OCTOBER 3, 2017

PLANTING FOR FOOD AND JOBS

STRATEGIC PLAN FOR IMPLEMENTATION (2017-2020)

MINISTRY OF FOOD AND AGRICULTURE

REPUBLIC OF GHANA

Contents

1. Executive Summary

Agriculture has long provided a firm foothold for Ghana's economy. Growth in contribution of agriculture sector to national gross domestic product (GDP) in the recent years however, has consistently declined. Trends in production of major food crops such as maize, rice and sorghum show that on-farm productivity has stagnated and the exploitable difference between the actual and potential output of most of the crops (yield gap) has widened. Low and inadequate levels of usage of productivity enhancing technologies such as quality seeds of improved varieties and fertilizer, thin extension services and weak market linkages constrain the growth in on-farm productivity.

The Government of Ghana (GoG) is fully committed to increasing the productivity and thereby catalyzing a structural transformation in the economy through increased farm incomes and job creation. To contribute to this goal, the GoG has initiated a flagship Planting for Food and Jobs (PFJ) Campaign that will motivate the farmers to adopt certified seeds and fertilizers through a private sector led marketing framework, by raising the incentives and complimentary service provisions on the usage of inputs, good agronomic practices, marketing of outputs over an E-Agriculture platform.

Although the fertilizers have been available to the farmers at subsidized prices through national fertilizer subsidy program since 2008, its effect on adoption remains low, due to lack of a comprehensive approach in galvanizing the outreach and impact of subsidies. Under the PFJ program, farmers who are willing to participate and raise their current productivity levels (productive poor) and whose land, water, labor and capital stifle the productivity (resource poor) will be mobilized through awareness and any associated proven farmers, nucleus farms, farmer based organizations (FBOs), private aggregators and enterprises.

In alignment with the markets, the types and volumes of seeds and fertilizers that are demanded by farmers will be identified by the PFJ program through a participatory approach. Availability and accessibility of these inputs will be facilitated through a private sector led market network at subsidized prices. Due to their low-income levels, the smallholder farmers often spend a far greater portion of their farm revenue in adopting the subsidized inputs than the well-offs. Hence the program will provide an additional option, whereby the beneficiaries shall pay half of the payable cost as down payment, and the remaining half at the end of the harvest. To contain misuse and elite capture, the program will limit the volume of subsidized fertilizers to a maximum of 2 Ha land.

The PFJ program will empower the beneficiaries with knowledge and skills on maximizing the benefits of the usage of the subsidized inputs through proximity extension services. Human and technical capacity of the national extension system will be strengthened by recruiting and training Agriculture Extension Agents (AEAs). The AEAs will be embedded in the targeted areas under the program and relevant technologies and information will

be transferred to farmers through regular and recurrent technical visits, and other established extension methods.

The PFJ program will improve the marketability of the increased production of food crops by establishing strong linkages between the producers, private aggregators, public food programs, and private food- and feed enterprises. On a commission basis, the private aggregators will also be engaged in collecting the balance of payments from the farmers, nucleus farms and FBOs on the subsidized inputs, as cash or kind. The program will refurbish existing warehouses and/or construct medium-sized warehouses in all the districts, and lease the operations to private aggregators or entrepreneurs, who shall provide improved services to the farmers on postharvest handling, storage, processing, packaging and marketing of the outputs. It is envisaged that graduation of farmers from subsidy dependence will be ushered in through a widespread presence of private network for both the inputs and outputs, robust extension services, gradual reduction in subsidies and the spill-over effects of farm revenues under the PFJ program.

Through an E-Agriculture component, the program will engage information and communication technologies (ICT) for efficient targeting of the beneficiaries, and effective management and governance of the scales and impact of the PFJ program. Through public-private partnerships, the program will establish e-profiles of the beneficiaries and maximize the use of ICT in establishing a supply chain management system that will efficiently integrate private service provisions on the distribution of the subsidized inputs, storage, balance payments by beneficiaries, marketing of outputs, and emergency responses. The program will also put in place appropriate ICT systems for communication, coordination of the extension services, emergency responses, and monitoring and evaluation of the outreach and impacts.

Under a 3-tier structure, the implementation of the program activities will be governed by technical committees at national, regional and district levels. The program is estimated to cost a total of 3,300,721,266 GH¢ (717,548,101 USD) over a period of 4 years (2017-2020). It is conceivable that through multiplier effects, the increased availability and accessibility of inputs and service provisions, the higher agricultural output and productivity will open new vistas of employment opportunities in agriculture and allied sectors through forward and backward linkages. The enterprises operating along the supply chains of inputs and marketing of outputs can create jobs and develop human and technical capacities in rural and urban areas. Furthermore, the increased outputs and productivity shall help accelerate modernization of farming and trigger a structural transformation by increasing the real farm incomes of producers who could then increase the demand for the goods and services produced by the non-farming rural and urban poor.

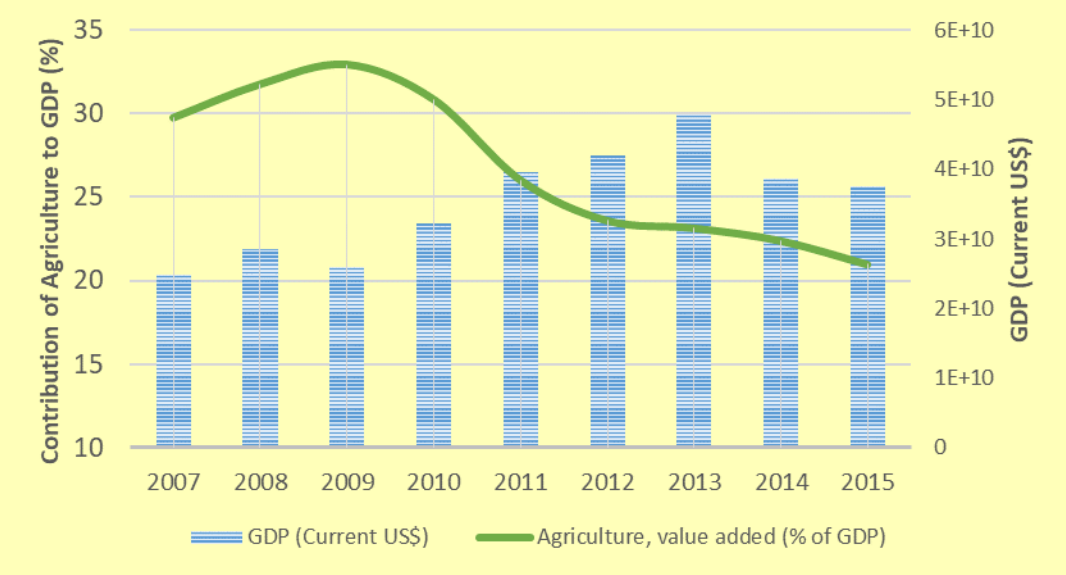
2. PROGRAM SUMMARY

Basic information:	Date:	January, 2017	
	Country:	Ghana	
	Sector:	Agriculture	
	Sub-Sector:	Crop	
	Responsible agency:	Ministry of Food and Agriculture	
	Implementing agency:	Ministry of Food & Agriculture	
Contact information:	Title:	Planting for Food and Jobs	
	Name:		
	Email:		
	Telephone No.:		
Implementation:	Duration:	4 years	
	Start date: 2017:	End date: 2020	
	Effective date:	Closing date:	
Program objectives:	Timely access to adequate quantities of quality seeds		
	Increased availability of fertilizer and its use		
	Reliable and routine technical assistance through extension		
	Improved marketing linkages to increase farm revenues, abate price volatility and ensure repayment		
	Efficient targeting and improved governance of the outreach and impact through E-agriculture		
	Efficient program coordination, management and M&E		
	Stronger partnership and active engagement with the private sector for more efficient input and output markets		
Program pillars/components:	Pillar 1: Seed access and development		
	Pillar 2: Fertilizer access and fertilizer systems development		
	Pillar 3: Extension Services		
	Pillar 4: Marketing		
	Pillar 5: E-Agriculture		
Program costing (2017-2020):		GH¢	US$
	Seed	908,062,490	197,404,889
	Fertilizers	1,842,504,980	400,544,561
	Extension Services	277,741,800	60,378,652
	Marketing	277,741,800	2,210,400
	E-Agriculture	28,980,000	6,3000,000
	Total	3,335,031,070	723,538,502

3. Background

Farming provides the lifeline for millions of livelihoods in Ghana by offering work and food. National surveys[1] show that while rural households in Ghana are predominantly (75.29%) engaged in operating small farms or livestock, about 22% of the urban households are also engaged in agricultural activities[2]. About 90% of farm holdings are less than 2 hectares in size[3], contributing 80% of the total agricultural output in the country[4]. Major staple food crops, including maize, rice, sorghum, millet and root crops such as cassava, yam and sweet potato are often produced in smallholder farms, with lean technical and operational efficiencies. Furthermore, smallholder farming of these food crops largely remains under rainfed and subsistence-based production environments, where rising the productivity remains a grim challenge. Hence, despite a substantial increment in area under farming and economically active population in agriculture[5], the contribution of net output from the agriculture sector to the national gross domestic product (GDP) has been steadily declining in the recent years (Fig. 1).

Fig. 1: Share of agriculture sector in national economic growth[5]



With Ghana's population expected to reach 30.5 million by 2020, at an annual growth rate of 2.36%[6], the agriculture sector is expected to play a leading role in feeding the population, while providing income and employment along its chains. Developmental evidences from green revolution in Asia suggest that increase in farm productivity could usher in food security and social transformation by creating opportunities elsewhere in the economy, as labor and capital shall move from the rural farm sector to even higher productive sectors in the rural non-farm and/or urban economies.

[1] Ghana Statistical Service (2014) Ghana living standard survey - Round 6 (GLSS6), Main report
[2] Ghana Statistical Service (2016) 2015 Labor force report
[3] Statistics, Research and Information Directorate (2011) Agriculture in Ghana, facts and figures (2010)
[4] Food and Agriculture Organization (2015) Country fact sheet on food and agriculture policy trends
[5] World Development Indicators (http://data.worldbank.org, June 2017)
[6] United Nations (2015) World population prospects

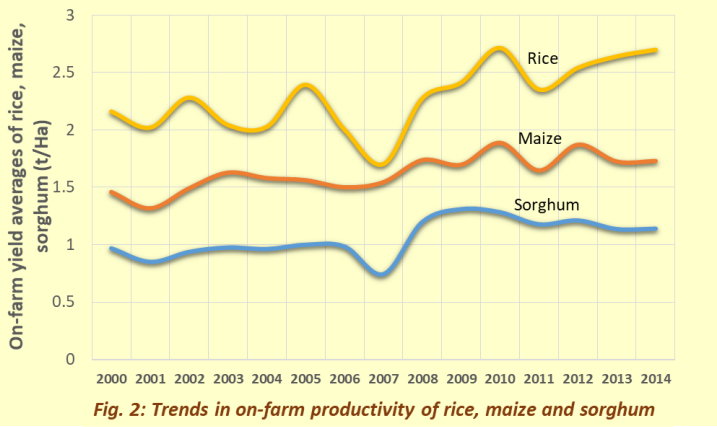


Fig. 2: Trends in on-farm productivity of rice, maize and sorghum

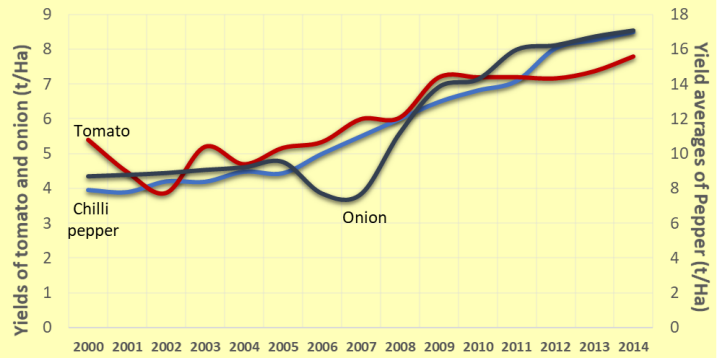


Fig. 3: Trends in on-farm productivity of tomato, onions and chilli pepper

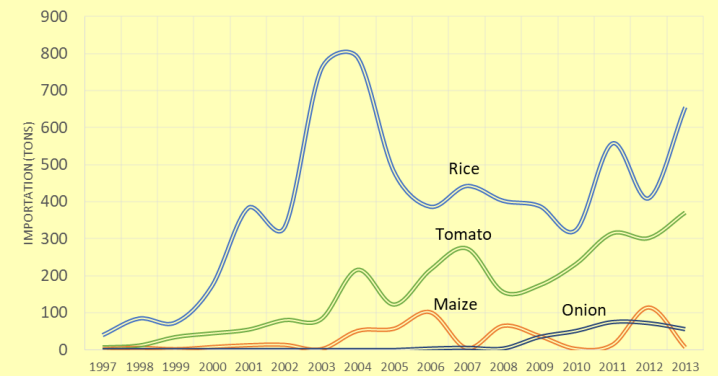


Fig. 4: Trends in importation of rice, tomato, maize and onion in Ghana

Total food grain production in Ghana has been steadily increasing in the recent years. However, the national average of on-farm productivity of the major cereal food crops such as maize, sorghum and rice has not increased substantially over the past several years (Fig. 2[7]), suggesting that the increased food production is merely due to the expansion of area under cultivation of major food crops. Productivity of vegetable crops such as tomatoes, onion and chilli pepper however has shown a marked increase (Fig. 3[7]), but still significantly far below the exploitable yield gap (80% of yield potential in respective production environments and actual on-farm average yield; table 1).

Due to the restrained growth in productivity levels, the increase in local production could not keep up with the pace of growth in consumption demand for crops such as rice, onion and tomatoes, prompting the local markets to import from elsewhere (Fig.4[7]). While the increase in cumulative local production of other commodities such as maize, sorghum, and chilli pepper has reduced the need for imports; the rapid growth in population and consumption of food crops (both as human food and as animal feed) in Ghana will mean that the gap between local supply and demand might widen. More importantly, the low productivity levels have severely curtailed the export opportunities of Ghana to potential markets in the region and globe.

Table 1. Space for on-farm productivity enhancement in food crops in Ghana

Crop	Maize	Rain fed Rice	Sorghum	Onion	Tomato	Chilli pepper
Yield potential (t/Ha; average from national research stations[8])	14.73	8.29	7.61	28.5	25.48	32.30
Exploitable on-farm yield gap	10.39	5.18	5.18	9.12	14.14	19.04

[7] Compiled from FAOSTAT

[8] Ghana-specific data from Global yield gap atlas; www.yieldgap.org/ghana

Since most of Ghana's soils are derived from thoroughly weathered parental materials, they are inherently deficient in nitrogen (N) and phosphorus (P),[9,10] two of the three (potassium (K) being the third) major productivity enhancing nutrients. By farming intensively without replenishing soil nutrients, soils are further getting depleted at a rate of 35 Kg (N), 4 Kg (P) and 20 Kg (K) per hectare per year.[9,11] Since 2008, the Government of Ghana (GoG) has put in place a 'National Fertilizer Subsidy Program' under which fertilizers are sold at subsidized prices. The purpose was to strengthen food security by increasing domestic production of staple food crops through increased use of fertilizer. Comparative changes in fertilizer uptake in the country (Fig. 5) however suggest that subsidization of the fertilizers alone will not increase the accessibility of fertilizers.[12,13,14] The subdued offtake of the fertilizers through national fertilizer subsidy program also implies that there is a need for improvisation on the reachability of the subsidies; empowerment of farmers through capacity building that will ensure the sustainability of the supply and demand of inputs and promotion of market -based solutions within the input and output supply chains.

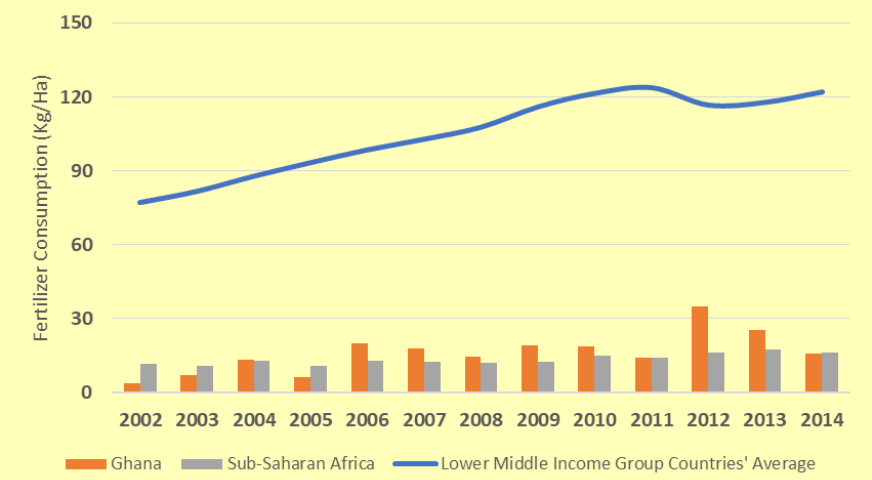


Fig. 5: Trends in fertilizer uptake in Ghana

The Government of Ghana (GoG) is dedicated to promoting on-farm productivity through intensification of targeted crops and thereby enabling job creation in agriculture and other associated sectors. Studies undertaken by the Ministry of Food and Agriculture (MOFA)[15] had revealed that (i) low accessibility to- and inadequate use of certified seeds, (ii) insufficient nutrient fertilizer application, (iii) lack of extension services to farmers, (iv) weak linkages between producers and markets, and (v) limited use of information and communication technology (ICT) in agriculture sector are amongst the major factors stifling total factor productivity in agriculture sector. In an effort to resolve these constraints, the GoG has recently launched a flagship 'Planting for Food and Jobs' (PFJ) Campaign.

