PFJ

Relative Advantage	Mean	SD
Adopting the seeds and fertilizer subsidy component of the programme will increase my productivity	3.69	1.02
Planting for Food and Job programme increases the quality of farm output	3.58	1.05
Overall	3.63	0.86

[n=277] Scale: 1=Very low agreement 2=Low agreement 3=Fair Agreement 4= High agreement 5=Very High agreement

Source: Field data, Nfaaful, 2021

Table 6 shows the mean and standard deviations of maize farmers perceived relative advantage component of the characteristics of the PFJ programme over existing intervention programme. From the table, maize farmers attest to the fact that using the seeds and fertilizer subsidy component of the PFJ intervention programme increased farmers productivity ($\bar{X}$=3.69,

SD=1.02). Result from Table 6 also shows that Planting for Food and Job programme had improved farm output ($\bar{X}$=3.58, SD=1.05). Again, the overall mean and standard deviation was computed to be 3.63 and 0.86 ($\bar{X}$=3.63 SD=0.86). The result shows the PFJ programme is relatively advantageous over existing farming technology in the study area.

Table 7: Compatibility of the perceived attribute of the PFJ programme

Compatibility	Mean	Std. Deviation
The concept of PFJ programme is compatible with existing farming practice	2.92	1.18
PFJ programme would fit into my lifestyle of crop farming	2.60	1.10
Overall	2.75	0.99

[n=277] Scale: 1=Very low agreement 2=Low agreement 3=Fair Agreement 4= High agreement 5=Very High agreement
Source: Field data, Nfaaful, 2021

Result from Table 7 again shows maize farmers perceived compatibility of the seed and fertilizer subsidy component of the PFJ programme. Maize farmers attest to the fact that using the seeds and fertilizer subsidy component of the PFJ intervention programme was fairly compatible with all existing farming practices of farmers ($\bar{X}$=2.92, SD=1.18). Result from table 7 again shows that the intervention programme would fit into maize farmers lifestyle of their farming occupation in the study area ($\bar{X}$=2.60, SD=.1.10). Table 7 again shows the seeds and fertilizer subsidy component of the PFJ policy was compatible with overall score of ($\bar{X}$=2.75, SD=.99). This result is similar to findings by Fischer and Vasseur (2002) who found out that farming styles in most rural communities in the Upper Eastern Region of

Ghana is one of the factors influencing adoption of agricultural technology an account for 70% of the factor considered in total

Table 8: Farmers perceived observability of the PFJ programme

Observability	Mean	Std. Deviation
The results of adopting a PFJ programme component would be easy for me to communicate to others.	3.60	0.73
I believe I could communicate to others the end result of using the PFJ programme in ones farming occupation	3.30	0.74
The results of adopting seeds and fertilizer subsidy are apparent to me	3.15	1.06
Overall	3.34	.52

[n=277] Scale: 1=Very low agreement 2=Low agreement, 3=Fair Agreement 4= High agreement 5=Very High agreement
Source: Field data, Nfaaful, 2021

Result from Table 8 shows the farmers' perceived observability component of the characteristics of the PFJ technology. From the Table, maize farmers interviewed in the study area attest to the fact that they would have no difficulty telling others about the result of adopting seeds and fertilizers subsidy component of the PFJ programme ($\bar{X}$=3.60, SD=0.73). Also, the table shows that farmers have the conviction to communicate to others the end result of using the PFJ programme in ones' farming occupation ($\bar{X}$=3.30, SD=0.74). The end results of adopting seeds and fertilizer subsidy component of the Planting for Food and Job programme were apparent to beneficiary maize farmers in the study area ($\bar{X}$=3.15, SD=1.06). Hall and Khan (2002) reported that famers willingness to adopt an agricultural technology is influenced by the physical characteristics of the technology in question which are easily observed by farmers. In all, beneficiary farmers

perceived the seeds and fertilizer subsidy component of the PFJ programme to be fairly observable ($\bar{X}$=3.34, SD=.52)

Table 9: Beneficiary farmers perceived complexity of the seeds and fertilizer subsidy component of the PFJ programme

Complexity	Mean	Std. Deviation
I find it difficult to access all the seed and fertilizer component of the PFJ input	3.31	1.10
I can easily apply the seeds and fertilizer subsidy component PFJ input without any stress	2.68	1.00
The use of identification card for farmers registration looks good to me	3.12	1.01
Overall mean	3.04	1.04

[n=277] Scale: 1=Very low agreement 2=Low agreement 3=Fair Agreement 4= High agreement 5=Very High agreement
Source: Field data, Nfaaful, 2021

Table 9 shows beneficiary maize farmers' perceive ease of use(complexity) of the seeds and fertilizer subsidy component of the PFJ programme. Again, beneficiary maize farmers interviewed in the study region testified from the table that they find it fairly difficult to obtain all of the input subsidy of the PFJ programme ($\bar{X}$=3.31, SD=1.10). With a mean and standard deviation of 2.70 and 0.97, respectively, the table also demonstrates that beneficiary farmers experience low level of stress in accessing PFJ input ($\bar{X}$ =2.70, SD=0.97). With a mean and standard deviation of 3.12 and 1.01, the final result demonstrates that the adoption of identification cards for farmers' registration is favorable to maize farmers in the research area.

Table 10:Perceive voluntariness of the PFJ component of the programme

Voluntariness	Mean	Std. Deviation
I was encouraged by a colleague farmer to take part in the PFJ programme	3.92	1.43
I accepted the PFJ input subsidy because it was subsidized	3.52	1.01
I am a farmer and eager to be first to use any new farming programme	3.19	1.40
I am willing to follow the lead of others in using the input subsidy of the PFJ programme	2.26	0.60
I need to be convinced of the advantage of the PFJ programme by peers	2.70	1.34
Overall mean	3.72	1.12

[n=277] Scale: 1=Very low agreement 2=Low agreement 3=Fair Agreement 4= High agreement 5=Very High agreement
Source: Field data, Nfaaful, 2021

Table 10 shows maize farmers' perceived voluntariness of the seeds and fertilizer subsidy of the PFJ programme. Maize farmers highly agreed that they were encouraged by colleague farmers to take part in the PFJ programme ($\bar{X}$ =3.93, SD=1.43). Also, beneficiary maize farmers in the research area accepted the PFJ input subsidy because it was subsidized ($\bar{X}$ =3.52, SD=1.01). The table also shows that farmers fairly agreed that they were keen to be the first to apply any new intervention programme ($\bar{X}$=3.20, SD=1.40). The maize farmers within the municipality were also less willing ($\bar{X}$=2.26, SD=0.60) to follow the example of others in employing the seeds and fertilizer subsidy component of the PFJ program. In all farmers highly agreed they participated in the seeds and fertilizer subsidy component of the PFJ without any external pressure on them to adopt ($\bar{X}$=3.72, SD=1.12). This result confirms findings from Morris (2012).