[9] Ministry of Food and Agriculture (2015) Towards a sustainable soil fertility strategy in Ghana
[10] Antwi et al. (2016) Geospatial approach to study the spatial distribution of major soil nutrients in the Northern region of Ghana. Cogent Geoscience 2: 1201906
[11] Quansah C et al. (2000) Soil fertility erosion and the associated cost of N, P and K Removal under different soil and residue management in Ghana. Ghana Journal of Agricultural Science, 33: 33-75
[12] Wanzala-Mlobela et al. (2013) Practices and policy options for the improved design and implementation of fertilizer subsidy programs in Sub-Saharan Africa. NEPAD Agency Policy Study
[13] Fearson J et al. (2015) Fertilizer Subsidy Programme in Ghana: Evidence of performance after six years of implementation. Journal of Biology, Agriculture and Healthcare Journal of Biology, Agriculture and Healthcare 5: 100-107
[14] Alliance for Green Revolution in Africa (2016) Evaluation of fertilizer and seed delivery system in Sub-Saharan Africa - Towards a third-generation subsidy model
[15] Ministry of Food and Agriculture (2017) Planting for Food and Jobs Concept - A program to stimulate rapid growth of the Ghanaian agricultural sector (draft; February 2017)

The PFJ represents a key strategy to overcome the deficits and reduce the importation of basic food commodities, where Ghana has both competitive and comparative advantages to produce and create more jobs. The purpose of this document is to set out a strategic plan for medium term (2017-2020) implementation of the PFJ. By providing a framework for annual and seasonal operational planning, this document intends to elaborate the directions, deliberate on a range of activities through which the goals of the PFJ could be achieved, in accordance with the priorities and interests of the stakeholders.

4. Developmental Contexts

Improving yields of the priority crops will allow farmers to meet demand for feed, food and jobs (both rural and urban), while minimizing the pressure on the need to bring large amounts of new land into crop production. Empirical evidences for poverty reduction and economic growth through increases in agricultural productivity suggests that such effects could largely occur through the impact that the increased productivity could make on the real household incomes of the growers. Often however, a fabric of national, regional and global contextual factors determines the complex and multiple pathways that lead to the increases in agricultural productivity and interlink the rise in productivity to the expected socio-economic transformation.

4.1. National Context

Attaining food security through self-sufficiency has been a policy priority in Ghana. While self-sufficiency signifies that Ghana produces all its food needs, food security implies the availability and physical access to food by the population, irrespective of whether or not it is produced within the country. The openness with international markets through its coasts, the high costs of transportation through the interior parts and the good potential for food crop production have long prompted Ghana to choose development strategies that will motivate increased productivity of staple food crops.

The coordinated program of economic and social development policies (2014-2020) under Ghana's vision 2020 envisages a transformed agriculture with forward and backward linkages to the industrial and services sectors. The long-term agricultural sector specific policy objectives are narrated in Ghana's Food and Agriculture Sector Development Policy (FASDEP). Asserting that the productivity of crops is low, the FASDEP II (2007-2015) envisages support for enhancing productivity at the national and agro-ecological levels for priority staple crops and sets annual targets for productivity and production growth of selected commodities in each district.

The key policy interventions for facilitating the transformation of the agricultural sector are outlined in the country's medium term overall national development policy framework, Ghana's Shared Growth and Development Agenda II (GSGDA-II; 2014-2017). The GSGDA-II underscores the importance of improving the productivity of crops and livestock; accelerating job creation; and enhancing the competitiveness of the sector to ensure its integration into the domestic and international markets.

Medium-term plan for implementation of FASDEP II in Ghana is represented by Medium Term Agriculture Sector Investment Plan (METASIP).

The METASIP-II (2011-2015) provides a roadmap for the implementation of CAADP. It focuses on investments for addressing constraints on productivity, market access and sustainable production. Through a sector wide approach, it aims to increase productivity at the farm level through continued research on improvement of priority commodities, improved access to appropriate inputs, improved access to extension services, increased adoption of Integrated Crop Pest Management (ICPM) measures and linkage to markets. The GoG has recently validated the policy matrices for METASIP-I and II, and has further developed a roadmap for METASIP-III (2018-2021). The PFJ will represent a flagship program under the METASIP-III. Ghana Agriculture Sector Investment Programme (GASIP) provides a long-term investment framework that will contribute to the realization of METASIP. Through a 3-year cycle, the GASIP also provides for supplementary financing for scaling up investments in private sector-led agricultural value chain development.

4.2. Regional Context

Ghana was one of the first African countries to sign the Comprehensive Africa Agriculture Development Program (CAADP) Compact in 2009 under the African Union's (AU) New Partnership for Africa's Development (NEPAD). By committing to invest 10% of annual government expenditure to agriculture, Ghana reaffirmed its aspirations by placing agriculture as the engine of social and economic growth. Recommitting to the key principles and values of the CAADP process; the Heads of States of AU recently adopted new declarations at Malabo[16] to accelerate agricultural growth by at least doubling their current agricultural productivity levels through social protection initiatives via targeted national budget lines, by the year 2025. Ghana has agreed to improve the provision of farm inputs, appropriate knowledge, information, and skills to smallholder farmers and create job opportunities for at least 30% of the youth in agricultural value chains for inclusive agricultural growth transformation.

In addition to the national CAADP investment plans, as a member of the Economic Community of West African States (ECOWAS), Ghana adopted the ECOWAS Agricultural Policy (ECOWAP)[17] under the regional CAADP Compact. ECOWAP envisages a modern and sustainable agriculture, based on the effectiveness and efficiency of family farms and the promotion of private sector for productive and competitive intra-community and international markets. ECOWAP is implemented through a Regional Agricultural Investment Program (RAIP)[18]. RAIP emphasizes on the sustainable development of farms through integrated management of soil fertility, strengthening of support services provided to producers and dissemination of improved technologies. RAIP prioritizes development of value chains, peri-urban agriculture and promotion of national, regional and international trade.

Recognizing that fertilizer is crucial for achieving an African Green Revolution, the member states of the AU[19] vowed in Abuja to increase fertilizer use through improved access to fertilizers by small-holder

[16] Malabo declaration on accelerated agricultural growth and transformation for shared prosperity and improved livelihoods, AU Summit in Malabo, June 2014

[17] Economic Community of West African States (2005) Regional agricultural policy for West Africa: ECOWAP

[18] Economic Community of West African States (2010) Regional Agricultural Investment Programme

[19] AU, Africa Fertilizer Summit – Abuja declaration on fertilizer for the African green revolution, Abuja, Nigeria, 4-7 December 2006

farmers. Under the Abuja declaration, the country governments have resolved to increase fertilizer use from 8.0 kilograms to 50.0 kilograms of nutrients per hectare by 2015 by promoting the private sector and strengthening of market systems.

4.3. Global Context

Universal calls on actions to end poverty and ensure prosperity, precipitated in the form of sustainable development goals (SDG)[20], entail Ghana to end hunger, achieve food security and improved nutrition through promotion of efficient and sustainable intensification and climate-proofing of agriculture (SDG-2) by 2030. Under this goal, Ghana recognizes food security as a complex condition requiring a holistic approach and involving a series of complementary actions targeting the access dimension of productivity (inputs), incomes of small-scale food producers, resilience of food production systems and the sustainable use of biodiversity and genetic resources. Ghana's SDG targets have called for increased investments on enhancing agricultural productive capacity through enhanced agricultural research and extension services, technology development.[21] Ghana has also proposed stronger partnerships with global, regional and national development agencies to capitalize on the synergies of the different programs and interventions. Under promotion of sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all (SDG 8); Ghana aims to substantially expand employment opportunities and achieve higher levels of economic productivity through a focus on high value added, labor intensive sectors such as agriculture.[22]

[20] United Nations (2016) Transforming our world: The 2030 agenda for sustainable development

[21] Sustainable Development Goals of Ghana; http://ghana.opendataforafrica.org/GHSDG2016/sustainable-development-goals-of-ghana

[22] National Development Planning Commission (2015) Ghana and the sustainable development goals (SDGs)

5. Implementation of the PFJ

5.1. Purpose

Global evidences[23,24,25,26] suggest that there are multiple pathways[27] through which increases in agricultural productivity can trigger structural transformation by virtues of real income changes, employment generation, rural non-farm multiplier effects, and food prices effects. However, barriers to technology adoption and constraints to access to markets shall inhibit the ability of farmers to participate in the gains from agricultural productivity growth. The purpose of the PFJ program is to mobilize access to both input- and output markets and thereby directly motivate farmers to increase their crop yields and indirectly generate employment opportunities along the value chains.

Under the PFJ program, the GoG intends to enhance productivity of crops of significance for food and feed in Ghana through integrated services on farming and marketing. The PFJ program provides a framework for engaging farmers through a private sector-led agricultural value chain development. The program will be governed by demand and market-driven approaches that will lead to increases in adoption of quality seeds of improved varieties, fertilizers and good agronomic practices, and marketing of farm outputs while building a critical knowledge base and strengthening systems that will further catalyze private sector participation and full engagement in the Agriculture sector. The Program will be spearheaded and implemented by the Ministry of Food and Agriculture (MOFA) in partnerships with public and private stakeholders. Through an integrated electronic platform, the program will be operationalized by facilitating relationships between farmers and the relevant agribusinesses, in order to ensure reliable access to inputs, financial services and output markets.

5.2. Program Goal and Objectives

Overall goal of the PFJ program is to contribute to modernization of agriculture sector that will lead to structural transformation of national economy through food security, employment opportunities and reduced poverty. The objectives of the PFJ program strategy are to:

i. to ensure immediate and adequate availability of the selected crops in Ghana through improved productivity and intensification of food crops, and extended support to private sector service providers
ii. to provide job opportunities for the teeming unemployed youth in the agriculture and allied sectors, and
iii. to create general awareness for all formal workers to either have farms and grow some cereals or vegetables or establish backyard gardens, when enough land is not available and accessible

[23] Irz X et al (2001) Agricultural productivity, growth and poverty alleviation. Development Policy Review, 19(4), 449-466
[24] Rao DS et al (2004) Agricultural productivity growth, employment and poverty in developing countries, 1970-2000 (Employment Strategy Paper)
[25] Thirtle, Colin, & Piesse, Jenifer. 2007. Governance, agricultural productivity and poverty reduction in Africa, Asia and Latin America. Irrigation and Drainage, 56: 165-177
[26] Alston JM et al (2009) Agricultural research, productivity, and food prices in the long run. Science, 325: 4-5
[27] Schneider K, Gugerty MK (2011) Agricultural productivity and poverty reduction: Linkages and pathways. The Evans School Review, 1: 56-74

5.3. Approaches and Interventions

To increase production and productivity, the PFJ program will adopt an integrated comprehensive approach that will substantially increase the availability of inputs (seeds and fertilizers) and the accessibility to input and output markets. The program will focus on the following key mechanisms: -

(i) facilitation of adoption of inputs, good agronomic practices and output marketing through an integrated e-agriculture platform, and

(ii) provision of support to private actors who are engaged in delivery of goods and services along the value chains in an efficient manner

Despite the fertilizers being made available to farmers at subsidized costs through a national subsidy program, the rate of fertilizer use by farmers has not substantially increased. The PFJ program will motivate the farmers to off take the subsidized fertilizers and in addition also widen the ambit by including the certified seeds of improved varieties. Since smallholder farmers spend a far greater portion of their farm revenue (due to low income levels) in buying these inputs, the PFJ program will moderate the financial burden of farmers by providing an option in which a farmer may pay only half of the payable portion. Through National Fertilizer Subsidy Program, the GoG presently contributes 50% of the market price of the fertilizers sold. Under the PFJ program, the farmer will pay half of the subsidized price (i.e, 25% of the total cost) at the time of collecting the inputs (down payment) and pay the remaining half (i.e, 25% of the total cost) after the crop is harvested.

The major interventions under the PFJ are organized around the following five strategic pillars (Fig. 6): -

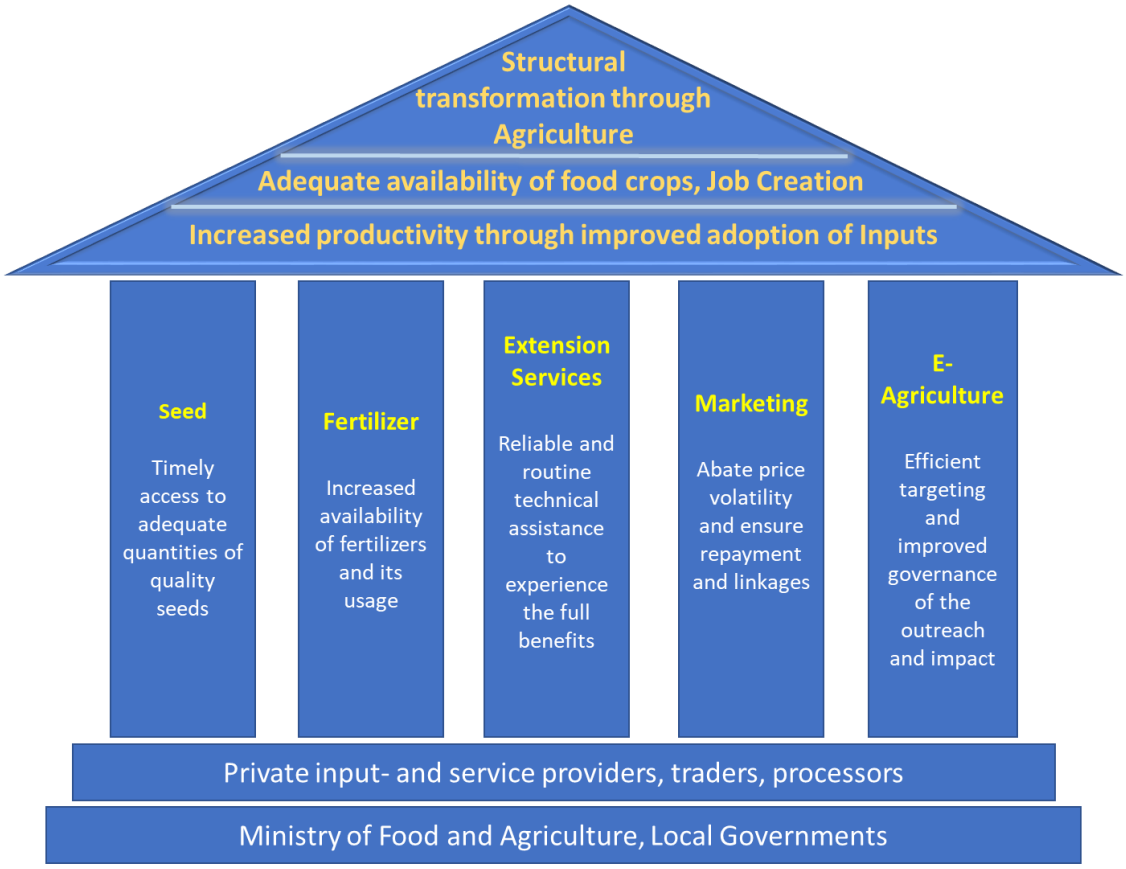


Fig. 6. Strategic pillars of the PFJ program

1. **Seed**: The program will catalyze market-led production of adequate quantities of quality seeds by private enterprises, certified seed companies and agro dealers, and facilitate timely distribution of the certified seeds at subsidized prices through public and private outlets to the targeted beneficiaries.
2. **Fertilizer**: Increasing the availability and the use of fertilizers by farmers are reinforced through this pillar. Private companies engaged in fertilizer production/blending and importation will be facilitated in meeting the fertilizer demands of the beneficiary farmers under the PFJ program through timely procurement, transportation and distribution.
3. **Extension Services**: The GoG will recruit and place Agriculture Extension Agents (AEAs) in all the 216 districts, provide the required logistics and embed them to work closely with the participating farmers. In partnerships with the local governments and private inputs and service providers, the extension services will provide reliable and programmed technical assistance so that the beneficiaries will access and experience the full benefits of the promoted technological packages.
4. **Marketing**: By promoting partnerships amongst farmers, nucleus farmers, farmer associations, farmer based organizations and private aggregators, marketing of both the inputs and outputs will be strengthened. It is envisaged that the facilitation of increased uptake of inputs will lead to increase in production of the targeted crops. New storage warehouses will be constructed in areas closer to the production and where necessary, the old warehouses will be rehabilitated and rendered functional. The PFJ will also assist farmers in marketing their farm outputs to (a) ensure the recovery of the remaining payment for the subsidized inputs, (b) minimize any ill effects of price volatility through increased participation and competition by private players, and (c) widen the benefits of increased production by establishing linkages with value addition and other food purchase programs.
5. **E-Agriculture**: To improve the targeting of beneficiaries and avoid diversion of the subsidized inputs, the PFJ program will profile the beneficiaries by engaging a state-of-art information and communication technology (ICT) platform. Through real time and cloud computing services, the data collected from the beneficiaries will be validated. By integrating ICT with the other program pillars and processes; responsiveness, efficiency, transparency and accountability of the government agencies and private service providers in providing inputs and services to farmers and other stakeholders will be strengthened.

5.4. Outreach and Target beneficiaries

The PFJ program is national in scope and will cover all the 216 districts in the country, where the prioritized food crops are grown. The program will target farmers (including growers in urban and peri-urban areas) who are willing to participate and raise their current productivity levels (productive poor) and whose land, water, labor and capital constrain productivity (resource poor). The program will limit the quantity of subsidized inputs available per farmer to a maximum of 2 Ha. Beneficiaries will need to pay half of the cost of subsidized inputs as down payment at the designated bank and bring the receipt for claiming the inputs. Beneficiaries who would not repay the remaining half of the cost of inputs at the end of the harvest for two consecutive seasons or years, will become ineligible for participating in the PFJ program until all the dues are fully cleared. In addition, the PFJ will impose internal controls, proper governance and management, checks and balances to curb elite capture.