Table 11: Comparison of the maize farmers perceived attribute of the seeds and fertilizer subsidy of the PFJ programme

Attribute of the PFJ	$\bar{X}$	SD
Relative Advantage	3.63	.86
Observability	3.34	.52
Complexity	3.04	.69
Voluntariness	3.72	1.12
Compatibility	2.75	.99

Scale: 1=Very low agreement 2=Low agreement 3=Fair Agreement 4= High agreement 5=Very High agreement
Source: Field Survey, Nfaaful (2021)

Table 11 shows the comparison of maize farmers perceived characteristics of the PFJ technology. From the table, majority of maize farmers strongly agreed that the PFJ intervention was voluntarily adopted by farmers in the study area without any pressure thereof ($\bar{X}$=3.72, SD=1.12). It was however, followed by relative advantage of the programme over existing technology ($\bar{X}$=3.63, SD=.86). The result of 'Relative Advantage confirm finding by Etwire et al 2013 who found a positive correlation between nature of intervention and willingness to adoption. This implies that majority of the maize farmers interviewed perceived PFJ to have the potentials of being more profitable than the existing maize farming technologies since the adoption was not forced on them.

In terms of Observability of PFJ intervention programme, maize farmers in the study area, fairly agreed ($\bar{X}$=3.34, SD=.52), that the physical characteristics of the improved seeds and high-quality fertilizers were demonstrated to them. This may have future implication on adoption.

Again, the result showed that maize farmers interviewed agreed to the fact that the intervention programme was fairly complex ($\bar{X}$ = 3.04 SD =

0.69). From the interview, the mode and criteria for becoming a beneficiary seem to be complex to them as compared to other intervention programme, the ever-changing terms and conditions of becoming beneficiary seem too complex to the farmers in the study area. In terms of compatibility, beneficiary farmers showed low level of agreement ($\bar{X}$=2.75, SD= .99). This implies that respondents were not too sure the degree to which the results of PFJ would be compatible to their farming occupation.

Voluntariness as an attribute of the PFJ had greater mean and standard deviation ($\bar{X}$=3.72, SD= 1.12) which shows that farmers in the study area were not pressured but welcome the intervention willingly since their net gain from their stand point seems high. This result is similar to findings by Foster and Rosengzeig (2010) who concluded that the net gain of farmers from adopting a new technology, taking into account all associated costs, is a crucial factor in determining acceptance "It has been discovered that one barrier to technology adoption is the expense of implementing agricultural technologies". For instance, since the 1990s, the structural adjustment initiatives of the World Bank in sub-Saharan Africa have exacerbated this restriction by removing subsidies on the costs of seed and fertilizer and hence makes farmers difficult to adopt an intervention programme (Muzari et al., 2013).

Maize farmers perceived effectiveness of the seeds and fertilizer subsidy component of PFJ programme

Table 12: Type of Seed received under the PFJ programme

Type seed	Cropping Year	f	%
Open Pollinated	2017-2018	130	45.45
Variety (OPV)	2018-2019	140	48.95
	2019-2020	76	26.57
	2020-2021	159	55.60
Type seed	Cropping Year	Frequency	Percentage
Hybrid Seeds	2017-2018	156	54.55
	2018-2019	146	51.05
	2019-2020	210	73.43
	2020-2021	127	44.40

Source: Field Survey, Nfaaful (2021)

Table 12 shows the type of improve seeds received by beneficiary maize farmers in the study area from 2017 to 2021 cropping season. The result indicate that majority (54.5%) of beneficiary maize farmers receive the Hybrid seeds between the cropping period of 2017 to 2020 as compared to the Open Pollinated Variety (OPV). Although only two improved varieties were available to beneficiary farmers in the study area, beneficiary farmers preferred hybrid seeds over the open pollinated variety from 2017 to 2021 exclusive 2019-2020 cropping season.

Table 13 Number of Times Beneficiary Farmers Receive the Seeds and Fertilizer subsidy component of the PFJ

Number of times	f	%
Once a year	40	14.4
Two Times a year	85	30.7
Three times a year	140	50.5
Above Three time a year	12	4.4

[n=277] Scale: 1=Ones a year 2=Two times a year 3= Three times a year 4= Above three times a year

Source: Field Survey, Nfaaful (2021)

Table 13 shows that majority (almost 51%) of beneficiary maize farmers in the study area received the seeds and fertilizer subsidy component of the PFJ three times in the cropping year. This result indicates the PFJ policy highly effective within the municipality.

Table 14 Effectiveness of seeds and fertilizer subsidy component of the PFJ programme

Variable	Frequency	Percentage
Using the subsidized fertilizer has improve my Production		
No agreement	4	1.4
Less agree	4	1.4
Fairly agree	5	1.8
Agree	11	4.0
Strongly agree	253	91.3
Using the subsidized seed has improve production		
No agreement	-	-
Less agree	1	0.4
Fairly agree	4	1.4
Agree	7	2.5
Strongly agree	265	95.7
My yield has increase drastically as compared to Previously		
No agreement	7	2.5
Less agree	12	4.3
Fairly agree	16	5.8
Agree	7	2.5
Strongly agree	235	84.8

[n= 277] Source: Field Survey, Nfaaful (2021)

As shown in Table 14 above, most of the respondents (88%) interviewed believed that the Planting for Food and Job programme is more effective since it has the potential to boost farmers yield and revenue. The small percentage of respondents (5%) who disagreed could be attributable to some difficulties and constantly evolving terms and circumstances regarding

eligibility for input subsidies, seeds and fertilizer included. However, the fact that the majority of respondents agreed to the overall effectiveness of the subsidy seeds and fertilizer inclusive suggests that the intervention programme is successful despite its modest drawbacks.

Maize farmers perceived effectiveness of the seeds and fertilizer subsidy component of PFJ