5.4.1. Targeting methods and tools

The program will mobilize the farmers through: -

- awareness creation amongst individual farmers and farming communities on the benefits of the PFJ program through mass media, local information meetings involving private service providers, district offices and embedded agriculture extension agents
- 'proven farmers' who have faced the same challenges as their fellow-farmers in the locality but have managed to deviate positively, and are willing to demonstrate and encourage adoption by peer farmers and farmer groups
- 'nucleus farms' where the primary farm operator often provides support to the smallholders around, in purchasing the inputs and marketing the crop outputs
- registered farmer based organizations (FBOs) which can gather and coordinate smallholder farmers who share a common interest in raising their productivity and revenues by availing the opportunities presented by the PFJ

It is estimated that there are 3,328 voluntarily registered FBOs in Ghana, of which about 2,000 FBOs are engaged in production of priority food crops.[28] Since the participation by individual farmers is on a voluntary basis, the program will largely identify nucleus farms and FBOs who are willing to participate in the PFJ program and assess their organizational ability in mobilizing farmers towards buying the subsidized inputs through a 'collective farming' approach. The PFJ is expected to reach at least 1 million farmers, 5,000 nucleus farms and 2,000 FBOs that are engaged in production of the prioritized food crops, as direct beneficiaries by 2020 (Table 2). Private companies engaged in seed production and distribution, fertilizer blending/production, importation and distribution, input dealers, processors, traders, financial institutions, nucleus farmers and FBOs involved in partnerships with PFJ, will indirectly benefit through the delivery of goods and services to the beneficiaries of the PFJ. Their involvement is crucial to ensure the smallholders' effective access to inputs, services, technical know-how, finance and markets.

Table 2: Projected outreach of the PFJ program

	2017	2018	2019	2020
Eligible districts	216	216	216	216
FBOs	10	650	1,350	2,000
Nucleus farmers	100	1,750	3,400	5,000
Direct Clients	200,000	500,000	1000000	1,500,000
Estimated number of households	202,860	562,400	1,123,500	1,682,000

[28] Salifu A et al (2012) Farmer based organizations in Ghana, International Food and Policy Research Institute, Working Paper 31: Ghana strategy program

5.4.2. Inclusiveness of gender and youth

Youth (15-35 years) and women farmers and households headed by women will be encouraged to participate in the program. To ensure the inclusiveness of gender and youth, the program will engage the following tools: -

(a) priority will be given to value chains that are important for women and young people;
(b) empowering women and youth in FBOs and providing leadership training;
(c) sensitizing district assemblies and regional house of chiefs;
(d) establishing regional gender teams;
(e) promoting the participation in aggregation, trading, banking, processing, packaging and value addition;
(f) engaging short-term gender and youth specialists to conduct value chain diagnostics;
(g) using role models in promotion programs; and
(h) using age and gender disaggregated indicators to monitor the outreach of the program

5.4.3. Subsidy model

The present fertilizer subsidy program is often criticized by the stakeholders for inconsistencies between its objectives and operations, lack of transparency, delayed payments to suppliers and inadequate monitoring and evaluation. In consultation with private and public stakeholders; the MOFA has recently designed and validated an improved farm input subsidy model that will contribute to the overarching objective of enabling socio economic transformation through increased productivity in smallholder farms.[29] The PFJ program will embrace this improved subsidy model (Fig. 7) for providing fertilizers and seeds to its targeted beneficiaries.

[29] Alliance for Green Revolution in Africa (2017) Roadmap for the improved input subsidy model for agricultural growth in Ghana

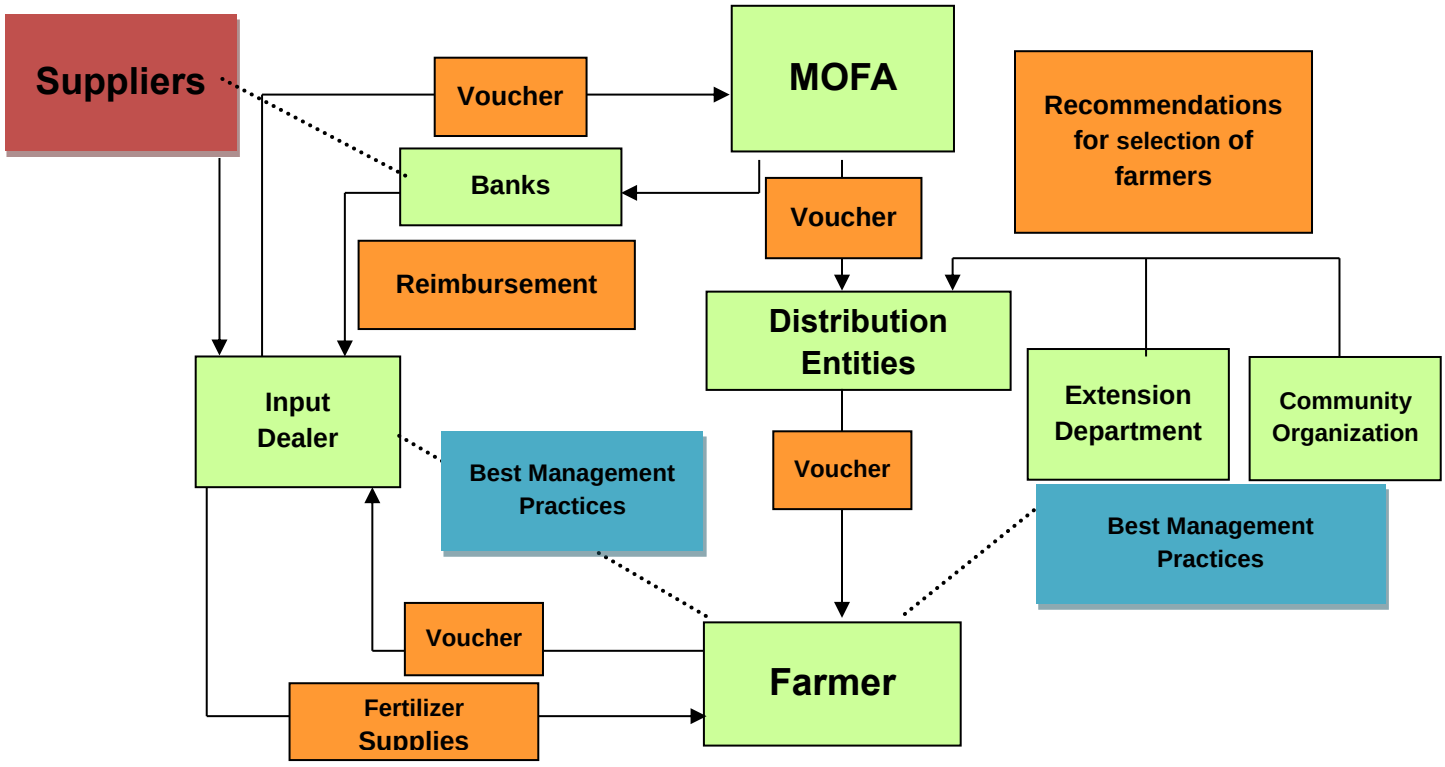


Fig. 7: Schematic illustration of an improved input subsidy model for Ghana[29]

Based on the guiding principles of improving the efficiency, transparency and effectiveness of the subsidy, the improved model includes the following features: -

- Ensure that the details of the subsidies (such as amount, type of inputs and the list of target entities) will be made available to the stakeholders by November of the preceding year
- Convene the administrative and logistical operations (such as selection of private suppliers, negotiations on prices, quantity and type of inputs for distribution) by February of the implementing year
- Communicate with stakeholders on the details of the subsidy packages to farmers and the roles of the public- and private stakeholders through mass media
- Populate the e-agriculture platform with procurement and distribution details (including the list of targeted beneficiaries, subsidy administration and information on input distribution and extension services)
- Secure the quality of the distributed inputs (fertilizers and seeds) through rigorous inspection on their adherence to the regulatory standards
- Annually review the subsidy packages based on monitoring and evaluation of the impacts of the distributed inputs and needs of the beneficiaries

5.5. Value chains

Crops under the support of the PFJ program are selected based on their contribution to national socio-economic importance such as (a) food security, (b) smallholder farm profitability and incomes, (d) supply of raw material for the livestock and industrial sector, (d) reduction in food import bill, (e) job creation, and (f) economic activity from various segments along the value chain. The selected value chains for the initial support under the PFJ program include maize, rice, sorghum, soya bean, tomato, onion and chilli pepper. The GoG aims to dispense the benefits of the program to about 2 million Ha by 2020. Based on the share of the current cropping areas and an expected additional growth (2.5% per annum) in area for cultivation of crops prioritized under the PFJ, projections on coverage of cultivated land area under the PFJ program are shown in table 3. Indicative administrative regions where these value chains will be focused are listed under appendix 6.1. While inclusion of too many value chains could progressively weaken the program's capacity; other food crops shall be included in the future, on the basis of evidences of contribution to the above-mentioned criteria.

Table 3: Projections on targeted crop areas under the PFJ program

Crop	2017	2018	2019	2020
Maize	150,000	578,668	907,780	1,182,040
Rice	30,000	124,628	198,380	259,840
Sorghum	-	118,494	197,490	263,320
Tomato	10,000	27,174	42,090	54,520
Onion	1,000	4,560	7,400	9,767
Chilli pepper	10,000	10,046	13,678	16,704
Soya bean	-	78,750	131,250	175,000
Total	201,000	942,321	1,498,068	1,961,191

5.6. Activities and Expected outcomes

5.6.1. Seed

The **specific objectives** of the interventions through the seed pillar are to increase the availability of quality seeds of improved varieties and allow the beneficiaries to be able to access and use these seeds, and improve their production in both qualitative and quantitative terms. The desired **outcomes** include increase in crop productivity, improved marketability of farm outputs and increased food availability in the country. The key sets of **activities** under this pillar include: -

- *Seeds selection:* The program will identify the market-oriented varieties that are adapted to local production environments in collaboration with the beneficiary groups, calculate the quantity of certified seeds to be supplied; and identify the required seed quality with specific and measurable indicators for each crop variety. Selection of varieties will be made by engaging the beneficiaries, seed suppliers and researchers through a participatory approach. Factors such as demonstrated economic value, market prices and domestic and global demand and supply dynamics will be included during the process of selecting the varieties. Where necessary, decision matrix analysis and/or paired comparison analyses (Appendix 5.4) to compare and select

from different subjective options in a given agro-ecological region. The program will promote distribution of certified seeds in small to medium weight packs (table 4) and promote standard seed rates in accordance with the crop ecosystem. The program will strengthen research and development so as to diversify the varietal choices available to the farmers. Adoption of varieties that are high yielding, are climate resilient and resistant to the prevalent biotic and abiotic stresses will be actively promoted through the program.

Table 4: Recommended seed rates and weights of seed packs

Crop	Maize	Rice	Sorghum	Soya bean	Tomato	Chilli pepper	Onion
Seed rate	OPV, 22.5 Kg/Ha Hybrids, 25 Kg/Ha	50 Kg/Ha	10 Kg/Ha	40 Kg/Ha	250 g/Ha	250 g/Ha	4 Kg/Ha
Seed pack sizes	5 Kg, 10 Kg, 20 Kg	5 Kg, 10 Kg, 20 Kg	5 Kg, 10 Kg	5 Kg, 10 Kg, 20 Kg	50g, 100 g	50g, 100 g	1 Kg

- *Research and development for improvement of seeds and varieties:* Due to inadequate availability of locally developed germplasm, the country's seed system is presently largely dependent on cultivars that are bred based on their adaptation to environments elsewhere. The PFJ program will diversify the varietal choices available to the farmers by strengthening the country's research and development capacities. The PFJ will actively promote research and development of high yielding, climate resilient inbreds and hybrids that are resistant to local major biotic and abiotic stresses. The PFJ will help disseminate seeds of such locally developed and locally adapted varieties by enhancing the production capacities of hybrids and breeder seeds at the originating research institutions and local private enterprises. The PFJ will promote research in purification of early generation seeds of local races of crops such as Sorghum that are presently multiplied only through quality declared seed (QDS) system for their mainstreaming into formal seed multiplication system.

- *Selection of partners:* After pooling the requirements from the different districts, the program will identify reliable private companies and organizations engaged in certified seed production through fair and transparent procurement procedures. All the seed producers under the PFJ program will necessarily have to be registered private entities and subject their production through the inspection and certification processes by Ghana Seed Inspection and Certification Division (GSID). Small and medium local seed enterprises and community based seed producers will be encouraged to supply the seeds through the program. It is expected that the program will face challenges during the initial stages in sourcing adequate quantities of breeder, basic and certified seeds of the desirable varieties in the country. In such circumstances, the program will import seeds from external sources such as the research institutions and/or the private companies in the ECOWAS region and elsewhere. The imported seeds will be scrutinized for compliance with quality control regulations and certification procedures prescribed under the

national[30] and the harmonized ECOWAS seed trade policies and legislations.[31,32] The targeted research institutions for breeder seeds include West Africa Centre for Crop Improvement (WACCI), University of Ghana, Legon for hybrid maize seeds, the Savannah Agricultural Research Institute for Soybean, Sorghum Crop Research Institute. Kumasi, for Maize and Rice Seeds, and Asian Vegetable Development Research Centre (AVDRC) for vegetable seeds. Nevertheless, the PFJ program will strive to reduce importation of seeds in the long term and promote local production of seeds. The PFJ program will advance developments in the national seed system by (i) building human and technical capacities of research institutions that are engaged in the production of breeder seeds, (ii) providing technical and financial assistance to private seed companies that are engaged in the production of basic and certified seeds for acquiring improved seed production technologies such as precision seeders, seed production protocols and management practices, equipment for grading and sorting seeds, (iii) facilitating seed inspection services to clusters of seed producers and (iv) ensuring traceability of the seeds.

- *Supply of seeds:* Timely production of the certified seeds of the desired crop varieties remains a serious challenge due to lack of availability of adequate quantities of early generation seeds of the desired crop varieties. To ensure timeliness in the supply of the certified seeds, the program will immediately and actively promote the production of breeder and basic seeds by private seed producers in partnerships with the research institutions from which the varieties were developed. Projections on the quantities of the different seed classes of the prioritized crops under the PFJ program are shown in table 5. Logistics for the transportation of the certified seeds to the targeted beneficiaries will be undertaken by private haulage companies and/or the private seed producers themselves. The beneficiary will pay the 50% of the subsidized cost for the certified seeds at the designated banks. Upon receipt of the receipt of the payment by the beneficiary, the certified seeds shall be availed from any of the authorized private seed producers' network of outlets and/or their respective district offices.

[30] Republic of Ghana (2013) National seed policy

[31] ECOWAS (2008) Regulation C/Reg.4/05/2008 on harmonization of the rules governing plant seeds and seedlings in the region

[32] Kuhlmann K, Zhou Y (2016) Seed Policy Harmonization in ECOWAS: The Case of Ghana, Syngenta Foundation for sustainable agriculture

Table 5: Requirements of quantities and types of seeds for the PFJ program

Seed Class	Crop/ Year	Maize (OPVs)	Maize (Hybrids)	Rice	Sorghum	Tomato	Onion	Chilli pepper	Soya bean
Certified Seed (tons)	2017	1339	638	700	0.0	1.2	1.2	1.2	-
	2018	9114	4340	6231	1184.9	6.8	18.2	2.5	3150
	2019	17753	8454	12377	2501.5	13.0	37.2	4.0	6650
	2020	18617	8865	12992	2633.2	13.6	39.1	4.2	7000
Basic Seed (tons)	2017	20	-	10	-	0.004	0.008	0.006	-
	2018	134	-	92	13.9	0.020	0.125	0.012	231.6
	2019	261	-	182	29.4	0.038	0.256	0.020	489.0
	2020	274	-	191	31.0	0.040	0.269	0.020	514.7
Breeder Seed (Kg)	2017	351.6	-	183.8	-	0.013	0.069	0.034	-
	2018	2393.4	-	1636.4	199.1	0.071	1.048	0.073	20.7
	2019	4662.1	-	3250.4	420.4	0.137	2.137	0.117	43.7
	2020	4889.0	-	3411.8	442.6	0.143	2.246	0.122	45.9

- *Complimentary services on seeds and seedlings:* Accessibility of seeds along the supply chain will be enhanced through a range of additional services that will mainly focus on strengthening the linkages amongst the stakeholders along the entire spectrum of seed value chain, including source seed providers, research and institutions, extension agents, seed inspection and certification authorities of PPRSD, seed producers, financing institutions and seed users (farmers). To strengthen the production and marketing of certified seeds under the PFJ program, the following activities will be pursued: -
  - enhance coordination between the production of the different seed classes of the targeted cultivars so that a critical mass of early generation seeds (breeder and basic) are constantly available
  - provide training for private seed enterprises and other registered individual seed producers on seed production technologies
  - create awareness on seed processing, packaging, labeling and tagging to enhance the marketability of certified seeds through the PFJ program
  - organize local seedling suppliers of seeds and seedlings for vegetables
  - develop capacities of local seed business entrepreneurs through training
  - facilitate development of certified nurseries to ensure constant supply of quality nursery stock especially for the vegetable crops, through training and support in obtaining certification
  - facilitate inspection and certification for the seed producers, where necessary
  - organize periodical training and awareness creation programs for generating demand by the farmers through such extension methods as demonstration plots, field days and multi-media

- *Setting trajectory for graduation (Seeds):* Graduation refers to the ability of the beneficiaries (both the private seed producers and seed users) to afford seed in the absence of the PFJ program. It is envisaged that the graduation will take place through the following activities: -
  - promote the development and availability of superior alternatives (such as hybrid seeds and other superior varieties) outside the sphere of the program that could replace those seeds that are promoted through the program
  - cater small seed packs (50 g, 100 g, 1 Kg, 5 Kg) that will improve the willingness and affordability of smallholder farmers
  - provide embedded extension services on seed production, seed use and productivity enhancing agronomic practices
  - facilitate distribution of the subsidized certified seeds through the private seed producers' marketing network
  - carry out a gradual reduction in the subsidy rates for the certified seeds over the course of the PFJ program
  - establish functional storage warehouses and infrastructures for seed processing, seed sorting, seed grading and seed packaging
  - widen the available financing options under the PFJ program for the production and purchase of seeds of all the improved varieties

Estimated costs: The prescribed activities under the seed pillar are estimated to cost about GH¢ 908,062,490 (USD 197,404,889) under the PFJ program over a period of 2017-2020 (Appendix 5.3).

5.6.2. Fertilizers

Without the use of fertilizers, the world food production could not have increased at the rate it did and more natural ecosystems would have been converted to agriculture. During the green revolution era (1960-1995), the global use of nitrogen fertilizer increased 7-fold, and phosphorus use increased 3.5-fold[33]. In Ghana, crop production is still constrained by too little application of fertilizers (Fig. 5), as the accessibility and affordability of fertilizers in crop production remain as major bottlenecks. On-farm economic evaluations in Ghana show that the respective average cost of fertilizers in rice and maize production could account for 34.2% and 51.5% of the total production costs in smallholder farms.[34]

The **specific objectives** of the interventions under this strategic pillar of the PFJ program is to motivate farmers on the use of fertilizers by providing price incentives, build critical knowledge value and increased access to timely and adequate fertilizer supply through private sector participation. The incentives include reduced cost of fertilizers and extension services on mitigating the potential risks of using fertilizers incorrectly. The expected **outcomes** include increased on-farm productivity, and improved household and national food security. The following activities will be geared to achieve the objectives under this pillar: -

[33] Tilman D et al (2002) Agricultural sustainability and intensive production practices. Nature 418: 671-677

[34] Akramov K, Malek M (2011) Analyzing profitability of maize, rice, and soybean production in Ghana: Results of PAM and DEA analysis, IFPRI Working Paper #28

- *Selection of fertilizers:* The PFJ program will entail proactive and rigorous planning on the fertilizer requirements. Annual estimation of the required fertilizers will take into account the number of targeted beneficiaries, the area planted and the crop mix. The choice of subsidized fertilizers will be based on the standard recommendations for the targeted crops (table 7). The national fertilizer subsidy program presently provides program supplies four types of fertilizer: NPK (15:15:15), NPK (23:10:05) and urea (46:0:0). The eligible farmers presently receive up to 10 bags of NPK of 50Kg each and/or 5 bags of urea of 50kg each. The most commonly used fertilizers by farmers in Ghana include NPK (15:15:15), urea and sulfate of ammonia. The PFJ program will identify the required fertilizer type and the spatial and temporal requirement of volumes according to the areas under intensification of each crop in each district in each season. Selection of fertilizers for the subsidy shall be made based on the laboratory analyses of soil nutrient conditions in key representative sites from the agro-ecological zones and/or through a participatory approach in which the beneficiaries, local authorities and private companies engaged in fertilizer research and development will be involved in identifying the suitable type of fertilizers (Appendix 5.4.). Based on the targeted crop areas under the PFJ program, provisional cumulative requirements of the fertilizers are shown in table 8.

Table 7: Recommended fertilizers for distribution under the PFJ program (1 bag = 50 Kg)

Crop	Maize	Rice	Sorghum	Soya bean	Tomato	Chilli pepper	Onion
NPK (bags/ Ha)	5	5	5	-	5	5	5
Urea or Sulfate of Ammonia (bags/ Ha)	2.5	2.5	3	-	2.5	2.5	2.5
Bio-fertilizer	-	-	-	3	-	-	-

Table 8: Projections on cumulative requirements of fertilizers (tons) under the PFJ program

Fertilizer/Year	2017	2018	2019	2020
NPK	27,175	198,119	388,056	407,050
Bio-fertilizer	-	11,813	24,938	26,250
Urea or Sulfate of Ammonia	13,588	110,909	219,043	229,857

- *Supporting the private fertilizer supply chain:* Based on the effective annual requirements, the PFJ program will invite tender from the private fertilizer companies for the supply of fertilizers. Through this process, the companies will be required to express their financial and technical capacities and areas of preference for supplying and supporting the distribution and adoption of the imported fertilizers at market prices. After price negotiations, the private companies will be allotted quotas of the various types of fertilizers and their quantities through a fair and transparent process. The companies will import fertilizers, clear shipments from the ports, pay all the charges, and deliver the allocated quantities of the various types of fertilizers to government offices and/or their private distributors in the designated regions and districts through either their own transportation means or haulage companies that are selected through a separate bidding process. The program will pay the private companies at negotiated price for

their supply based on the reconciliation of the relevant waybills at the district and regional level using designated forms. In order to alleviate the liquidity constraints of the private companies and expedite the supply of fertilizers, the PFJ program will put in place an electronic clearance mechanism for the way bill to avoid delays in payments to suppliers.

- *Promoting local blending of fertilizers:* Where appropriate, the PFJ program will endorse local blending of fertilizers, soil amendments, and other water-soluble products into irrigation system (fertigation) and use of fertigation techniques in vegetable production. Furthermore, the program will encourage local private companies on blending of micronutrients such as Ca, Mg, S, Fe, Zn, B, Mn, Mo and Cu with major nutrients (N. P and K), and their promotion through the national fertilizer subsidy program as appropriate.

- *Distribution:* Upon submission of the proof (bank receipt) of the down payment towards the subsidized price of fertilizer, the farmer will be able to collect the fertilizers from the distribution points. Since the physical distance that farmers travel to obtain the subsidized fertilizer is an important determinant of the accessibility of poor farmers to the product, the distribution of the subsidized fertilizers will be facilitated by the use of both the private agro-dealer network and government distribution channels. While the program will encourage the participation of the affiliated retailers of the fertilizer companies which imported the fertilizers, it will not restrict the participation of any other agro-dealer in the supply chain. The program will encourage youth and women in distributing the subsidized inputs in remote areas through preferential licensing and financing of agro-dealerships.

- *Complimentary services:* The PFJ program will insist that the quality of the fertilizers supplied to farmers are compliant with the prescribed regulatory standards of the GoG and ECOWAS.[35,36] By engaging the services of Plant Protection and Regulatory Services Directorate (PPRSD), the program will establish the physical attributes, nutrient contents, purity, weight of fertilizer bags at importation points and along the distribution chain through routine inspection, sampling and analysis of fertilizers. Through the embedded AEAs, the program will promote efficient use of fertilizers by the beneficiaries. The objective is to increase on-farm crop productivity by matching the application of fertilizers to crop demand in time and space and minimizing the nutrient losses in the field. Farmers will be encouraged to undertake soil testing and compliment the use of subsidized inorganic fertilizers with the required supplementary organic and other inorganic fertilizers so as to improve the sustainability of cropping systems. Furthermore, farmers will be dissuaded from the seasonal burning of crop residues and persuaded to adopt integrated soil management practices. In partnerships with private fertilizer companies, nucleus farms and FBOs, farmers' knowledge on optimal use of fertilizers will be promoted through various extension methods such as demonstrations, field days, group meetings, mass media and exchange visits.

[35] Ministry of Food and Agriculture (2013) Fertilizer policy of Ghana
[36] IFDC (2013) The quality of fertilizer traded in West Africa: Ghana report. Evidence for stronger control

- *Setting trajectory for graduation (Fertilizers):* Graduation of farmers from subsidy dependent fertilizer usage has important implications for the outreach and cost effectiveness, as it shall allow the PFJ program to scale down and diversify into other value chains and/or other productivity enhancing factors over time. Graduation is envisaged through the following activities and the spill-over effects: -
  - Enabling private sector participation in fertilizer supply systems
  - Averting crowding out effect on private investments in fertilizer business
  - Thickening of private fertilizer supply chains in rural markets
  - Building trust of the farmers on the quality of subsidized fertilizers, by emphasizing regulatory controls along the distribution network
  - Promoting establishment of local organic fertilizer production enterprises
  - Gradual reduction in subsidy percentage on market prices of fertilizers
  - Promoting collective buying of fertilizers through nucleus farms and FBOs
  - Value chain support services emphasizing capacity building on fertilizer use efficiency, appropriate soil fertility replenishment and sustainable soil management practices
  - Increased productivity, farm revenues and disposable incomes

Estimated costs: It is estimated that the above described activities and the absorbed subsidy costs on fertilizer inputs will cost about GH¢ 1,842,504,980 (USD 400,544,561) over a period of 2017-2020 (Appendix 5.3).

5.6.3. Extension Services

Extension services can play a pivotal role in translating the increased availability of inputs and technologies through the program into increased productivity. The **specific objective** of this pillar is therefore to augment the outreach and the impacts of the PFJ program through increased frequency and the quality of extension services on various technical and non-technical services and markets. The **expected outcomes** include incremental adoption of the facilitated inputs and increased on-farm productivity. Activities under this pillar include the following: -

- *Deployment of extension agents:* It is estimated that the extension directorate of the MOFA would need a total of 4,000 Agriculture Extension Agents (AEAs) in the 216 districts, where only about 2,600 AEAs are presently employed. To fill the gaps, the MOFA has recently recruited about 858 AEAs and deployed them in various districts in Ashanti (188), Brong Ahofo (122), Central (37), Eastern (86), Greater Accra (30), Northern (121), Upper East (73), Upper West (76), Volta (48) and Western (77) regions for the PFJ program. After an initial probationary tenure for 2 years under Youth Employment Agency, the AEAs will be migrated into the payrolls of the MOFA. Logistics such as motorbikes, fuel, protective clothing for the AEAs are being established with the support through a Canadian grant facility for the PFJ program. It is expected that the AEAs will guide farmers on the adoption of good agronomic practices, bestow efficiency in the use of inputs, and facilitate increase in on-farm productivity and farmers' income.

- *Mobilization of farmers:* Awareness on the benefits of the PFJ program amongst farmers growing the targeted value chain crops in rural, peri-urban and urban areas will be created through mass media and regional and district agricultural offices. The AEAs in the districts will proactively approach nucleus farmers in their respective enclaves and suggest the satellite out-growers and other independent farmers around the nucleus farms to enroll and organize the procurement of seeds and fertilizers through the PFJ program. Registered FBOs that are engaged in processing and marketing activities generally operate as private business entities and are driven by revenue generation. Since such FBOs could become cost-effective delivery channels for extension services; the AEAs will orient the FBOs on joining the PFJ program through cooperation between FBOs and district agriculture offices and private input suppliers. In urban and peri-urban areas, the extension services will generate awareness for all formal workers to either farm the targeted food crops and/or establish backyard gardens, if enough land is not available and accessible.

- *Provision of support services:* Farmers' knowledge on good crop management practices, optimal input use and marketing can contribute of increasing crop productivity and farm revenues. Facilitating these knowledges through provision of extension services is an important endeavor of the PFJ program. The major extension approach under the PFJ program will involve training and visits, as this approach will provide continuous adjustments through continuous feedback from farmers to extension agents and to other implementing institutions. Through transfer of technology (TOT) model, information and technologies that are generated at national research stations will be diffused to farmers using various methods such as individual/household extension, farmer groups (nucleus farms and FBOs) and mass media. The key actions include the following: -
  - Carrying out regular and recurrent technical assistance visits to the beneficiaries' farms
  - Transferring technologies to farmers on input usage, overall agronomic performance of cropping systems, mitigating biotic and abiotic risks and threats, postharvest handling, storage and marketability of outputs
  - Strengthening the ability of nucleus farmers and FBOs in transferring the market information, prices, weather and technologies to farmer members
  - Training for MoFA staff and AEAs on good agricultural practices (GAPs) of the selected crops, postharvest management, marketing, business management and M&E through study tours, technical exchange sessions and workshops
  - Equipping each of the 10 regions with one demonstration and research and extension centers each that can provide technical assistance on transfer of technologies to the targeted beneficiaries
  - Facilitating pluralistic extension services through training, demonstration and adaptive trials in partnerships with private input and service providers, development partners and non-government organizations (NGOs) that share the program's objectives
  - Encouraging farmers to join the electronic registration and validation processes for availing the benefits under the PFJ program
  - Advising the PFJ beneficiaries on the importance of payment of the balance towards subsidized inputs received from the program

- Providing bi-directional linkage between researchers and farmers on mitigating risks and threats, and refining the agronomic practices in light of the PFJ program's objectives

Estimated costs: The extension services described above are estimated to cost about GH¢ 277,741,800 (USD 60,378,652) under the program (Appendix 5.3).

5.6.4. Marketing of Produce

It is conceivable that the PFJ program will increase the production of the targeted crops through its interventions and thereby create space for marketing of the farm outputs. Through its multiplier effects, a network of efficient marketing channels for farm outputs shall lead to increases in farm revenues, supply of raw materials for food and feed industries, and creation of jobs in farm and allied sectors. The **specific objectives** of this pillar are to (i) promote the roles of private sector in storage and marketing of farm outputs and (ii) facilitate forward and backward linkages between the producers and commodity chain actors. The **expected outcomes** include translation of higher production to higher real farm incomes and creation of jobs in farm and off-farm sectors. Major activities will include the following: -

- *Collection of outputs:* The program will encourage participation of private aggregators (traders, processors, nucleus farmers, FBOs, food and feed enterprises and exporters) in production areas in collecting the balance of payments on the subsidized inputs in cash or kind (farm produce) from the beneficiaries. Through mutual consensus, the aggregators shall arrange either the collection of cash or produce at farmgate or direct delivery by the farmers. On the basis of commission for collection with the designated banks however, the aggregators shall arrange only payments of cash on behalf of the beneficiaries. Since such traders, processors, and exporters are also often one of the primary sources for informal credit to poor agriculture-dependent households, nucleus farms and FBOs; their linkages could also help increase the farmers' access to finance for the input purchase transactions and other complimentary services. The commissioned private aggregators will be mandated to communicate with the farmers on the importance of adhering to quality standards of the farm products.

- *Facilitation of storage infrastructures:* The expected increments in food crop production as a result of the interventions from PFJ are shown in table 9. An inventory of existing warehouses across the country and their functional status and their security and legal arrangements will be prepared. Requirements of rehabilitation measures to render functionality to the existing warehouses will be assessed. Through public private partnerships, the PFJ program will rehabilitate existing warehouses and where necessary, will construct new medium-sized storage warehouses in the districts. Through a cluster approach, commodity-based warehouses shall be developed in areas where production of the targeted crop(s) are high. Since the quality of outputs from various farmers could be highly heterogeneous, such warehouses shall be equipped with facilities for sorting, grading, processing and packaging. Private sector will be encouraged to lease and operate these warehouses, and enhance the aggregation and marketability of outputs. Well established warehouse facilities could also serve as point of extension activities

such as training on quality improvement through improved production practices, postharvest handling, grading, packing and storage.

Table 9: Estimated additional production (tons) of food crops through the PFJ program

	Average yield (t/Ha)		Expected additional production (tons)			
Crop	Current	Projected	2017	2018	2019	2020
Maize	1.7291	5	281,427	1,915,912	3,732,007	3,913,616
Rice	2.6964	4	18,250	162,465	322,704	338,727
Sorghum	1.141	4	-	338,774	715,190	752,832
Tomato	7.8037	12.5	22,542	127,617	244,367	256,042
Onion	17.1	25	2,370	36,026	73,421	77,161
Chilli pepper	8.5	15	29,900	65,304	104,642	108,576
Soya bean	n/a	5	-	212,625	448,875	472,500

- *Linkages with public food programs and services:* The program will establish strong linkages between private aggregators who are undertaking the collection and/or storage of farm outputs with public programs engaged in procurement of food crops such as Ghana School Feeding Program (GSFP), Ghana Prisons Service, National Disaster Management Organization (NADMO), Food Fortification Program (FFP) and World Food Program (WFP). Such linkages for the private aggregators will serve as incentives and could further motivate marketing of outputs from the PFJ program. The aggregators and storage warehouses will be linked with Grains & Legumes Development Board (GLDB)'s facilities, where grading, sorting, processing and packing infrastructures are already available. Since some private entrepreneurs, nucleus farmers and FBOs are also engaged in processing, packaging and marketing of the farm outputs (including perishables such as tomato, onion and green chilli pepper), engagement of such players as commissioned aggregators could also help improve the quality of production and increase accessibility to markets by the PFJ beneficiaries. In addition, the nucleus FBOs can also provide a firm base for dialogue and cooperation in programs with other institutions, possessing credibility and power to ensure participation of the PFJ beneficiaries in marketing their outputs.

- *Linkages with animal feed industry:* Animal feed industry represents a significant value addition opportunity for food crops such as maize, rice and soybean. It is estimated that Ghana's poultry industry in 2014 demanded 248,334 tons of maize, 81,809 tons of rice and 182,083 tons of soybean as poultry feed.[37] Human consumption demand for animal proteins in the form of chicken and fish will further drive the long-term demand for yellow maize, rice and soya bean as animal feed. However inadequate supply of the requirements such as yellow maize and soya cake limit the expansion of the domestic industry and prompt cheaper broiler imports from other countries.[38] The PFJ program will facilitate direct linkages between farmers, aggregators and animal feed chain actors such as feed processors, private animal feed enterprises and poultry farms.