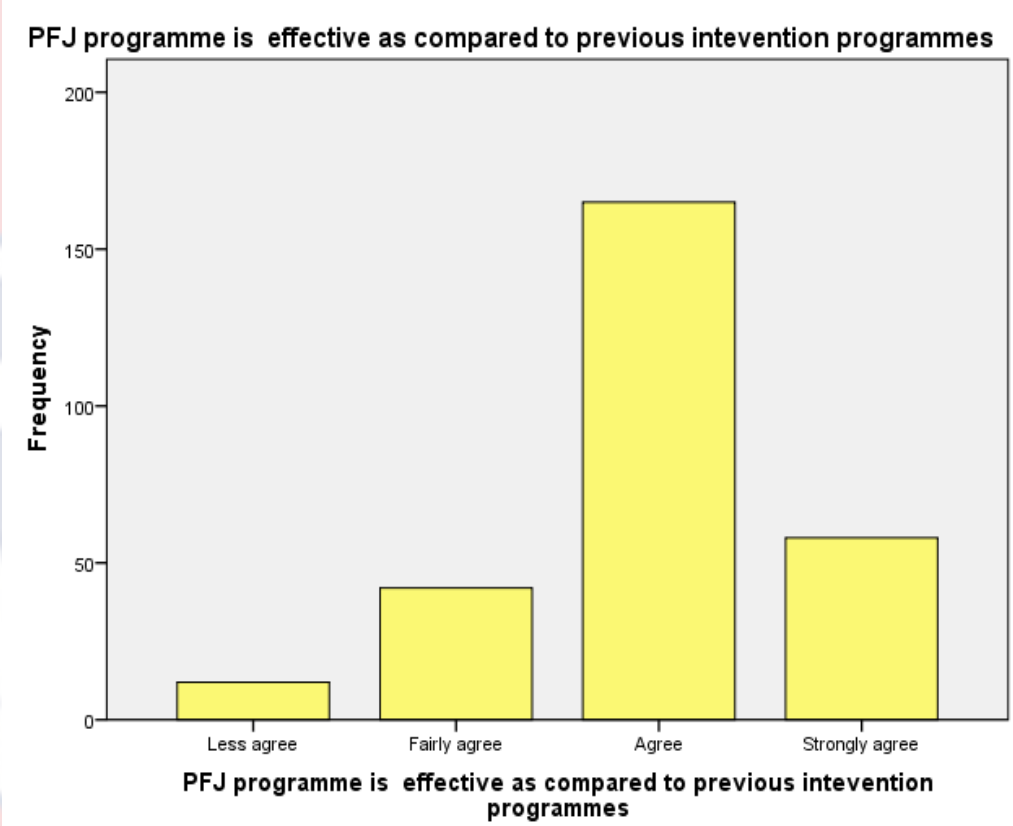


Figure 6: Effectiveness of seeds and fertilizer subsidy of the PFJ
Source: Field Survey, Nfaaful (2021)

Figure 6 indicate that majority of the farmers interviewed agreed to the fact that PFJ is highly effective. From the graph the farmers actually commended extension agent in the registration and distribution of the input subsidy. According to the respondent a lot of sensitization programmes have been conducted by the AEAs and majority of them attest to the fact that the programme is highly effective. However, despite maize having participated in

numerous intervention programmes, the seeds and fertilizer subsidy component of the PFJ programme seems to more effective as compared to previous intervention programmes. The graph shows that majority of the maize farmers interviewed agreed to the fact that PFJ is more effective as compared to previous intervention programme. Only a few of the beneficiaries disagree with the effectiveness, owing to the fact that most input dealers delay and divert the seeds and fertilizers to other destinations. This implies that the responsible ministry must closely monitor those importers and distributors so that the intended purpose of the programme can be achieved, if possible, the distribution channels must be digitized in order to accomplish the ministry's goals and aspiration since food security is now a major challenge across the globe.

Table 15: Comparison of the effectiveness of the seeds and fertilizer subsidy component of the PFJ programme

Variables	Freq	$\bar{X}$	SD
Using the subsidized seed has improve production	277	4.94	0.33
Using the subsidized fertilizer has improve my production	277	4.82	0.67
My yield has increase drastically as compared to previously	277	4.63	0.96

[n= 277] Scale:1 Ineffective 2. Effective 3. Fairly effective 4. Effective
Source: Field Survey, Nfaaful (2021)

Table 15 displays the comparison of the effectiveness of the seeds and fertilizer subsidy component of the Planting for Food and Job programme in the Agona West Municipality of the central region of Ghana. Maize farmers in the study area highly agreed to the fact that using the seeds and fertilizer subsidy has improve maize production with means and standard deviation of

$\bar{X}$ = 4.94 SD = 0.33 and $\bar{X}$=4.82 SD = 0.67 respectively. Also, maize farmers highly agreed to the fact that the adoption of the seeds and fertilizer subsidy component of the PFJ has drastically increased maize production as compared to previously ($\bar{X}$ = 4.63 SD = 0.96.) Since all the mean values are close to five (5), it means that the programme is highly effective in the study area.

Impact of the Planting for Food and Job programme on income of maize farmers

Table 16: Impact of the programme on income

Variables	Frequency	Percentage
Due to PFJ programme, I can now take care of my household		
No agreement	16	5.8
Less agree	33	11.9
Fairly agree	113	40.8
Agree	86	31.0
Strongly agree	29	10.5
Due to the PFJ programme, I can now save part of my income		
No agreement	-	-
Less agree	28	10.1
Fairly agree	50	18.1
Agree	81	29.2
Strongly agree	118	42.6
No agreement	28	10.1
Total	277	100

[n= 277] Source: Field Survey, Nfaaful (2021)

Findings from Table 16 show that the majority (226), or 94.2% of the maize farmers surveyed, agreed that the intervention programme has improved the stability of their income. Only 16 farmers, or 5.8% of the total, refused to accept the claim of constant income from the intervention programme. This data from MoFA (2012), which found that farmers in the majority of rural communities were able to preserve a portion of their income throughout the implementation of FASDEP I, indicates a high likelihood of

the intervention programme. Again, the results of table 14 show that all of the respondents surveyed (277), or 100% (Less agree = 10.1%, Fairly agree = 18.1%, Agree = 29.2%, Strongly agree = 42.6%) of maize farmers, agreed that they can now save to take care of their household. This success story could be attributed to the adoption of the subsidy from seeds and fertilizer component of the Planting for Food and Job program. This outcome highlights the significant effects of the money received as a consequence of the intervention programme and supports finding from Addae (2017) who found at that rice farmers in Ashanti region of Ghana were able to support their households using input subsidies. The introduction of split-corm technology in southern Kenya, according to a study by Bonabana Wabi (2010), helped lower-income farm households rise to middle-class status.

Impact of the Planting for Food and Job programme on maize yield

Table 17: Impact of the PFJ programme on yield

There was yield increment from the adoption of the input subsidy component of PFJ	Frequency	Percentage
Fairly agree	40	14.4
Agree	196	70.8
Strongly agree	41	14.8
Total	277	100.0

[n= 277] Source: Field Survey, Nfaaful (2021)

Table 17 shows that the implementation of the seeds and fertilizer subsidy component of the Planting for Food and Job programme had led to an improvement in maize production for all 277 respondents, or 100% (Fairly agree = 14.4%, Agree = 70.8%, Strongly agree = 14.8%) of the maize farmers questioned. This demonstrates a significant influence on yield and the findings also validates a report by the MoFA (2017) that stated the PFJ

intended to increase maize production from 2017 until the end of the first year of implementation (2018) from 1.7 mt/ha to 2.7 mt/ha, respectively. Again, the result also concord with Iddrisu, (2019) who found out that maize production increased from 1.5 mt/ha to 1.9 mt/ha a year after the adoption of the PFJ programme in the northern region of the country.

Yield comparison before and after the implementation of the Planting for Food and Job Programme

Table 18: Paired Sample t-test of yield comparison before and after the adoption of the PFJ programme.