[37] USAID (2014) Agricultural development and value chain enhancement (ADVANCE II) - End market survey report PY 2014
[38] USAID (2012) The market for maize, rice, soya and warehousing in Ghana

- *Price Volatility:* The commodities targeted under the PFJ program are generally subject to seasonal fluctuations (Fig. 8)[39] in local markets, as their supply is dependent on the harvest, planting, weather conditions, transportation and feed demand. Due to the expected surge in cumulative production under the program however, the base prices of the targeted crops may change in relation to other competitive food alternatives. The program shall not interfere with the market forces acting on the prices of commodities. The program will nevertheless constantly monitor the seasonal volatility in prices and shall intervene only when there are strong evidences of unfair market practices. While the program will constantly embark on diversification of markets for the targeted crops, the program shall promote direct procurement from the producers and/or introduce producer support prices and policies through public programs only when there is a need to abate any unfair volatile forces. After assessing their potential in minimizing the risks of price volatility; the PFJ program will engage strategies such as (a) negotiating the establishment of agreements between producers and buyers with economic clauses that could be equitable to both the parties in a volatile market, (b) engaging National Food buffer stock Company (NAFCO)'s role in stabilizing prices via national stockpiles and buffer stock facilities with clearly redefined policies that will alleviate NAFCO's financial and administrative constraints[40], (c) horizontal diversification of PFJ program into alternative crops, (d) promoting value addition of the outputs, (e) establishing comprehensive partnerships through incentives and joint ventures with various commodity stakeholders to mobilize greater participation in the commodity value chain, and (e) promoting financial risk management tools such as innovative insurance products, forward options and futures contracts between producers and buyers.

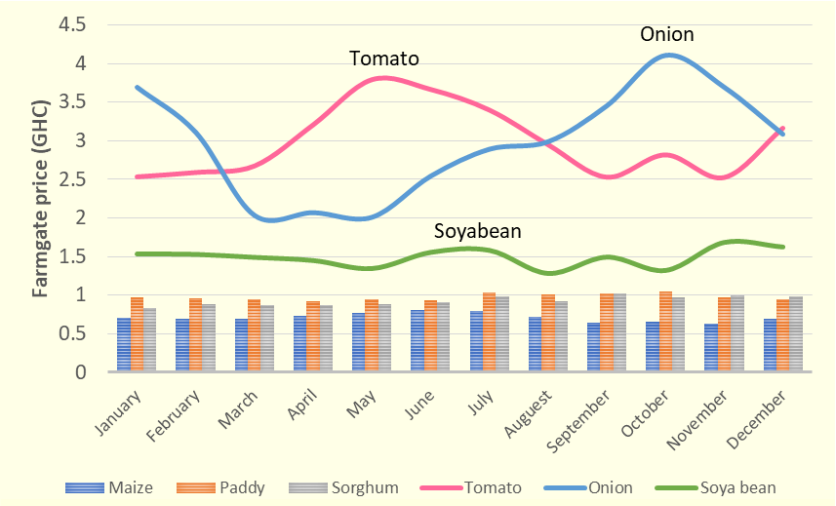


Fig. 8: Fluctuations in monthly average prices of the targeted crops under the PFJ

- *Facilitation of private enterprise development on processing and value addition:* The PFJ will establish linkages between producers, aggregators and private enterprises that could generate finished products from the farm outputs. Where the commodities are highly perishable such as tomato; the PFJ will encourage setting up of small cottage industries with mobile processing units to transform into semi-processed forms such as purees. Such semi-processed products will then be mobilized for further processing along the commodity chains, such as preservation under cold

[39] Based on raw data sourced from Statistics, Research and Information Directorate, MOFA
[40] Monitoring African Food and Agricultural Policies (2012) Analyses of incentives and disincentives for maize in Ghana

storage systems for future sale. Food processing companies, research institutions, individuals and cottage industries will be encouraged to develop and commercialize new products and food recipes from the local crop outputs. Such activities will help expand the market base for each commodity, decrease price volatility and increase the potential for higher revenues and additional jobs.

- *Facilitate packaging and branding enterprise development:* The PFJ will support local industries that employ innovative technologies in packaging and branding the value-added products. Such marketing interventions will feed into the Government's One District One Factory initiative.

- *Facilitate exploration and development of new market niches:* The products from the current PFJ target crops have wider usage and hence market potential across the West African sub-region. The PFJ will therefore support existing export oriented companies and new entrants with proven markets to explore and penetrate new and niche markets to facilitate sale and marketing of the local production. Promotion for exportation will be made through Ghana Export Promotion Council (GEPC) and the Ministry of Trade. In collaboration with Agribusiness Support Unit and Women in Agricultural Directorate (WIAD) and private marketing firms, the PFJ will promote development of the domestic markets for the outputs and the processed products.

- *Job creation:* Evidences from green revolution in Asia have revealed that the higher agricultural output stimulates employment in the rural and urban non-farm sectors through both forward and backward linkages.[41] The increased use of improved seed and fertilizers have strongly influenced the scale of the change in labor demand in rural Asia; by engaging increased number of man hours in preparatory tillage, sowing, fertilization, harvesting, threshing and winnowing.[42,43] The overall growth in the farm economy in Asian and South American countries are also able to absorb higher numbers of rural unemployed, especially the landless rural poor.[44] Implementation of the PFJ is therefore bound to generate jobs in both rural and urban areas in Ghana through increased value chain activities, production, value addition and commodity processing and marketing. Some of the avenues through which jobs could be created under the PFJ program by virtues of the following: -

  1) promotion of input use which could in turn shall: -
     a) expand farming into arable land that is not used hitherto effectively; creating more job opportunities for rural farm and non-farm families
     b) generate urban and rural jobs in supplying the required farm inputs through such PFJ-prompted activities as: -
        i) importation and/or local blending of fertilizer nutrients

[41] Hanmer L, Naschold F (2000) Attaining the International Development Targets: Will Growth Be Enough? Development Policy Review, 18: 11-36
[42] Ahmed I (1976) Employment Effects of the Green Revolution. The Bangladesh Development Studies, 4: 115-128
[43] Irz A et al. (2001) Agricultural Productivity Growth and Poverty Alleviation. Development Policy Review, 19: 449-466
[44] Pingali PL (2012) Green Revolution: Impacts, limits, and the path ahead. PNAS, 190: 12302–12308

ii) local production of certified seeds
iii) financial services
iv) farm mechanization services
v) storage services
vi) transportation services
vii) trading/retailing and distribution services

2) focus on labor-intensive crops such as rice, soy beans and vegetables is bound to increase both on-farm and off-farm employment for landless men and women in rural areas throughout the production season
3) the increased output production will generate jobs through
   a) trading of commodities
   b) processing of raw materials
   c) value addition
   d) export marketing of raw materials, semi-processed products (e.g. tomato puree) and finished products, residues (e.g. straw) and by-products
4) coordination and implementation of the PFJ program will also create jobs in the provision of
   a) public- and private extension services
   b) rural banking services
   c) e-registration and data processing services
   d) information and communication technology services

It is that conceivable that the rise in trading, grading, processing, packaging, value addition and marketing activities in food and feed industries that the PFJ program would render could create more jobs especially for the youth and women, in both farm and off-farm sectors. It should be noted that most of the job creation will come through micro, small and medium enterprises in rural and urban areas. Hence nurturing such enterprises through appropriate policies will become critical in sustaining the jobs created under the PFJ. PFJ program will provide linkages for the entrepreneurs in agriculture sector with synergistic government initiatives that are aimed at creating jobs such as One-district-one-factory[45] in potential production areas. Furthermore, the increase in agricultural production shall potentially increase revenues of farmers who then shall increase the demand for the goods and services produced by the non-farming rural poor, triggering a structural transformation through the economy.[46] Overall estimates of potential number of jobs that could be created through the implementation of the PFJ program is shown in table 9. Based on cropping area projections, projections on number of jobs that could be created in each cropping season are shown in table 10.

[45] Ministry of Finance (2017) Sowing the seeds for growth and jobs - 2017 Budget statement and Economic policy, Government of Ghana

[46] Schneider K, Gugerty MK (2011) Agricultural productivity and poverty reduction: Linkages and pathways. The Evans School Review, 1:56-74

Table 9: Estimated number of employment opportunities under the PFJ program

Value chain activity	2017	2018	2019	2020	Total
Input Supply Chain (Seeds, Fertilizers)	4,536	5,443	6,532	7,838	24,349
Production	471,713	566,056	679,267	815,120	2,532,155
Postharvest handling and processing	378,395	454,074	544,889	653,867	2,031,224
Marketing of Outputs	4,968	5,962	7,154	8,585	26,668
E-Agriculture	3,888	4,666	5,599	6,718	20,871
Total	863,500	1,036,200	1,243,440	1,492,128	4,635,268

Table 10: Projections on number of employment opportunities per cropping season

Task requiring employment	No. of jobs
Agro-input Dealers	
Seed and fertilizer suppliers (including transport services; same transport services will be available to aggregators)	
Fertilizer distributed (60,066MT)	12,013
Assume 1 person loads/offloads 5tons; 60066/5 persons	
Seeds distributed (3,050MT)	610
Assuming 1 person loads/offloads 5tons; 3050/5persons	
Above people in the transport service will be assigned to aggregators to offtake produce	
Creation of new outlets for input dealers	
Agrochemical dealers (5 outlets/district)	
Each outlet employs 2 persons (5x2x216)	2,160
Input Distribution by District Assemblies	1,080
(Seed and fertilizers deposited at District Assemblies)	
Each District assembly will employ 5 people	
for the fertilizer and seed distribution	
(5x216 people)	
Production (Due to the expansion of acreage; 231,126 ha)	
Labors (3 extra workers/ha) 3x231,126 persons	693,378
Tractor services for 231,126ha	
Assume 1 tractor will plough 10acres/day for 24days	
231126/10acres/24days	
Each tractor will need 2 operators (963x2)	1,926
Post-Harvest- processing	
Processing- Shelling machine 5/district	
Each machine will need 2operators (5x2x216)	2,160
Marketing- Aggregators	

Task requiring employment	No. of jobs
Each district will have 5 aggregators and each aggregator will employ 5 people (5aggregatorsx216districtsx5people	5,400
Warehouse for storage	
Assuming each district has 1 warehouse (216 warehouses); Each warehouse will employ 10 people for storage, cleaning, drying, grading, packaging/bagging operations (216 warehouses x 10 people)	2,160
Milling services for rice	
Assuming 2 people will mill 1 ton/hr for 6hrs (129600 x 2/6); 10% for feed = 88000MT; Milling of maize for feed (176000 x 5tons = 880000MT); Milling of soya for feed (4300x3tons =12900MT)	43,200
Agric Extension Agents (Agric College Graduates) Employed	1,200
National Service (University Graduates) Employed	2,160
E-Agriculture	
Registration (3 persons/district) 3x216	648
Data processing (1 person/district) 1x216	216
Total jobs created	768,311

Estimated costs: The proposed activities under this pillar are estimated to cost about GH¢ 10,167,840 (USD 2,210,400). Costs for activities for mobilizing the value chain actors and supporters are partially covered also under the other pillars viz., seed, fertilizer and extension services (Appendix 5.3).

5.6.5. E-Agriculture

Applying the principles of ICT in agriculture, also referred to as E-Agriculture, can help the PFJ program achieve its objectives by providing fast, reliable and accurate dissemination of information through its complex network of stakeholders. Application of ICT can also help the PFJ beneficiaries decide when, where and how to: access the inputs, cultivate and harvest the targeted crops, and market their produce. The **specific objective** of this pillar is therefore to improve the efficiency of the implementation of the PFJ program through appropriate ICT tools. The **expected outcome** of the activities under this pillar is improved governance and management of the outputs of the program.

E-Agriculture offers a wide range of ICT solutions to the various needs and challenges of the PFJ program. However, within the national framework of legal and policy regulations on ICT[47], the PFJ program will deploy those ICT solutions (devices, networks, mobiles, and software applications) that will ensure data integrity and security during its implementation. In order to get the desired results from the applications of E-Agriculture, the PFJ will (i) assess the requirements of the ICT models and tools for the deliverables

[47] Ministry of Communications, Republic of Ghana (2003) Ghana ICT for Accelerated Development (ICT4AD) Policy,
The Electronic Communications Act, 2008, Act 775,
The National Communications Regulations 2003, L.I. 1719.

of the program, and (ii) engage private sector in establishing and applying the required models and tools for efficient integration of the targeted beneficiaries and implementation of the program. Under E-Agriculture, the PFJ program envisages the following activities: -

- Electronic registration and validation of the target beneficiaries, public and private value chain supporters and service providers
- Efficient inclusion of youth, women and poor smallholder farmers under the PFJ program
- Establishment of a database on registered and validated identities of target beneficiaries, nucleus farms, FBOs and registered value chain actors and supporters and other resources (human and infrastructure) of the PFJ program
- Maintenance of records of land use, cropping patterns and extension services (extension visits and services) using satellite and/or Global Positioning Systems (GPS)
- Establishment of 'supply chain management system' that will allow the program to transmit and track the orders and movement of the subsidized seeds and fertilizers
- Electronic clearance mechanisms for way bills of importers, transporters, distributors and retailer network
- Lowering of the transaction costs along the input supply chains and commodity output chains
- Elimination of subsidy leakages through efficient logistics-tracking tools
- Facilitation of information on input subsidies, prices and sources
- Weather forecasting and emergency communication and coordination services on mitigating climatic risks
- Early warning and management of pests (e.g. Fall Army Worm) and diseases
- Dissemination of knowledge on input usage, good agronomic practices, harvesting and postharvest handling methods
- Establishing e-payment accounting systems for the beneficiaries and their payment records towards the procurement of subsidized inputs
- Improving coordination and monitoring of the PFJ program through appropriate adoption of networking tools in communication and implementation
- Facilitating beneficiary profiling, crop and land observations (using satellite and/or earth observation technologies such as drones), market research, data mining, data processing and impact assessment
- Facilitating market information on
    - aggregators, market locations and storage warehouses
    - output prices
    - changes in consumer demand and supply
    - market intelligence that shall help in long term decision making by farmers based on market demands, product specifications (e.g. yellow maize versus white maize for poultry industry), market prices and trends

The mechanisms of development, deployment and management of ICT systems for communication with the stakeholders will be driven by the demands of beneficiaries, markets and the implementers of the PFJ program. Given the dynamics in the advancement of information and communication models, the

PFJ shall resort to the following models of communication for disseminating information with its stakeholders: -

- *Web portals:* The program will host a collection of relevant web sites, such as that of MOFA, private input suppliers, private service providers, food and feed enterprises to form one stop centers for the farmers,
- *Text based service:* Communication of vital information to the beneficiaries shall be made through short text message services (SMS) of mobile phone networks. The PFJ program shall prepare and publish text messages through appropriate telecommunication channels. This service shall jointly be operated by the MOFA, regional/district agriculture offices and telecom service providers.
- *Mobile internet based service:* Information dissemination through smart phone services, e.g. technical information, market information, PFJ-news, etc.

Estimated costs: Activities under E-Agriculture are estimated to cost about GH¢ 28,980,000 (USD 6.3 million) towards the PFJ program (Appendix 5.3).

5.7. Risk Assessment and Management

It is highly likely that the PFJ program may confront different types of risk during the course of its implementation. The two primary sources of risk in agriculture involve (i) Production risks which include such elements as weather, insects, disease, technology and any other events that directly affect the quantity and quality of production, and (ii) Price/Marketing risk which includes the various uncertainties in the market for the targeted commodities, such as changes in the prices of inputs and/or outputs. By enabling changes in the risk environment and employing tools that could efficiently manage the risks, the PFJ program will manage reducing the impact of such risks. The major risks that could potentially cause a severe impact on the implementation of the PFJ program and the mitigating actions are summarized in table 10.