Mean Yield	$\bar{X}$ (Kg/ha)	SD (Kg/ha	MD (Kg/ha)	95%CI Lower	Upper	T	Df	Sig
MYB (15/16)	407.9	89.15	-	-	-	-	-	-
MYA								
2017	1026.4	619.6	618.6	-691.8	-545.3	16.6	276	.000*
2018	1004.1	371.7	596.2	-640.1	-552.3	26.7	276	.000*
2019	1077.6	370.4	669.8	-713.5	-625.9	30.1	276	.000*
2020	1044.9	371.1	637.8	-680.9	-593.2	28.6	276	.000*

MYB= Mean Yield Before, MD=Mean Difference , MYA= Mean Yield After, n= 277 $p<0.05$ **1 maxi bag=60kg**

Source: Field Survey, Nfaaful (2021)

Table 18 demonstrates unequivocally how the input subsidy significantly affected the yield of maize in the study area. Statistically, there was 150% increase (at 0.05 alpha level) in yield of maize farmers in the study domain. Mean yield before and after the implementation of the input subsidy was found out to be 408mt/ha and 1038mt/ha respectively (MYD= 630mt/ha) Again Table 18 shows the yield comparison after the adoption of the intervention programme to the mean yield after the intervention programme. In consideration, yield increase with significant values of 0.000, for the 2017–2018, 2018–2019, and 2019–2020 cropping seasons. We therefore reject the first null hypothesis (accept the first alternative hypothesis) since the increase in yield could be attributed to the usage of improved seeds and subsidized fertilizer component of the PFJ. However, within the cropping years, there was a significant increase in yield from 2017 to 2018, followed by 2018 to 2019 with significant value of 0.000 but slightly decrease in 2019 to 2020 as compared the yield before. This result supports findings by Iddrisu (2019), who found out that the livelihood of arable crop farmers in the northern region of Ghana increased initially as a result of the adoption of PFJ, remained stable in the second season, but decreased in the third cropping season. This drop in yield could be attributed to the COVID-19 pandemic since many farm operations were halted during the 2019–2020 cropping period.

Yield comparison between male and female headed house hold before and after the seeds and fertilizer subsidy component of the PFJ programme

Objective four seeks to compare the impact of PFJ on yield of male and female headed household in the study area. Table 19 and 20 shows the mean yield difference for male and female headed household before and after the adoption of the seeds and fertilizer subsidy component of the PFJ programme.

Table 19: Average yield after PFJ to total yield in 2015 and 2016

	$\bar{X}$	SD	MD	95% CI				
Variables	Kg/ha	Kg/ha	Kg/ha	Lower	Upper	T	Df	Sig
MYA (2017-2020)	1038.3	236.8						
			630.4	602.9	657.9	45.2	276	.000*
MYB (2015/16)	407.8	89.14						

MYA=Mean Yield After, MYB= Mean Yield Before, MD=Mean Difference
n= 277 p<0.025
Source: Field Survey, Nfaaful (2021)

Table 19 above confirms a significant increase in yield at 0.05 alpha level for both male and female headed household after the implementation of the seeds and fertilizer subsidy component of the PFJ programme. By comparing mean yield before to mean yield after (MYB= 407.8, MYA=1038.3), it can be observed that there was an improvement in yield of 154% which shows that the intervention programme was helpful since there was a significant improvement in yield. This confirms projections by (MFEP, 2017) which estimated the yield of arable crop farmers to increase from 1.7mt/ha to 2.mt/ha. Again, this finding is similar to findings by Donkoh

et al. (2016), which evaluated the efficiency of Ghana's Block Farm Credit Programme (BFCP), to be beneficial. This study found that the BFCP was successful in raising farmers despite significant problems that needed to be fixed if the programme was to be more successful.

Table 20: Yield comparison between male and female after PFJ implementation

Gender	$\bar{X}$ kg/ha	SD	95% CI Lower	95% CI Upper	SEM	T	Sig-2 tailed
Male (n=179)	1051	246.1	-22.5	94.6	18.4	1.212	.226
Female (n=98)	1014	218.1	-20.5	92.61	22.0		

n= 277 Levene test (F=1.26, sig:0.26 Source: Field Survey (Nfaaful, 2021)

Table 20 compares the impact of the seed and fertilizer subsidy component of the PFJ programme on the yield of male and female after the adoption of the PFJ programme. From the table, there was no significant difference in yield improvement between male and female since the mean yield of male and female was computed to be 1051mt/ha and 1014mt/ha respectively with only 37mt/ha mean yield difference. This shows that there was appreciable improvement in yield for both male and female in the study area and concord with findings by Akudugu et al. (2012) who state that there is a strong correlation between the use of agricultural technology by Ghanaian farmers and gender. Hence this research fails to reject the null hypothesis.

Table 21: Yield comparism between male and female before the PFJ implementation

Gender	$\bar{X}$ kg/ha	SD	95% CI lower	95% CI Upper	SEM	T	Sig-2 tailed
Male (n=179	404.1	90.7	-32.8	11.3	6.8	0.959	0.338
Female(n=98)	414.7	86.3	-32.5	11.0	8.7		

n= 277 Levene Test(f=0.947, sig:0.331) Source: Field Survey (Nfaaful, 2021)

Result from Table 21 above shows the mean yield and standard deviation of male and female before the adoption of the PFJ programme in the study area. The mean yield for male and female before the PFJ programme were computed to be 404 and 414 respectively. This result indicates that there were no statistically significant differences in yield for both male and female before the implementation of the seeds and fertilizer subsidy component of the Planting for food and job programme. This result is also consistent with findings by Geo (2011) who found out that mean yield for different gender were always the same when both genders were given equal opportunities

Table 22: Impact of the PFJ on savings of maize farmers per cropping season

Amount saved per cropping season	Frequency	Percent
200-399 Ghana Cedis	83	36.5
400-599 Ghana Cedis	66	29.1
600-799 Ghana Cedis	75	33.1
Above 800 Ghana Cedis	3	1.3
Total	227	100.0

n= 227 Source: Field Survey (Nfaaful, 2021)

Table 22 revealed that the PFJ programme has had a significant positive impact on farmer savings. Approximately 80% of farmers who participated in the

program reported being able to save a portion of their income as a direct result of their involvement in PFJ. This finding underscores the programmes success in promoting financial resilience and savings behaviors among Ghanaian farmers. The result is however in concordance with a report by Doss, (2012) who found out that farmers experience indirect savings from the adoption of input subsidy in the western region of Ghana.

Relationship between the attribute of innovation and demographic characteristics on yield of maize

Table 23: Correlation Matrix of the attribute of innovation and its impact on yield of maize farmers

Variables	Y	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8
Y	-								
X_1	.152*	-							
X_2	.216**	.251**	-						
X_3	.018	.278**	.145*	-					
X_4	.061	.691**	.208**	.384**	-				
X_5	.005	.262**	.095	.476**	.115	-			
X_6	.093	.661**	.203	.393**	.641**	.143*	-		
X_7	.073	.004	-002	-.033	.000	.007	.014	-	
X_8	-.012	-.012	-.138*	-.030	-.010	-.010	.044	.022	-

Source: Field Survey (Nfaaful, 2021) *p<0.05(2-tailed). **p<0.01(2-tailed)

Y = Impact on yield (kg/ha)
X_1= Voluntariness
X_2 = Marital Status (1=Married, 0= Otherwise)
X_3 = Compatibility
X_4 = Observability
X_5 =Complexity
X_6 = Relative Advantage
X_7 = Sex (1= Male, 0=Female)
X_8 = Educational Level

Table 23 present the result of the correlation matrix. The result indicates that there is a positive significant relationship between one characteristic or attribute of the PFJ (Voluntariness) and a demographic

characteristic (marital status) even under alpha level of 0.01. The implication of the relationships is that each of the two component was important in enhancing maize yield of farmers who adopted the seeds and fertilizer subsidy component of the PFJ programme. For instance, farmers in the study area adopted the seeds and fertilizer subsidy component of the PFJ programme voluntarily without any force. This means that farmers in the study area wished to apply fertilizer before the PFJ but because of the high price, they were hesitant to do so. Hence the intervention programme was their breakthrough. Again, marital status of maize farmers had a significant impact on maize yield in the study area.

Challenges of the Planting for Food and Job programme

Despite the intervention programme having high prospect of ensuring yield and income in order to reduce food import bill in the country, beneficiary farmers are also faced with complex challenges and difficulties in the programme implementation. Therefore, summary of (7) mean perceived challenges of PFJ intervention implementation in maize production in the Agona West Municipality in the central region of Ghana were considered and discussed in table 24. These challenges include environmental, technical, land ownership, economic, educational, institutional and political with its ranking.

Table 24: Farmers perceived Challenges of the PFJ programme

Challenges	$\bar{X}$	SD	Rank
Governmental	4.2	1.36	1st
Economic	3.6	1.1	2nd
Financial	2.9	.6	3rd
Demographic	2.4	0.6	4th
Technical	2.1	0.7	5th

[n=277] Scale: 1= Negligible challenge 2=Low challenge 3 Moderate Challenge 4= Substantial Challenge 5= High Challenge

Source: Field Survey, Nfaaful (2021)

Result from Table 24 shows in ascending order of mean the ranking of the various challenges of the seeds and fertilizer subsidy component of the Planting for Food and Job Programme. The challenges ranges from governmental, economic, financial, demographic and technical.

Governmental Challenges

Maize farmers identified governmental or political obstacles as their first and topmost concern in the implementation of the PFJ programme. From the table, governmental challenge was found to be substantial ($\bar{X}$ =4.2, SD=1.36). The most important governmental challenge perceived to pose substantial challenge were incompatible of the PFJ with current government policies in agriculture and arable crop production in Ghana. Again, discrimination in the sharing of input subsidy by extension agent was seen to pose challenge in the implementation of the input subsidy. The findings of this study support a previous study by Eldis (2012), who also found out that 60% of agricultural intervention schemes are governed by state bodies and frequently subjected to the influence of political activists. Given that it ultimately affects the farmers with little political clout, this needs to be addressed urgently. Similar challenge were noted by (Kirwan, 2015) who found out that 50% of input dealers hoard subsidized input, preventing the target recipients from getting the full amount expected.

Economic Challenge

The findings in Table 24 again shows that there are substantial economic challenges in the implementation of the PFJ ($\bar{X}$ =3.60 SD=1.10). The most important economic challenges perceived to pose challenge were availability of capital for investments, farm size, and the unpredictability of

PFJ returns on investments. According to studies, access to credit facilities and farm size are positively correlated (Mignouna et al, 2011). Larger farms, as opposed to smaller farms, are more likely to adopt new technology since they can afford to devote even a tiny amount of their land to experimenting (Uaiene et al., 2009). The size of the farm has been demonstrated in several studies to have a detrimental impact on the adoption of new agricultural technologies. Particularly in the event of an innovation that requires a lot of input, like PFJ, small farms may be encouraged to embrace a technology. Farmers with limited land may choose to use land-saving techniques instead of increasing agricultural output, such as greenhouse technology and zero grazing, among others (Yaron, Dinar and Voet, 1992; Harper et al, 1990).

Demographic and farm related challenge

Demographic and farm related characteristics were perceived to have pose a moderate challenge ($\bar{X}$ =2.4, SD=0.6) to the implementation of the seeds and fertilizer subsidy component of the PFJ. This implies that educational level, sex, marital status, age land size and land ownership have low impact on the implementation of the seeds and fertilizer subsidy component of the PFJ. The most important demographic and farm related challenges farmers perceived to pose a challenge to the successful implementation of the PFJ programme were farmers resistance to change, land ownership or land tenure problems, low farming experience, farmers low level of education, aged farmers and formation of Farmers Based Organizations and environmental constraint (See Appendix A). In terms of education, the result was similar to findings by (Byrness and Byrness, 1978) who found out that 70% of cassava growers in western Nigeria lacked a formal education. Again

Dankwa (2002) and Kumi (2003) also found out that land litigation in most rural communities affect 65% of arable crop production in the Ashanti region of Ghana. According to Rogers' Diffusion of Innovation theory (2003), people who adopt technology early tend to have more years of formal schooling than people who adopt technologies later. Additionally, literate people are more inclined to use technologies than illiterate people. As a result, it is anticipated that maize farmers' degree of formal education will favorably (hypothetically) correlate with their use of and intention to acquire technology (Tey & Brindal, 2012). Farmer based organizations were also assessed in the study area. According to the literature, "Farmers in a social group exchange information on the advantages and application of a new technology," belonging to a social group fosters social capital, trust, and information and idea sharing. In their study of how community-based organizations impacted the adoption of split corm banana technology in Ghana, Katungi and Akankwasa (2010) found that farmers who participated more in these groups were more likely to engage in social learning about the technology, which increased their likelihood of adopting it.

Although social groups may have a detrimental effect on technology adoption, particularly when free-riding behavior is present. Foster and Rosenzweig (1995) investigated the uptake of Green Revolution technologies in India and discovered that learning externalities in social networks increased adoption's profitability, but they also discovered that farmers seemed to be profiting from their neighbors' expensive technological experiments. Learning externalities have inconsistent consequences therefore, the more people

experiment with a new technology, the more beneficial it is to do the same, and the opposite is also true.