Table 10: Risk assessment matrix

Risk Area	Risk Description	Probability	Impact	Mitigating Actions
Seed	Germination, purity and average yield performance of seeds supplied through the PFJ program are inadequate	Low to medium	High	• Engagement of quality by enforcement agencies (PPRSD) through close coordination • Analytical testing of seeds along the production and supply chain • Linking supplier's contract arrangements to feedback mechanisms by the seed users • Training for private seed producers on quality seed production
	Seeds of preferred varieties are not available on time to the beneficiaries	Medium	High	• Sourcing of certified seeds from other countries through private contracts to fill the gaps in local supply of certified seeds of the targeted crop varieties • Acceleration of research and development on in-country varietal development and early generation seed production
Fertilizer	Quality of fertilizers distributed to farmers is compromised	Medium	High	• Enforcement through analytical testing for nutrient contents and quality along the supply chain (importation, storage and distribution) • Setting electronic monitoring and weighing system for fertilizers at the distribution points
	Degradation of soil fertility due to inappropriate use of fertilizers	High	High	• Extension - advice and support on best soil management practices through extension services • Create a sound and practical understanding on the importance of soil testing • Encouraging the use of low-cost technologies (such as spectral imaging of leaves) for measuring the crop's need for nutrients

Risk Area	Risk Description	Probability	Impact	Mitigating Actions
				• Communicating and exchanging expertise regarding best practices on storage and distribution by private companies
Extension Services and Production	Significant spatial and temporal variations in weather variables such as precipitation, temperature, wind leading to climate change	Medium	High	• Building multi-level partnerships with institutions and development partners in enabling an improved agricultural support service system to farmers • Building technical capacity of community based institutions in resource conservation and adaptation to climate change • Integration of localized weather and climate information services with extension services • Collection of information on adaptation and other coping practices practiced by local farmers • Strengthening overall risk management capacity of local governance systems through awareness creation and training
	Pest and disease outbreaks	Medium	High	• Periodical technical assessment of risks from pests and diseases by engaging stakeholders • Establishing early warning system for potential risks based on the local knowledge, technical assessment of evidences and socio-economic impacts • Promoting integrated management of pests and diseases employing physical, chemical and biological methods of controlling pests • Communication with stakeholders on the possible sources and causes of outbreaks and management packages of tackling the critical risks and threats

Risk Area	Risk Description	Probability	Impact	Mitigating Actions
				• Diversification of targeted crops and/or different cultivars of the same crop (e.g. yellow and white maize) across the given agroecological zones over the course of the program
Marketing of Produce	Poor recovery rates from the beneficiaries on the balance of payment against the subsidized inputs	Medium	High	• Close monitoring of production activities of the beneficiaries and reminding the beneficiaries on the payment through extension services • Facilitating marketing of production through contractual arrangement with obligations for repayment • Providing electronic platform for enabling direct and indirect transfer of payment by the beneficiaries through aggregators and commissioned agents
	Delayed payment by off-takers	Medium	High	• Constant engagement of commercial operators and stakeholders • Engagement of nucleus farms and FBOs as pivotal collection points and service provisions • Improving the access to market information including price, trading options and collective bargains • Facilitating negotiations on forward pricing and contract pricing between farmers and commercial operators • Arrangements for forward linkages with implementation of relevant national programs and initiatives (e.g. School Feeding Program, one-district-one-factory)

Risk Area	Risk Description	Probability	Impact	Mitigating Actions
E-Agriculture	The limited government infrastructure and information technology may affect selection of eligible resource-poor and productive-poor smallholder farmers	Medium	High	• Spearhead a sound public awareness campaign to facilitate adoption of the subsidy targeting plans • Decentralization of administering the selection of beneficiaries to local governance and local operating systems such as nucleus farms, FBOs • Leverage existing government processes and information technology infrastructure for managing identification and selection of the beneficiaries • Engagement of private companies in registration and validation process of selected beneficiaries of the program
	Activities may be too aggressive to take account of the sector's capacity to accept and support activities, and the associated level of change that these activities will seek to deliver	Medium	High	• Integration of unorganized sections of the beneficiary system of the PFJ program through collective channels such as nucleus farms and FBOs • Coordination of ICT managed activities through District Technical Committee so that the E-Agriculture pillar's focus does not become too broad, but rather targeting its specific, high-priority needs of the beneficiaries • Promoting flexibility within the ICT systems to accept and adapt to the tangible needs of the beneficiaries and stakeholders

5.8. Coordination of the program

The MOFA will be responsible for overall strategic guidance and will coordinate implementation of the program through a 3-tier structure (Fig. 9). The lead agency for the coordination of the program within MOFA will be the National Technical Committee (NTC) team. Chaired by the Deputy Minister (Crops), the NTC will steer the general course of actions and set directions in conformity with the overarching national developmental strategies and drive the implementation process through Regional Technical Committees (RTC) and District Technical Committees (DTC) set across the nation. The NTC holds the key decision-making responsibilities while the RTC and DTC will have oversight and coordination functions. The purpose and the terms of reference of the technical committees are annexed in Appendix 5.2. Since the members and chairpersons of the three tiers are top ranking officials who can influence the decision-making process; the implementation structures are built within the existing organizational framework of governance and hence do not require any institutional restructuring or special delivery unit.

The NTC will oversee the implementation of the strategic activities at national level and prepare a quarterly report on the progress of the program to the Minister for Agriculture. The NTC also shall coordinate with development partners and other national stakeholders on the implementation of the program. Representatives of the private sector from all levels of the value chains will be included in any discussions related to the design and implementation of the PFJ program. In consultation with the District Technical Committee (DTC) of the relevant districts, the RTC will establish institutional arrangements, safeguard against risks, develop a monitoring plan, coordinate and supervise the implementation in the respective region, propose decisions and report to NTC on a quarterly basis. The DTC will develop seasonal and annual operational plans, mobilize private- and public-sector actors and supporters, implement and monitor the day-to-day activities, constantly assess and manage any risks and threats to the implementation, propose decisions, and report on a monthly basis to the RTC.

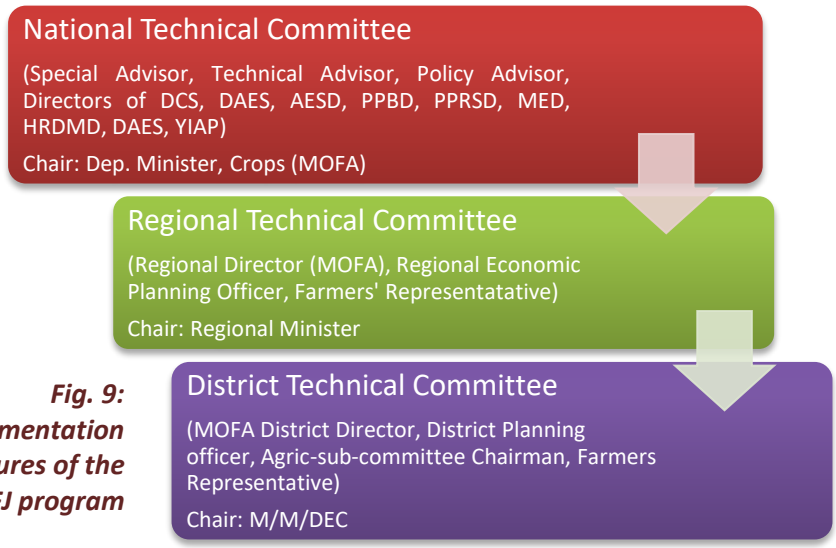


Fig. 9: Implementation structures of the PFJ program

ICT tools can be catalytic in stepping up the coherence and coordination of implementation activities and deriving cooperation from a spectrum of stakeholders and geographical regions. To alleviate time-, cultural-, political- and administrative delays in communication, coordination and implementation through the various layers of central, regional, district and local governance; the technical committees will adopt ICT networking tools through which they can create contents and share efficiently with the stakeholders. A Gantt chart rendering the workplan for the proposed implementation of the PFJ in this document is outlined in Annex 6.6.

It is conceivable that there are several risks that could threaten the successful implementation of the PFJ program. A risk assessment matrix collating the possible risks, probabilities, impacts and mitigating actions is shown in Annex 6.7.

5.9. Monitoring and Evaluation

The technical committee members will play a lead role in tracking the progress and providing counselling to stakeholders on implementation of the various activities across the different value chains. During periods of emergency such as outbreaks of pest and diseases or climatic severities, the technical committees will decide on alternate courses of implementation approaches and methods on interventions and modes of deliveries, so as to meet the objectives of the PFJ program. The technical committees will ensure that timely and relevant information is being systematically used to improve decision-making, and that reliable and relevant data and information are made available through their monthly and quarterly reports. Discrepancies on outputs, outcomes and impacts will be avoided by disaggregating the data on gender, age, commodity, location and time.

Evaluation of the PFJ program will use indicators (section 4.6) that are based on reliable data and verifiable evidence on inputs, outputs, outcomes and impacts. Using appropriate ICT tools, the program will monitor and evaluate the supply of subsidized inputs through the supply chain management system of the program, public expenditure tracking system and payment records of financial institutions. Frequency of extension services will be monitored through the spot records of technical visits, using global positioning system (GPS). Outputs will be tracked using quantitative assessment such as administrative information systems, seasonal (every 6 months) surveys, annual crop production surveys and earth observation technologies such as drones and satellite based data. Since information on critical indicators such as input adoption rate, farm revenues and number of jobs created are not readily available within the national agriculture systems, the PFJ program will build capacity on systematic collection and analyses of information at district, regional and national levels.

Outcomes will be measured against a set of core indicators defined under the logical framework (section 4.6). Since it is often difficult to measure and disentangle the various causes and processes that lead to the desired behavioral changes as outcomes and impacts of the PFJ program, both quantitative and qualitative data will be used. National statistical surveys such as labor force report, annual facts and figures from the relevant ministries and participatory assessment surveys of the PFJ program will be used as tools. Technical reports on input use efficiency, partial factor productivity (seeds and fertilizers) and sustainability of cropping systems will also be used in evaluating the outcomes.

While the evaluation of outcomes of the PFJ program will be conducted annually after every 2 crop seasons of interventions; the impact of the PFJ program will be measured every 3 years. Since the deliverables of the PFJ program are aligned to that of Ghana's CAADP commitments; the outputs of the PFJ shall be shall be readily integrated with the Joint Sector Review process of country's CAADP implementation plan and reported to Agriculture Sector Working Group annually. A framework for measuring the performance of the implementation of the PFJ program is outlined in table 11.

Table 11: Performance measurement framework for the implementation of the PFJ program

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
	GOAL											
1	i. Growth in real incomes of rural households	The real income is the nominal income adjusted for price changes. Real income is thus, the nominal income divided by the consumer price index in its decimal form.	Ghana Living Standards Survey, GSS		2017	0					Rural and Urban	Challenges are posed when survey periods do not coincide with the program implementation
2	ii. Percent change in Agricultural GDP	The gross domestic product (GDP) is the value of all final goods produced by the agricultural sector of the country within a given year.	The data will be obtained from national accounts collected by GSS / Ministry of finance	Yearly Reporting	2016	0					No disaggregation	
3	iii. Average per capita expenditure of rural households	This indicator measures the expenditures of rural households as a proxy for income. It is based on the assumption that increased expenditures is strongly correlated to increased income.	Population-based surveys of rural households	Start and end of the Program	2017	TBD					No disaggregation	It is assumed that resources will be made available for a baseline survey
	STRATEGIC OBJECTIVE 1: INCREASED ACCESS TO TARGETED FOOD CROPS											
4	1a. Proportion of household expenditure on food	The percent of household expenditure spent on food is the expenditure on food per annum divided by total expenditure. The average is reported for all households.	Population-based surveys of rural households	Start and end of the Program	2017	TBD					Rural and Urban	

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
5	1b. Prevalence of households with moderate or severe hunger	This indicator measures the percent of households experiencing moderate or severe hunger, as indicated by a score of 2 or more on the household hunger scale (HHS). The numerator for this indicator is the total number of households with a score of 2 or more on the HHS. The denominator is the total number of households in the sample with HHS data.	Population-based survey and official DHS data	Start and end of the Program	2017	TBD					Rural and Urban	Timely release of DHS data.
6	1c. Changes in installed storage capacity for target crops	This indicator measures changes in cubic meters of storage capacity of facilities that have been installed/leverage through the PFJ program. Installed storage capacity is an aggregate amount that encompasses on-farm and off-farm storage. Both newly installed and refurbished storage of only direct beneficiaries should be counted here.	Obtained and reported by DADUs	Yearly Reporting	2016	0					Districts	Reduction in post-harvest losses through improved storage capacity could substantially increase both food and income available to rural households and increase food availability to urban areas as well.
7	1d. Number of individuals benefiting directly from PFJ interventions	An individual is a direct beneficiary if he or she comes into direct contact with the set of interventions (goods or services) provided through PFJ. The intervention needs to be significant, meaning that if the individual is	Obtained and reported by DADUs	Yearly Reporting	2016	0	200,000	500,000	1,000,000	1,500,000	Sex of beneficiary, District	Based on the assumption that all beneficiaries of PFJ are registered and the numbers can be aggregated for reporting.

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		merely contacted or touched by an activity through brief attendance at a meeting or gathering, s/he should not be counted as beneficiary.										
	Intermediate Result 1.1: Improved On-Farm Productivity of Targeted Crops											
8	1.1a. Average on-farm yields of targeted crops	It is a partial measure of efficiency measured which is estimated as output per hectare. This will be measured by metric tons of harvested target crop. Recommended for program evaluation.	Crop Production Surveys by SRID	Start and end of the Program	2016	Maize: 1.7291 Rice: 2.6964 Sorghum: 1.141 Soybean: N/A, Tomato: 7.8037, Onion: 17.1, Chilli pepper: 8.5				Maize: 5 Rice: 4 Sorghum: 4 Soybean: 5 Tomatoes: 12.5 Onion: 25 Chilli: 15	Crop Species, Crop variety, Rain-fed v. Irrigated areas	MED/SRID will pool resources for a baseline survey and an end of program evaluation
9	1.1b. Farmers' technical efficiencies in producing targeted crops	This indicator measures the efficiency with which all inputs are transformed into outputs. It is an index expressed in percent. Refer to Reference Form in Appendix A for estimation procedure. Recommended for program evaluation.	Crop Production Surveys by SRID	Start and end of the Program	2017	TBD					Crop Species	MED/SRID will pool resources for a baseline survey and an end of program evaluation
10	1.1c. Total production of targeted crops	This is the volume of nation output of target crops measured in metric tons	Crop Production Surveys by SRID/MED	Start and end of the Program	2017	TBD					Crop Species	MED/SRID will pool resources for a baseline survey and an end of program evaluation

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
11	1.1d. Gross margins per hectare of target crops	The gross margin is the difference between the total value of sales of the crop and the cost of producing that crop, divided by the total number of hectares of the crops in production. Recommended for program evaluation.	Data will be obtained through Farmer surveys by SRID	Start and end of the Program	2017	TBD					Crop Species, rain-fed v. irrigated areas	MED/SRID will pool resources for a baseline survey and an end of program evaluation
Sub-intermediate result 1.1.1: Increased access to quality seeds of improved varieties												
12	1.1.1a. Number of improved varieties made available on the market through PFJ implementation	This is the number of existing improved varieties that are sold to farmers as part of PFJ interventions	Obtained and reported by DADUs. Verification with the Directorate of Crop Services	Yearly Reporting	2016	0					District and Crop Species	DADUs involvement in facilitating farmers access to the product make them sources of data and with proper records keeping as mandated, will make data available.
13	1.1.1b. Quantity of certified seeds of improved varieties sold	This is a kilogram measure of certified seeds of improved varieties of target crops sold through the District offices and retail outlets as a result of PFJ	Obtained and reported by DADUs	Yearly Reporting	2016	0					District and Crop Species	It is assumed that all the seeds sold will be planted and thus, larger sales will result in increased production, all things being equal.
14	1.1.1c. Proportion of the quantities of certified seeds required by registered farmers that is met	This is the percent of the required certified seeds of improved varieties that is made available for sale to farmers. The numerator of the quantity available for sale while the denominator is the quantity required. The required quantities of certified seeds are determined by multiplying the requirement per hectare by the to the	Obtained and reported by DADUs	Yearly Reporting	2016	0					Region, District and Crop Species	The quality of this data is dependent on farmer knowledge of the actual size of their farms and their willingness to truthfully disclose the information. The information is critical for the determination of the required quantities of inputs.

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		total farm size of registered PFJ beneficiaries.										
15	1.1.1d. Number of registered private seed companies supplying certified seeds	The indicator is a count of private seed companies that produce and sell certified seeds	Seed Producers Association of Ghana, Directorate of Crop Services	Yearly Reporting	2016						Crop Species	It is assumed that all seed producers are registered with the association
16	1.1.1e. Average distance from farmer to nearest retail outlet	The distance in kilometers from the farmer to the nearest retail outlet is the distance from the farmer's village/town of residence to that of the nearest retail outlet. Each district will estimate an average for its farmers from which a national average will be derived.	Obtained and reported by DADUs	Yearly Reporting	2016						Region, District	The assumption is that short distance from retail outlet is a motivating factor to use certified seeds rather that seeds from farmers' last production
17	1.1.1f. Number of Contractors of certified seeds meeting deadlines for supply	This indicator is the count of contractors who are able to supply certified seeds within the period stipulated in their contract.	Directorate of Crop Services	Yearly Reporting	2017						Crop Species	Evidence of Contract and delivery dates will be made available to MED.
Sub-intermediate result 1.1.2: Timely and adequate supply of fertilizer												
18	1.1.2a. Number of registered private entities engaged in fertilizer imports and distribution	This entails a count of all private entities (non-Government) engaged in fertilizer imports and/or distribution. Disaggregation by activity (i.e., Import and distribution) makes provision for possible double counting.	Ghana Agricultural Input Dealers Association	Yearly Reporting	2016						No disaggregation	The assumption for having this indicator is that if more private entities engage in fertilizer imports and distribution, there will be more investment in agriculture or related activities.