Again land tenure problems in the study area also seem to pose challenge in in the implementation of the PFJ programme. Quite a number of the respondent interviewed were farming on the land on the basis of agreement made with the chief and other custodians of the land. In Ghana and Agona West to be specific, farmers are faced with problems of land litigation. Survey conducted by Binney (2014), in the western region of Ghana concluded that about 90% of tree cropping were based on certain contractual agreement of which Agona West municipality was of no exception. Also, environmental constraint on agriculture in rural communities were also investigated as part of demographic features. The factors that contributed to maize farmers' perception of the "environmental challenge construct" as "serious" were the uneven topography of the majority of arable farms, the vegetation's predominance of trees and forests, and the lack of highways leading to fields. This result is similar to findings by Abbey (2014) that access to road network is one of the factors which hinders marketing of agricultural produce in most rural communities in Ghana. Respondents perceived that the aforesaid issues would make access to farm input like such, knapsack sprayers and irrigation machines to farms very difficult. In Ghana, maize yields higher when grown in sandy loamy soil types which is mainly found in forest areas of Ashanti, Brong Ahafo, Central, Eastern, Western and Volta regions (CSIR, 2002). Since soil quality has been found to pose significant influence on maize production, it is therefore imperative, to educate arable crop producers

on the soil and other climatic requirement in relation to fertilizer application other agricultural protocols.

Technical Challenges

Table 24 also shows that maize farmers in the study area face moderate technical challenge with mean and standard deviation of 2.1 and 0.7 respectively ($\bar{X}$=2.1, SD=0.7). The most important technical challenges perceived by maize farmers to pose hindrance to the implementation of the PFJ programme were lack of awareness of the seed and fertilizer subsidy component of the PFJ, lack of adequate training by extension agent on the planting of subsidized seeds, lack of training by extension agent on how to apply the subsidized fertilizer supplied under the PFJ, lack of technical knowledge on fertilizer application in general and observation of planting distance. The result was also consistent with a study by (Adesina and Zinnah 1993), who found out that farmers' perceptions of the traits of the contemporary rice variety had a substantial impact on their choice to adopt it.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Overview of the Chapter

This chapter present the summary of the findings, inferences drawn from the findings, and suggestions made in light of the study's findings. The particular goals and hypotheses established for the study have been used to structure the summary of the findings and conclusions. This section also identifies possible areas for further research and analysis related to the Planting for Food and Jobs in Ghana.

The main objective of the study was to examine the effects of the seeds and fertilizer subsidy component of the Planting for Food and Jobs programme on yield and income of maize farmers in the Agona West Municipality of the central region of Ghana. The study specifically focused on the following specific objectives: identifying the farmers' perceived attribute of the seed and fertilizer subsidy component under the PFJ; identifying the farmers' perceived effectiveness of the seeds and fertilizer subsidy components of the PFJ; comparing the yield of maize farmers before and after adoption of the PFJ; comparing the impact of PFJ on yield of male and female headed household; identifying the relationship between impact on yield and other factors, identify the challenges facing the implementation of the PFJ.

The literature review emphasized the growing trend of food scarcity around the world. In fact, it serves as a stark reminder of how dire things are in Africa. Additionally, the literature showed how important input subsidy programmes were in resolving issues like food scarcity, low productivity, and global food insecurity in Africa and other parts of the world. It ties economic

growth and the abolition of poverty together both directly and indirectly. A theory and a model were set to guide the study. These were; The Theory of Change (ToC) by Weiss and Rogers Diffusion of Innovation model by Rogers and expanded theory by more Moore and Benbasat. The researcher primarily concentrated on the impact component of the Theory of Change in order to evaluate how the intervention programme affected the yield and income of maize farmers in the study area. The perceived attribute of innovation component of the Rogers Diffusion of Innovation model was also utilized to assess the effects of the seeds and fertilizer subsidy component of the PFJ programme.

The study focused on maize farmers in the Agona West Municipality of the Central Region of Ghana who were beneficiaries of the Planting for Food and Job Programme since the implementation of the programme (2017). Content validated structured interview schedule (for maize farmers) were used for data collection. Results were analyzed using descriptive statistics, independent sample t-tests, Ordinary logistic regression, biserial and point biserial. Result from the analysis revealed that there were statistically significant differences between all the various levels of the perceived characteristics of the attribute of the seeds and fertilizer subsidy component of the PFJ programme. The means and standard deviations of the perceived characteristics of the PFJ was computed (Relative advantage-$\bar{X}$=3.34, SD=0.86, Observability- $\bar{X}$=3.34, SD=0.52, Complexity- $\bar{X}$=3.04, SD=0.69, Voluntariness $\bar{X}$=3.72, SD=1.12, Compatibility $\bar{X}$=2.75, SD=0.99). Again, there was significant increase in yield after the adoption of the seeds and fertilizer subsidy component of the PFJ programme with mean yield

difference of 630mt/ha (MYD=630mt/ha). The study also showed that there was significant improvement in yield for both male and female headed household (male=1051mt/ha, female=1014mt/ha, MYD=37mt/ha). This implies that the seeds and fertilizer subsidy component of the PFJ benefited both males and females in the study area. The result also revealed that the intervention programme was highly effective since the yield of farmer in the study area increased by 150% which resulted in appreciably increased in income of farmers. There is a significant relationship between one characteristic of the seeds and fertilizers subsidy component of the PFJ (Voluntariness) and a demographic characteristic (marital status) under alpha level of 0.01

Conclusions

1. It can be concluded that 87% of the respondents interviewed perceived the seeds and fertilizer subsidy component of the PFJ programme to be very highly effective in the Agona West Municipality of the central region of Ghana.
2. Again 260 of the respondents representing (94%) of the maize farmers in the study area agreed to the fact that the PFJ policy have had comprehensive impact on their yield and on their income as compared to previous years when there was no PFJ. There was 94% 95%, 93% and 94% increase in yield between 2017, 2018, 2019 and 2020 cropping season respectively.
3. There was a significant difference in yield of maize after the adoption of the seed and fertilizer subsidy component of the Planting for Food and Job programme with mean yield difference of 630mt/ha which indicate 154%

increase in maize yield after the adoption of the seeds and fertilizer subsidy component of the PFJ

4. Again, there were no significant differences in yield of maize between male and female headed household of famers in the study area (male=1051mt/ha, female=1014mt/ha, MYD=37mt/ha). This means there was significant improvement in yield for both males and females in the study area hence the study refused to reject the null hypothesis.
5. Beneficiary farmers voluntarily involvement in the seeds and fertilizer subsidy component of the PFJ likely affect adoption which subsequently increase the yield of beneficiary maize farmers hence the study refuse to accept the alternative hypothesis.
6. Three main substantial challenges to the PFJ programme were governmental (political interference) economic (financial constraint) and demographic challenges (age, sex, land size etc).

Recommendations

The following recommendations were made based on the conclusions;

1. The programme was highly effective hence after four years, government should not end the intervention programme since it will jeopardize farmers' access to food. The Government of Ghana should continue to provide farmers with input subsidies until efficient farm product storage and marketing are realized in these communities.
2. Investments in road networks, post-harvest management, irrigation, and market connections, among other things, must be made in order to make farming successful in study areas. When this is done, many young people who continue to have doubts about the success of the intervention

program, will be inspired to pursue careers in farming as an occupation since the programme had significant impact on yield and income of maize farmers in the study area.

3. Since the project benefited both male and female headed household in the study area it is recommended that other bodies such as NGOs and private sector must contribute to the campaign of gender equality and equity. There is however the need to bring gender-sensitive indicators to the attention of policy makers in the next intervention project implementation programme in Ghana.
4. MoFA and Department of Agriculture should continue to sensitize farmers on the importance of planting hybrid seeds since there was significant improvement in yield of maize in the study area.
5. Other attributes of the seeds and fertilizer subsidy component of the PFJ (Relative Advantage, Complexity, Compatibility, Observability) did not have significant relationship with yield in the study. This means that the implementation of the seeds and fertilizer subsidy of the PFJ intervention programme must be redesign.
6. Implementers of the programme should develop field demonstration plot within AEAs operational area to serve as a guide to apply fertilizer with the right dosage and how to plant the hybrid seeds taking into consideration all the cultural practices
7. The issue of political interference must carefully be examined since its one of the major drawbacks in project implementation. Again, the mode of registration to become a beneficiary of the intervention programme by farmers should include the option of repayment in kind.

Suggestions for Further Research

1. In addition to the maize farmers in the study region under the Planting for Food and Job Programme, the study should be expanded to include additional arable farmers (PFJ).
2. Future research should extend the population to other researchers and academicians who have greater interest on evaluation of government intervention programme in Ghana.
3. Since the project benefited both male and female headed household in the study area the researcher is calling upon other bodies such as NGOs and private sector to contribute to the campaign of gender equality and equity. There is however the need to bring gender-sensitive indicators to the attention of policy makers in the next intervention project implementation programme in Ghana.
4. Further studies should include other factors such as source of finance, labour, land availability, input like herbicides and pesticide etc. that has significant influence on yield.
5. In order to address food security across the many ecological zones, a larger discussion and the production of ideas are required.

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APPENDICES

APPENDIX A

Demographic and Farm-related Challenge	N	Mean	Std. Deviation
Land ownership or land tenure issue	277	1.75	1.04
Low farming experience	277	1.71	1.07
Farmers low level of educational level	276	3.89	1.34
Aged farmers	277	4.44	0.97
Overall Mean	276	2.94	0.61

Table for Determining Sample Size from a Given Population

N	*S*	*N*	*S*	*N*	*S*
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370
150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

Note.—*N* is population size.
S is sample size.

APPENDIX C

UNIVERSITY OF CAPE COAST

DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

TOPIC: EFFECT OF SEEDS AND FERTILIZER SUBSIDY OF THE PLANTING FOR FOOD AND JOB ON OUTPUT OF MAIZE FARMERS IN THE AGONA WEST MUNICIPALITY

Dear sir/madam,

This study aims to collect data on the effects of the input subsidy provided by the Planting for Food and Jobs program on maize farmers' production and revenue in the Agona West Municipality of the Central Region of Ghana. The information gathered will be kept confidential and used solely for academic purposes. Only the researcher, supervisor(s), and enumerator(s) will have access to the data, and individual identities will remain anonymous and not be disclosed to any other individuals or organizations.

DEMOGRAPHIC AND FARM RELATED CHARACTERISTICS OF MAIZE FARMERS IN THE STUDY AREA.

Name---------- Telephone No.----------

1. Sex: 1. Male [ ] 2. Female [ ]
2. Please provide your age at your last birthday ---------- (in years)
3. Please indicate your highest educational qualification.

   1. No formal educat [ ] 2. Primary Education [ ] 3. Middle School Certificate /JSS [ ] 4. Senior Secondary School Certificate [ ]

   5. GCE 'O' level [ ] 6. GCE 'A'' level [ ] 7. Tertiary [ ]

4. Marital Status: 1. Married [ ] 2. Other

5. Sex of beneficiary farmers 1 Male [ ] 2. Female [ ]

6. Please indicate in years your farming experience as a maize farmer……..

7. How many separate plot of land do you use for maize farming?.....

SECTION A

PERCEIVED ATTRIBUTE OF THE SEEDS AND FERTILIZER SUBSIDY COMPONENT OF THE PFJ PROGRAMME AMONG MAIZE FARMERS

1. Please rate the level of agreement you have with the following characteristics/attributes of seeds and the fertilizer subsidy component of the PFJ among maize producers in your area.

   1=Very low agreement 2=Low agreement 3=Fair Agreement 4= High agreement 5=Very High agreement

	Perceived Attributes/Characteristics of Seeds and Fertilizer subsidy component of the PFJ	**Levels of Agreement**				
A	**Relative advantage**	**1**	**2**	**3**	**4**	**5**
1	Adopting the seeds and fertilizer subsidy component of the PFJ technology would increase my productivity					
2	Planting for Food and Job programme increases the quality of farm output					
B	**Compatibility**					
1	The concept of PFJ programme is compatible with existing farming practice					
2	PFJ programme would fit into my style of crop Farming					
C	**Observability**					
1	The results of adopting a PFJ programme component would be easy for me to communicate to others.					
2	I think I could explain to others how using the PFJ					

	program would improve one's ability to work in agriculture.					
3	The results of adopting seeds and fertilizer subsidy are apparent to me					
D	**Complexity**					
1	I find it difficult to access all the component of the PFJ input					
2	I can easily apply for the input subsidy without any Stress					
3	The use of Identification card for farmers registration looks good to me					
E	**Voluntariness**					
1	I was encouraged by colleague farmers to take part In the intervention programme					
2	I accept the PFJ input subsidy because it was Subsidized					
3	I am a farmer and eager to be first to use any new new farming intervention programme					
4	I am willing to follow the lead of others in using the input subsidy of the PFJ programme					
5	I need to be convinced of the advantage of the PFJ programme by peers					

SECTION B

EFFECTIVENESS OF THE SEEDS AND FERTILIZER SUBSIDY OF THE PLANTING FOR FOOD AND JOB PROGRAMME

1. In your opinion, do you see the adoption of hybrid seed as the way of ensuring food security in the country? 1. Yes 2. No

2. If Yes, how?.....

3. If No, Why?.....

How many times in the cropping season do you receive the seeds and fertilizer subsidy component of the PFJ programme?.....

5. Can you please indicate the number of times AEAs visit your farm in month after the introduction of the Planting for food and Job Programme?.....