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
19	1.1.2b. Quantity of imported fertilizers	The unit of measure for total quantities of name fertilizer in metric tons.	Ghana Agricultural Input Dealers Association / PPRSD /GRA-CEPS	Yearly Reporting	2016						Fertilizer type	
20	1.1.2c. Number of public/private retail outlets for fertilizer	This is the count of fertilizer retail outlets within the operation area. Thus, it is reported at district, regional and national levels.	Obtained and reported by DADUs	Yearly Reporting	2016						Region, District	The assumption is that larger numbers can reduce distances from farmers to retail outlet and motivate farmers to use fertilizer. Larger supply is a disincentive to price increases.
21	1.1.2d. Average payment processing time for fertilizer importers, transporters and distributors on account of improved ICT services.	This is the mean time frame from when payments request are made to when actual payment is made to fertilizer merchants	MoFA performance Audit, Auditor General's report	Yearly Reporting	2016						No disaggregation	
Sub-intermediate result 1.1.3: Increased frequency and quality of extension services												
22	1.1.3a. Extension Agent /Farmer ratio.	This measure of coverage of public extension services is an expression of AEAs as ratio to the number of farmers with a geographical area. It is estimated at district, regional and national levels	Obtained and reported by DADUs	Yearly Reporting	2016						Region, District,	It is assumed that all extension agents will be provided with all the resources required in order to perform their assigned tasks.
23	1.1.3b. Number of farmers who have received extension	The indicator is the count of farmers who experienced extension contact through the PFJ program in the year	Obtained and reported by DADUs	Yearly Reporting	2017						Sex of beneficiary, District	

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
	services through the PFJ program											
24	1.1.3c. Number of farmer groups trained	This indicator counts farmer groups trained as a result of PFJ during the year. Individual farmers are not counted separately, but as one entity.	Obtained and reported by DADUs	Yearly Reporting	2016						District, Sex orientation (i.e., Male Female or Mixed)	
25	1.1.3d. Farmers' satisfaction with extension services	This is an average of graduated levels of farmers' satisfaction expressed in a survey conducted by an independent body an part of the program evaluation. The levels of satisfaction will be graduated (scaled) for quantification between levels 1 to 5. The Indicator is recommended for Program Evaluation.	Survey by MED using the sampling frame of registered PFJ beneficiaries	Start and end of the Program	2017	TBD					No disaggregation	
26	1.1.3e. Percent of PFJ beneficiaries accessing extension information via ICT channels	The numerator for estimation this percent value is the count of PFJ registered beneficiaries accessing extension information through ICT channels (including text messages and internet services), and the denominator is the total of all registered PFJ beneficiaries. The beneficiaries are defined to include farmers and marketing agents.	Centralized database of PFJ	Quarterly and yearly reporting	2016						Sex of beneficiary, District	It is assumed that all farmers who register to use the facility, actually use the facility and no faulty equipment are assumed. It is also assumed that the AEAs will monitor the use of such facility by registered farmers.
Sub-intermediate result 1.1.4: Increased and sustained farmer adoption of improved seed and fertilizer technology and agronomic practices												

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
27	1.1.4a. Proportion of farmers using certified seeds	This indicator measures the percent of farmers that used certified seeds of improved varieties during the current reporting year. The numerator is the count of beneficiary farmers using certified seeds of selected varieties while the denominator is the total count of beneficiary farmers.	Obtained and reported by DADUs	Yearly Reporting	2016						District, Sex of farmer, Crop Species,	The indicator tracks successful adoption of certified seeds of improved varieties in an effort to improve agricultural productivity.
28	1.1.4b. Stock to sale ratio of certified seeds of selected varieties under the PFJ	This is the average quantity of inventory of certified seed available divided by the quantity sold of certified seeds of selected varieties by the District offices. Same is reported of those in retail outlets.	Obtained and reported by DADUs	Yearly Reporting	2016						Crop Species, Crop Varieties, PFJ/Retail outlet	Low ratios indicate good sale and assumed that what is sold is used by the farmers in their fields.
29	1.1.4c. Number of hectares planted to certified seeds of improved varieties of target crops under PFJ	This indicator measures the area (in hectares) of land first planted to certified seeds of improved varieties during the current reporting year. It also looks at those farmlands that continue to use certified seeds under PFJ	Obtained and reported by DADUs	Yearly Reporting	2016		201,000	942,321	1,498,068	1,961,191	Region, District, New / Continuing	This indicator is used with the assumption that Agric Extension agents will have the resources required to effectively measure the farm plots. It is also assumed that farmers use the required amounts per hectare.
30	1.1.4d. Proportion of area under cultivation covered by certified seeds of improved varieties under the PFJ	In this proportion, the numerator is hectares of specified crop planted to certified seeds of improved varieties while the denominator is the total hectares of land cultivated. The program	Crop Production Surveys by SRID/MED	Start and end of the Program	2017						Region, District, Crop species	MED/SRID will pool resources for a baseline survey and an end of program evaluation

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		must determine in year one, the improved varieties under consideration for PFJ. Suitable for program evaluation										
31	1.1.4e. Number of farmers that applied new technical and management practices as result of agricultural extension services	This is the count of farmers who applied the technical and management practices delivered by the AEAs during the reporting year as a result of PFJ interventions. New technologies or management practices include management (financial, planning, human resources), member services, procurement, technical innovations (processing, storage), quality control, marketing, etc.	Obtained and reported by DADUs	Yearly Reporting	2016						Region, District, Sex of farmer, Crop Species	The indicator tracks successful adoption of technologies and management practices in an effort to improve agricultural productivity
32	1.1.4f. Proportion of registered farmers under PFJ using fertilizer for target crops	The numerator of this percent measure is the number of registered farmers under PFJ using fertilizer for target crops and the denominator is the total number of farmers in the operation area. This indicator is estimated at district, regional and national levels.	Obtained and reported by DADUs	Yearly Reporting	2016						Region, District, Sex of farmer, Crop Species	There is an assumption that registered farmers who purchase fertilizers will apply them to their crops.
33	1.1.4g. Average Quantity of fertilizer used per hectare of target crop	This is the mean of the number of kilograms of fertilizers used on a hectare of target crop in the operational area.	Crop Production Surveys by SRID/MED	Start and end of the Program	2016						Region, District, Sex of farmer,	

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		Suitable for program Evaluation									Crop Species	
34	1.1.4h. Proportion of PFJ registered farmers adopting integrated soil fertility management techniques	The numerator of this percent measure is the count of PFJ registered farmers while the denominator is the total count of the registered farmers.	Obtained and reported by DADUs	Yearly Reporting	2016						Region, District, Sex of farmer, Crop Species	Relevant soil fertility data and information will vary according to the program context. In this case the program is interested in increasing soil carbon over time since it contributes to improved fertilizer use efficiency, rainwater infiltration and retention of soil moisture, thereby increasing long-term agricultural productivity and resilience. Improvement in these biophysical conditions can be demonstrated where number of farmers adopting integrated soil fertility management techniques is significantly high. Thus, a high percent value of registered farmers under the PFJ program adopting the techniques is a fair measure of efforts at increasing soil carbon.
35	1.1.4i. Stock to sale ratio of the fertilizers in retail outlets	This is the average quantity of inventory of fertilizer available divided by the quantity sold of certified seeds of selected varieties by the District offices.	Obtained and reported by DADUs	Yearly Reporting	2016						Fertilizer type, PFJ/Retail outlet	Low ratios indicate good sale and assumed that fertilizer sold is used by the farmers in their fields.

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		Same is reported of those in retail outlets.										
	Intermediate Result 1.2 Enhanced Roles of Private Sector in Storage and Marketing of farm outputs											
36	1.2a. Proportion of farmers' output of target crops sold	The numerator of this percent measure for each farmer is the quantity in kilograms of the output that is sold and the denominator is the total output of the farmer. The value is estimated for sampled farmers and the mean value is derived. This indicator is recommended for program evaluation.	Crop Production Surveys by SRID/MED	Start and end of the Program	2017						Region, District, Sex of farmer, Crop Species	MED/SRID will pool resources for a baseline survey and an end of program evaluation
37	1.2b. Percent share of local produce of selected crops in national food market	The denominator of this indicator is the total quantity in metric tons of the selected crop in the national food market and the numerator is the quantity of the produce grown locally.	National food balance sheet	Yearly Reporting	2016						No disaggregation	Assuming that SRID will continue to provide reliable data for this indicator
38	1.2c. Value of incremental sales (collected at farm-level) attributed to PFJ implementation	The value of incremental sales indicates the value (in GHS) of the total amount crop sold by beneficiary farmer relative to a base year. It is calculated based on the total quantity/volume (in metric tons) sold of a crop multiplied by the unit price in the reporting year minus the total quantity/volume (in metric tons) sold of a	Crop Production Surveys by SRID/MED	Start and end of the Program	2017						Region, District, Sex of farmer, Crop Species	MED/SRID will pool resources for a baseline survey and an end of program evaluation

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		product times the unit price of crop in the base year.										
Sub-Intermediate Result 1.2.1 Improved market efficiency as a result of PPPs for provision of storage and distribution infrastructure												
39	1.2.1a. Value of new private sector investment in the agriculture sector or food chain leveraged by PFJ implementation	Investment is defined as any use of resources intended to increase future production output or income. New investment refers to those investment made during the reporting year. "Leveraged by PFJ implementation" indicates that the new investment was directly or indirectly motivated or facilitated by activities funded by the PFJ program. Thus, investments to be reported do not include funds received by the investor from the program as part of any grant or other award.	Program Management, GIPC	Yearly Reporting	2016	0					No disaggregation	Obtaining data for this indicator is dependent on the willingness of private sector entities to truthfully disclose the value of investments.
40	1.2.1b. Kilometers of feeder roads improved or constructed	Count only those roads improved or constructed during the reporting year and leveraged by PFJ. "Improvement" indicates significant improvement to the ease commercial transport along that road, while "constructed" refers to a new road.	Department of Feeder Roads	Yearly Reporting	2016	0					Region, District, Newly constructed/Improved	PFJ will not make direct investment in roads construction and rehabilitation. But the importance attached to the program will likely facilitate a process for leveraging investments in road improvement and construction in rural areas.
41	1.2.1c. Number of functional storage	This indicator is the count of storage warehouses that have been installed/leverage	DADUs will report on warehouses within the district	Yearly Reporting	2016	0					Region, District	AEAs will be well informed about storage facilities

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
	warehouses in operational areas as a result of PFJ	as a result of the PFJ interventions.										within their operational areas.
Sub-Intermediate Result 1.2.2 Increased uptake by animal feed industry												
42	1.2.2a. Percent share of local produce in national animal feed markets	The numerator for measuring this percent value is quantity of marketed locally produced feed while the denominator is the total quantity of all animal feed marketed in the reporting year.	Animal Production Directorate of MOFA and	Yearly Reporting	2016						No disaggregation	
43	1.2.2b. Volume of maize/soybean sourced by Private Enterprises from aggregators, nucleus farmers and FBOs for animal feed	This indicator is the quantity in metric tons of maize and soybeans sourced from farmers by the three entities in a reporting year.	Data to be obtained and reported by DADUs. Verified from Animal Production Directorate of MOFA and feed mills	Yearly Reporting	2016						District, Maize/Soybean	
Sub-Intermediate Result 1.2.3 Increased uptake by public food programs and services												
44	1.2.3a. Number of marketing agreements between private food aggregators and public food programs	This is the count of documented transaction agreements between private food aggregators and public food programs in operational areas during the reporting year.	Data to be obtained from known public food program organizer in the districts and reported by DADUs	Yearly Reporting	2016						Region, District	
45	1.2.3b. Volume of selected grains sourced by public food programs	This is the quantity (in metric tons) of locally produced grains purchased	Data to be obtained from known public food program organizer in the districts and	Yearly Reporting	2016						Regional, District	

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
			reported by DADUs									
Sub-Intermediate Result 1.2.4 Increased uptake by food exporters												
46	1.2.4a. Volume of selected crops and their processed products exported as a result of PFJ	This indicator will measure the volume of regional and non-regional exports in metric tons. It is the total quantity in metric tons of export of target crops and their processed products. Exports should be counted against the baseline of existing export levels from the previous year when PFJ did not exist.	Ghana Export Promotion Council (GEPC)	Yearly Reporting	2016						Crop type	
47	1.2.4b. Value of selected crops and their processed products exported	This indicator will measure the value of regional and non-regional exports in USD. It is the sum value of export of target crops and their processed products. The value of exports should be counted against the baseline of existing export levels from the previous year when PFJ did not exist.	GEPC	Yearly Reporting	2016						Crop Type	
48	1.2.4c. Share of Ghana's locally produced targeted food crops in intra-regional trade	The denominator of this ratio measure is the total value of traded produce of target crops within the West African Region in the reporting year. The numerator is the total value of the traded produce originating from Ghana. All local currencies will	Special studies, Ministry of Trade	Start and end of the Program	2016						No disaggregation	Regional trade agreements present opportunities for marketing any excess production of target crops. Besides phytosanitary standards are less rigid within the West Africa and should not present much

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		be converted to USD. This indicator is recommended for program evaluation.										difficulty for entry to regional markets. Resources for studies is critical for reporting on this indicator.
Sub-Intermediate Result 1.2.5 Increased uptake by local industries												
49	1.2.5a. Number of new value-addition enterprises engaged in food processing of target crops or manufacturing based on the crops	The indicator is a count of production entities engaged in food processing or manufacturing and sourcing some inputs from farmers in the operation areas.	Data to be obtained from the District Assembly on firms and organizations processing food in the districts and reported by DADUs	Yearly Reporting	2016						District, Crop Species	Data availability depends on the consistency with which Das are able to record the data and their willingness to disclose such data
	STRATEGIC OBJECTIVE 2: INCREASED JOB CREATION											
50	2. Number of jobs attributed to PFJ implementation	Jobs should be converted to full-time equivalents. Jobs are all types of employment opportunities created during the reporting year in agriculture-related enterprises (including paid on-farm employment). Jobs created should be actual permanent jobs, adjusted to full-time equivalent (FTE) and directly created as a result of PFJ intervention. Divergence from this definition will make comparison and aggregation across operation areas and sectors problematic. Jobs lasting less than	Data will be obtained from a combination of: a) surveying target employers; and b) developing localized multipliers	Collated District data will be reported yearly and compared with data obtained from developing localized multipliers at start and end of program	2017						Sex of jobholder, New / Continuing	Experts will be engaged for developing localized multipliers for the estimation of jobs created as a result of PFJ

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		one month are not counted since those jobs do not provide stability over reasonable time. Attributed to PFJ implementation" includes farming and non-farm jobs where PFJ investments were made to expand jobs and where a program objective of the PFJ investment was job creation. Recommended for program evaluation.										
	Intermediate Result 2.1 Increased demand for on-farm labor											
51	2.1a. Number of new on-farm jobs created by commercial farmers, including out growers, as a result of intensification in rural, urban and peri-urban areas	This is the count of new on-farm jobs within an operation area within the reporting year	Data on employer records will be obtained and reported by DADUs	Yearly Reporting	2016		471,713	566,056	679,267	815,120	Sex of jobholder, Out grower/ Other Commercial	Data quality will depend on the willingness of employees to disclose the required information
Sub-Intermediate Result 2.1.1 Increased area planted for targeted crops												

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
52	2.1.1a. Number of hectares under improved technologies or management practices as a result of PFJ intervention	This indicator measures the area (in hectares) of land first brought under new technology during the current reporting year. It also looks at those farmlands that continue to apply the technologies under PFJ. Relevant technologies include: a) Mechanical and physical: New land preparation, harvesting, processing and product handling technologies; b)Biological: New germ plasm (varieties, breeds, etc.) that could be higher-yielding or higher in nutritional content and/or more resilient to climate impacts; or high-protein maize, soil management practices that increase biotic activity and soil organic matter levels; c) Chemical: Fertilizers, insecticides, and pesticides safe storage application and disposal of agricultural chemicals, effluent and wastes, and soil amendments that increase fertilizer-use efficiency (e.g. soil organic matter); d) Management and cultural practices: Information technology, conservation	Survey of sampled farmers within the operational areas and reported by DADUs	Yearly Reporting	2016	0	201,000	942,321	1,498,068	1,961,191	New vrs Continuing, Technology type	This proxy indicator used with the assumption that increased area of cultivation will lead to an increase in the demand for on-farm labor. It also tracks successful adoption of technologies and management practices in an effort to improve agricultural productivity

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		agriculture, improved/sustainable agricultural production and marketing practices, increased use of climate information for planning disaster risk strategies in place, climate change mitigation and energy efficiency, and natural resource management practices that increase productivity, Integrated Pest Management (IPM), and Integrated Soil Fertility Management (ISFM), and Post-Harvest Handling (PHH) related to agriculture should all be included as improved technologies or management practices. Zero for the baseline.										
Sub-Intermediate Result 2: 1.2 Increased labor use per unit of land												
53	2.1.2a. Average number of man-days of hired labor per hectare	This indicator seeks the number of man-days of hired labor engaged on a plot per cropping season divided by the farm size in hectares and multiplied by the number of cropping seasons per year. This per farmer measure is averaged for sampled farmers in the operational area. Average figures are reported at the District,	Mini-Survey of sampled farmers within the operational areas and reported by DADUs	Yearly Reporting	2017						Region, District	It is assumed that some labor-intensive technologies are likely to records of higher labor use and, thus, promote job creation. In terms of data collection, it is assumed that AEAs will receive the required resources mini-surveys.