6. What final score would you give the program's effectiveness on a scale of 1-4? 1 Very effective 2. Effective 3. Fairly effective 4. Ineffective

7. Please indicate your level of agreement on the following attributes/characteristics of seeds and Fertilizer subsidy component of the PFJ among maize farmer in your locality

1= No Agreement 2=Low Agreement 3=Fair Agreement 4= Agreement 5=Strongly agree

	STATEMENT	Level of agreement				
		1	2	3	4	5
1	Using the subsidized fertilizer has improve my Production					
2	Using the subsidized seeds has improve my Production					
3	My yield has increase drastically as compared to without the PFJ programme					

SECTION C

YIELD COMPARISM BEFORE AND AFTER THE ADOPTION OF THE SEEDS AND FERTILIZER COMPONENT OF THE PLANTING FOR FOOD AND JOB PROGRAMME

1. Which pillar(s) of the PFJ have you benefited or still benefiting?

1. Certified seeds [ ] 2. Fertilizer subsidy [ ] 3. Both [ ]

2. Have you received any training in any of the pillars of the Planting for food and Job Programme? 1. Yes [ ] 2 No [ ]

3. If yes what training programme was it and by which organization?.....

4. Have you ever received fertilizer under the Planting for food and Job Programme in your farm? 1. Yes [ ] 2. No [ ]

5. If yes please indicate the type and quantity of fertilizer received under the PFJ programme

Maize season	Type of fertilizer	Amount in Bags
2017/2018		
2018/2019		
2019/2020		

Key

1. NPK 15:15:15
2. NPK 20:10:10
3. NPK 23:10:5 4. UREA
5. LIQUID FERTILZER BEGREEN

6. Did you use fertilizer in your farm before the introduction of the Planting for Food and Job campaign?1. Yes 2. No

7. If Yes, please indicate the Type and Quantity of Fertilizer used before the introduction of the Planting for food and Job Programme

Maize season	Type of fertilizer	Amount in Bags
20013/2014		
2014/2015		
2015/2016		

Key

1. NPK 15:15:15
2. NPK 20:10:10
3. NPK 23:10:5
4. UREA 5. LIQUIDFERTILZER BEGREEN

8. Before the introduction of the Planting for food and Job Programme, what was the rate of application of fertilizer on your crops? .....

9. What was the rate of fertilizer application in your farm under the introduction of the Planting for food and Job Programme?.....

10. Which maize varieties did you planted before the implementation of the planting for food and Job programme?.....

11. What is the average yield per hectare of the above-mentioned variety? .....

12. Do you still use the same variety of maize? 1 Yes 2 No

13. If yes why do you maintain the same variety? ……..

14. If no, why did you change that variety of maize……

15. What is/are the recommended maize seed variety/varieties in this area?.....

16. Have you received the hybrid seed under the planting for food and Job campaign? 1. Yes 2. No

17-19. If yes please indicate the quantity of improved seeds received under the Planting for food and Job campaign.

Cropping season	Type of improved seeds	Amount in Kg
Q17. 2017/2018		
Q18. 2018/2019		
Q19. 2019/2020		

Type of improved seed

1.Open pollinated Variety (OPV)

2.Hybrid

20-22 Upon using hybrid seeds under the Planting for food and Job Programme Please indicate your yield on the land size.

Cropping Season	Yield		Total Yield (bags)
	Major Season	Minor Season	
Q20. 2017/2018			
Q21. 2018/2019			
Q22. 2019/2020			

23-25. Please indicate your yield on the land size before the introduction of the Planting for food and Job Programme for the past two years

Cropping Season	Yield		Total Yield (bags)
	Major Season	Minor Season	
Q23. 2014/2015			
Q24. 2015/2016			
Q25. 2016/2017			

SECTION D

IMPPACT OF THE SEEDS AND FERTILIZER SUBSIDY COMPONENT OF THE PFJ PROGRAMME

1. Which of the following best describes your main source of income or support? (1) Food crop farming (2) petty trading (3) salaried labor, (4) raising livestock (5) specify ……..……...

2. For how long have you been practicing the above activity? (In years)

(1) 1-5 (2) 5-10 (3) 10-15 (4) Above 15

3. What is your Weekly/Monthly/Annual income from the above activity?

Option	Weekly	Monthly	Annual
1	10-50	10-50	100-500
2	50-100	50-100	500-1,000
3	100-150	100-150	1,000-1,500

4. Are you able to save any or part of your income? (a) Yes [ ] (b) No [ ]

5. If Yes how much are you able to save weekly, monthly or annually? .....

6. If No, Kindly explain why you are not able to save……

7. What problem(s) do you face with respect to the practice of the above activity? ……..

8. Do you view the "Planting for Food and Jobs" programme as a complement to your current or potential sources of income? 1. Yes 2 No

9. If Yes, how?.....

10. If No, Why do you see it as such?.....

11. Have you been able to make any savings from the input subsidy since the start of the Planting for Food and Job Programme? 1. Yes 2 No

12.If Yes, how much?.....

13. Has there been any improvement in livelihood after using hybrid seeds? 1. Yes 2. No

14. If Yes, please indicate the extent of improvement in livelihood. 1. No improvement 2. Low improvement 3. Moderate improvement 4. Improvement 5. High improvement

SECTION E

IMPLEMENTATION CHALLENGES OF THE PFJ PROGRAMME IN GHANA

Please indicate in your opinion the challenges that are likely to hinder the seeds and fertilizer subsidy component of the PFJ programme in Ghana by using the following ratings**: (Please note that your rating of low challenge implies a very high prospect in this study)**

1= Negligible challenge 2=Low challenge 3= Moderate Challenge

4= Substantial Challenge 5= High Challenge

	CATEGORY OF THE CHALLENGE	1	2	3	5
A	**Financial challenges**				
1	Farm size				
2	Availability of fund for investment				
3	Unpredictability of PFJ returns on investments				
B	**Technical Challenge**				
1	Lack of farmers awareness of the seeds and fertilizer subsidy component of the PFJ programme				
2	Lack of adequate training by extension agent on planting of subsidized hybrid seed				
3	Lack of adequate training by extension agent on how to apply the subsidized fertilizer.				
4	Lack of technical knowledge on fertilizer application				
C	**Operator demographic Challenges**				
1	Farmers resistance to change				
2	Land ownership/tenure systems problems				
3	Low farming experience				
4	Farmer's low educational level				
5	Aged farmers				
D	**Governmental Challenge**				
1	PFJ programme is not compatible with current government policies in agriculture and arable crop production in Ghana				
2	Discrimination in the sharing of input subsidy by extension agent				

1. Do you see the Planting for food and Job Programme as the major way of ensuring food security in the country? 1. Yes 2. No

2. If Yes how? .....

3. If No why?.....

4. The Planting for food and Job Programme seems to have a lot of implementation challenges 1. Strongly Disagree 2. Disagree 3. Agree 4. Strongly Agree

5. Please indicate in rating, the implementation challenges that are likely to hinder the Planting for food and Job Programme except those who disagree.

1= No challenge 2=Low challenge 3= Moderate Challenge 4= Substantial Challenge 5= High Challenge

6. Within the year, how often do you access Planting for food and Job campaign input and at what

month?.....

7. Please indicate with reason why you access the Planting for Food and Job input in the above stated month (ie. Q6)……

8. Has there been any differences in yield after accessing any of the Planting for Food and Job iput? 1. Yes 2. No

9. If yes, please indicate the yield difference in bags after planting the hybrid seeds……

10. From a scale of one to five, please indicate how the seeds and fertilizer component of the Planting for Food and Job campaign has been helpful to you? 1. Not helpful 2. Moderately helpful 3. Helpful 4.Very helpful 5. Extremely helpful.

THANK YOU FOR YOUR COOPERATION