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		Regional and National levels.										
	Intermediate Result 2.2 Increased jobs for marketing seeds and fertilizer											
54	2.2a. Number of new off-farm jobs created along the input supply chain as a result of PFJ intervention	This set of new jobs include all types of employment opportunities created during the reporting year by producers of certified seeds, fertilizer importers, input distributors, transporters and input outlets within the operation areas	Data on employer records will be obtained and reported by DADUs	Yearly Reporting	2016	0	4,536	5,443	6,532	7,838	Sex of jobholder, Category of supply chain actors	There is an assumption the healthy professional relationships existing between DADUs and actors of the input supply chain provide favorable conditions for soliciting reliable data from private sector entities.
	Intermediate Result 2.3 Increased jobs for the provision of supporting ICT services											
55	2.3a. Number of directly created ICT related jobs under PFJ	The indicator is the count of new employees of ICT service provider on account of PFJ-related service in a year.	E-Agriculture Centre	Yearly Reporting	2016		3,888	4,666	5,599	6,718	Sex of jobholder	
	Intermediate Result 2.4 Increased jobs for value addition of targeted crops											
56	2.4a. Number of off-farm jobs created by value addition entities processing PFJ target crops	The indicator is a count of new jobs created by existing and new production entities engaged in food processing or manufacturing within the operation areas. District level data is collated for regional and national levels.	DADUs will obtain this data from processing and manufacturing entities within their operation area for reporting.	Yearly Reporting	2016		249740.7	299688.84	359626.74	431552.22	Sex of jobholder, Crop type	Can pose significant data quality issues. MED will monitor and verify reported data with randomly selected manufacturing entities.
	Intermediate Result 2.5 Increased jobs for marketing output of Targeted Crops											
57	2.5a Number of off-farm jobs created along the commodity distribution chain	The indicator is a count of new jobs created as a result of enhanced commodity distribution of target crops of PFJ by existing and new	Data will be obtained through the development of localized multipliers since most of the new jobs along the	Start and end years of the program	2017		4,968	5,962	7,154	8,585	Sex of jobholder, Crop Type, Category of commo	MED will obtain resources required for engaging consultants to conduct data collection and analysis

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
		entities. Recommended for program evaluation.	commodity chain will be created indirectly.								dity distribution actors	
Sub-intermediate result 2.5.1 Increased jobs for export of target crops and their processed products												
58	2.5.1a. Number of off-farm jobs created in the export sub-sector	The indicator is a count of new jobs created as a result of increased export of produce/products of target crops of PFJ by existing and new entities. Recommended for program evaluation.	Data will be obtained through the development of localized multipliers since most of the new jobs along the commodity chain for export will be created indirectly.	Start and end years of the program	2017						Sex of jobholder, Category of work	MED will obtain resources required for engaging consultants to conduct data collection and analysis
Sub-intermediate result 2.5.2 Increased jobs for private sector provision of storage services for targeted crops												
59	2.5.2a. Number of new public-private partnerships formed for the provision of storage services	This proxy indicator is the count of new PPPs formed in the reporting year for the provision of storage services.	DADUs and Directorate of Crop Services	Yearly Reporting	2016						No disaggregation	This proxy indicator is used with the assumption that the new partnerships formed will increase the number of storage facilities and required to build and manage them.
60	2.5.2b. Total number of new jobs created for the provision of storage services	The indicator is the count of new employees of storage entities in the operational area on account of PFJ-related service in a year. District level data is collated for regional and national levels.	Data on employer records will be obtained and reported by DADUs	Yearly Reporting	2016		124870.35	149844.42	179813.37	215776.11	Sex of jobholder, Construction/ Management of the facility	Can pose significant data quality issues. MED will monitor and verify reported data with randomly selected manufacturing entities.
Sub-intermediate result 2.5.3 Increased jobs for private sector participation in domestic trade and distribution of targeted crops												

#	Performance Indicator Title	Indicator Definition	Sources of Data	Reporting Frequency	Base Year	Baseline Value	2017	2018	2019	2020	Disaggregation	Assumptions
61	2.5.3a. Number of new private sector entities registered for the distribution of targeted crops in the local market	This proxy indicator is the count of new private sector entities registered during the reporting year for the distribution of targeted crops in the local market	Data will be obtained through the development of localized multipliers since the boundaries for their operations tend to be rather fluid, besides, most of the new jobs along the commodity chain will be created indirectly	Start and end years of the program	2017						No disaggregation	This proxy indicator is used with the assumption that the new private sector entities registered for the distribution of targeted crops in the local market will require workers and therefore, create new jobs.

6. Appendices

6.1. Administrative regions where the selected food crops will be intensified

Maize	Rice	Sorghum	Soya bean
Upper East Region	Upper East Region	Upper East Region	Upper East Region
Northern Region	Northern Region	Northern Region	Northern Region
Brong Ahafo Region	Brong Ahafo Region	Upper West Region	Brong Ahafo Region
Volta Region	Volta Region		Ashanti Region
Central Region	Central Region		Upper West Region
Eastern Region	Eastern Region		
Ashanti Region	Ashanti Region		
Western Region	Greater Accra Region		
	Upper West Region		
	Western Region		

6.2. Institutional structures for PFJ implementation

The current membership[15], and the responsibilities and deliverables of the 3-tier structure for the implementation of the PFJ are detailed below.

1. National Technical Committee (NTC)

The NTC is comprised of the following members:
Hon. Dep. Minister, Crops (Chair)
Special Advisor to the Hon. Minister
Director, DCS, Convener
Director, DAES)
Policy Advisor, MoFA.
Director, AESD.
Director, PPBD.
National Coordinator, YIAP
Director, PPRSD
Director, MED
Deputy Director, HRDMD
Technical Advisor
Deputy Director, DAES, Secretary.

The primary objectives of the National Technical Committee are to:

- develop and implement an operational plan
- develop and implement a monitoring plan

Deliverables

- prepare a quarterly field report and submit to the Hon Minister on progress of the program

2. Regional Technical Committee

The composition of RTC includes the following members: -

Hon. Regional Minister - Chairman
MOFA Regional Director- Secretary
Reg. Eco. Planning Officer - Member
Farmers Representative – Member

The primary objectives of the Regional Technical Committee are:

- mobilize both the public and private sector actors for the program.
- domesticate the criteria for client selection at district level
- set and agree on targets for the various crops for the region and districts
- develop and implement an operational plan
- develop and implement a monitoring plan
- establish an electronic database for various categories of participants (Farmers, traders, processors, Feed millers, input dealers (seed and fertilizer), etc.)

Deliverables

- prepare a quarterly field report and submit to NTC which catalogues issues of distribution and activities of AEAs and farmers in the various jurisdictional regions. The report should also include:
- record challenges and actions taken to address them
- record positive and negative lessons from the implementation
- recommend practical actions to improve and sustain the program
- prepare monthly reports and submit to NTC covering activities of off-takers in terms of purchases, recovery of loans and in-kind recoveries

3. District Technical Committee

Hon. M/M/DEC Chairman
MOFA District Director - Secretary
District Planning officer - Member
DCD - Member
Agric-sub-committee chairman - Member
Farmers Representative - Member

The primary objectives of the District Technical Committee are to:

- mobilize both the public and private sector actors for the program.
- domesticate the criteria for client selection
- set and agree on targets for the various crops for the district

- develop and implement an operational plan
- develop and implement a monitoring plan
- facilitate the implementation process for the program during this planting season
- establish an electronic database for various categories of participants (Farmers, traders, processors, Feed millers, input dealers (seed and fertilizer), etc.)
- report on any incidents of interest (positive and negative) to the success of the program
- monitor activities of all stakeholders under the program

Deliverables

- prepare a monthly field report and submit to RTC which catalogues issues of distribution and activities of AEAs and farmers in the various jurisdictional districts. The report should also include:
    - record challenges and actions taken to address them
    - record positive and negative lessons from the implementation
    - recommend practical actions to improve and sustain the program
- prepare monthly reports and submit to RTC covering activities of off-takers in terms of purchases, recovery of loans and in-kind recoveries.

6.3. Estimation of costs

Costs of the various activities prescribed under the implementation plan for the PFJ are estimated as follows: -

No.	Component/Activities		2017	2018	2019	2020	Total (GH¢)
1.	Seed						
1.1.	Identify market oriented, farmer preferred varieties and estimate the requirements of the certified seeds of the targeted crops		9,936,000	19,872,000	19,872,000	19,872,000	
1.2.	Engage private seed producers in timely supply of adequate quantities of the various seed classes						
		Cost of certified seeds (per Kg)	15,265,693	147,054,515	293,486,540	308,129,742	
1.3.	Make the certified seeds of the targeted crops available for uptake by farmers through public- and private networks						
		Mobilization of seed producers	993,600	1,987,200	1,987,200	1,987,200	
		Workshop Activities	1,987,200	3,974,400	3,974,400	3,974,400	
1.4.	Provide complementary services on seed production by seed producers and the usage of certified seeds by farmers						
		Training Farmers on seed use	1,490,400	5,961,600	5,961,600	5,961,600	
		Training Seed producers	993,600	3,974,400	3,974,400	3,974,400	
		Demonstration plots	1,242,000	2,484,000	2,484,000	2,484,000	
		Field days	496,800	216,000	216,000	216,000	
		Multi-media	496,800	216,000	216,000	216,000	
		Participatory Assessment	1,490,400	2,980,800	2,980,800	2,980,800	
		Sub-total (1)	34,392,493	188,720,915	335,152,940	349,796,142	908,062,490
2	Fertilizer						
2.1.	Engage private fertilizer companies and transporters for the supply of the required fertilizers						
	Meeting with officials and farmers (seasonal) on selection and estimation of requirements		Covered under 1.1.				
2.2.	Make the fertilizers available for use by the target beneficiaries through public- and private outlets						
		Cost of NPK	31,251,250	227,836,459	446,264,469	468,107,270	
		Cost of Urea or Sulfate of Ammonia	12,908,125	105,363,294	208,091,259	218,364,055	

No.	Component/Activities		2017	2018	2019	2020	Total (GH¢)
		Cost of bio-fertilizer	0	10631250	22443750	23625000	
2.3.	Promote appropriate use of fertilizers and other soil fertility management practices						
		Workshop Activities	1,987,200	3,974,400	3,974,400	3,974,400	
		Training Farmers on fertilizer use	1,490,400	5,961,600	5,961,600	5,961,600	
		Training farmers on input use efficiency	993,600	3,974,400	3,974,400	3,974,400	
		Demonstration plots	1,242,000	2,484,000	2,484,000	2,484,000	
		Field days	496,800	216,000	216,000	216,000	
		Multi-media	496,800	216,000	216,000	216,000	
		Participatory Assessment	1,490,400	2,980,800	2,980,800	2,980,800	
		Sub-total (2)	52,356,575	363,638,203	696,606,678	729,903,525	1,842,504,980
3	Extension Services						
3.1.	Recruit and deploy agriculture extension agents in close proximity to production areas under the PFJ program						
		Recurring Costs	41,184,000	67,200,000	67,200,000	67,200,000	
		Logistics (Transportation)	2,230,800	3,314,800	3,314,800	3,314,800	
3.2.	Mobilize individual farmers and farmer groups through nucleus farms, farmer based organizations through awareness creation						
		Meeting with nucleus farmers and FBOs (seasonal)	372,600	1,490,400	1,490,400	1,490,400	
3.3.	Transfer technologies on efficient input usage, good agronomic practices, postharvest handling, storage and marketing through regular and recurrent training and visits						
		(a) Demonstration plots (GAPs)	1,242,000	2,484,000	2,484,000	2,484,000	
		(b) Field days (GAPs)	496,800	216,000	216,000	216,000	
		(c) Multi-media (GAPs)	496,800	216,000	216,000	216,000	
		Seasonal Surveys	993,600	1,987,200	1,987,200	1,987,200	
			47,016,600	76,908,400	76,908,400	76,908,400	277,741,800
4	Marketing of Outputs						
4.1.	Engage private aggregators in collecting the farm outputs and balance payments from the farmers		149,040	298,080	298,080	298,080	

No.	Component/Activities	2017	2018	2019	2020	Total (GH¢)
4.2.	Construct new and rehabilitate old warehouses in high production areas and lease to private operators for collection, quality enhancement, storage and value addition of produces					
	Rehabilitation of existing warehouses (130)		2,990,000			
	Construction of medium sized warehouses (86)		3,956,000			
4.3.	Establish linkages between farmer groups, private aggregators and public food procurement programs and food- and feed enterprises	198,720	397,440	397,440	397,440	
4.4.	Monitor and attenuate volatility in prices of input and outputs caused by unfair market practices	23,000	23,000	23,000	23,000	
4.5.	Promote job creation opportunities along the input supply and commodity chains in agriculture and allied sectors	248,400	496,800	496,800	496,800	
		470,120	7,863,240	917,240	917,240	10,167,840
5	E-Agriculture					
5.1.	Establish a database containing e-profiles of targeted beneficiaries, private value chain actors and supporters	1,840,000	4,278,000	6,762,000	9,200,000	
5.2.	Put in place a 'supply chain management system' for the program to transmit and track the orders and movement of the inputs and outputs	2,300,000	1,150,000	920,000	920,000	
5.3.	Improve communication (including advisory/emergency responses) and coordination of the various activities of the program through efficient ICT tools	230,000	460,000	460,000	460,000	
	Sub-total (5)	4,370,000	5,888,000	8,142,000	10,580,000	28,980,000
6	Coordination					
	Meetings (technical committees)	1,194,160	2,388,320	2,388,320	2,388,320	
	Monitoring & Evaluation	230,000	460,000	460,000	460,000	
	Sub-total 6	1,424,160	2,848,320	2,848,320	2,848,320	9,969,120
	Total of sub-totals 1 through 6	140,029,948	646,189,077	1,123,013,577	1,175,553,627	3,084,786,230
7	Contingencies	2,800,599	12,923,782	22,460,272	23,511,073	61,695,725
8	Administrative Cost (5%)	7,001,497	32,309,454	56,150,679	58,777,681	154,239,311
	Total (GH¢)	149,832,044	691,422,313	1,201,624,528	1,257,842,381	3,300,721,266
	Total (USD)	32,572,183	150,309,198	261,222,723	273,443,996	717,548,101

6.4. Tools for selection of type of seeds, fertilizers and other intervention options

6.4.1. Paired Comparison Analysis

Paired comparison analysis, also known as pair-wise comparison, is a useful decision-making tool by weighing up the relative importance of different options. It shall be helpful when there is not consensus on choices, where the options are completely different, where evaluation criteria are subjective, where they're competing in importance, or when there is no objective data to make a decision.

Application of this tool will involve the following steps: -

Step 1: The implementing agent prepares a list of all of the options that need to be compared.
Step 2: The options are marked as both the row and column headings on a table or worksheet. This is so that the implementer can compare options with one-another.
Step 3: The participating stakeholders will be engaged in deciding which of the two options is most important.
Step 4: The implementers mark the option within each of the blank cells, through a pair-wise comparison of the options.
Step 5: By scoring the difference in importance between the options, running from zero (no difference/same importance) to any maximum number (major difference/one much more important than the other).
Step 6: Finally, the implementer consolidates the results by adding up the values for each of the options. If required, the implementer may convert these values into a percentage of the total score.

A hypothetical example of a paired comparison analysis table for identifying the choice of varieties for which seeds are to be distributed in a district (filled in with hypothetical values): -

	Variety A	Variety B	Variety C	Variety D
Variety A		A, 2	C, 1	A, 1
Variety B			C, 1	B, 1
Variety C				C, 2
Variety D				

In the above example, the implementer shall add up the A, B, C, and D values and convert each into a percentage of the total. These calculations yield the following totals:

Variety A = 3 (37.5 %)
Variety B = 1 (12.5 %)
Variety C = 4 (50 %)
Variety D = 0

Here, the implementer shall decide to select variety C.

6.4.2. Decision Matrix Analysis

Decision matrix analyses can be particularly powerful when the implementers have a number of good alternatives to choose from, and many different factors to take into account. This makes it an effective technique to use in almost any important decision where there isn't a clear and obvious preferred option during the implementation of the PFJ program. The following steps shall be considered while executing the decision matrix analysis.

Step 1: List all the implementation options as row headings on a spreadsheet or table, and the factors the implementer needs to consider as column headings.

Step 2: The implementer then engages the stakeholders to score each option/factor combination by working down the columns of the table, scoring each option for each of the factors in the decision. The implementer shall score each option from 0 (poor) to 5 (very good). If none of the options are good for a particular factor, the implementer does not have to have a different score for each option. In such cases, all options should score 0.

Step 3: The implementer will have to work out the relative importance of the factors in the decision. The scores, 0 to 5, where 0 means that the factor is absolutely unimportant in the final decision, and 5 means that it is very important. It is however acceptable to have many factors with the same importance.

Step 4: By multiplying each of the scores from step 2 by the values for relative importance of the factor that are calculated in step 3, the implementer shall obtain weighted scores for each option/factor combination.

Step 5: The implementer shall then add up these weighted scores for each of your options. The option that scores the highest shall be selected as the desired option.

A hypothetical example of Decision Matrix Analysis showing unweighted assessment of how each fertilizer supplier satisfies each factor: -

Factors:	Cost	Quality	Timeliness in delivery	Reliability	Location	Total
Weights:						
Supplier 1	1	0	0	1	3	5
Supplier 2	0	3	2	2	1	8
Supplier 3	2	2	1	3	0	8
Supplier 4	2	3	3	3	0	11

Hypothetical example of a Decision Matrix Analysis showing weighted assessment of how each supplier satisfies each factor: -

Factors:	Cost	Quality	Timeliness in delivery	Reliability	Location	Total
Weights:	4	5	1	2	3	
Supplier 1	4	0	0	2	9	**15**
Supplier 2	0	15	2	4	3	**24**
Supplier 3	8	10	1	6	0	**25**
Supplier 4	8	15	3	6	0	**32**

This makes it clear to the implementer that Supplier 4 is the best option, despite its location.

6.5. Estimation of jobs that could be created under the PFJ

Component	Interventions	Nature of jobs	Number of jobs/district	Total number of jobs
Maize	Input	· Seed Suppliers (including production, transportation, distribution)	2	7 x216 = 1,512
		· Fertilizer Suppliers (including warehouse operations and transportation)	2	
		· Agro-chemical input Dealers	2	
		· Extension services (public and private)	1	
		Sub-total	7	
	Production	· Farmers	1	1x 813,631=83,631
		· Land Preparation/Tractor Service Providers	3	
		· Labors	3	3X813,631 = 2,440,893
		· Input Dealers		
		· Financial Intermediaries	1	
		· Insurance brokers		8X216 =1728
		· Extension services		
		· Security services	1	
		· Food vendors	1	
		Sub-total	10	3,274,252
	Post-Harvest / Processing	· Harvesters/Labors	3	3x813,631 =2,440,893
		· Shelling Services Providers	2	
		· Transportation Service Providers	4	13x216=2,808
		· Drying Service Providers	3	
		· Storage Service and Facilities Providers	1	
		· Miller Service Providers	2	
		· Food and beverage industries	1	
		· Extension services		
		Sub-total	16	
	Marketing	· Middlemen/Intermediary Traders	5	9 x216 =1,944
		· Buyers (Micro / Small / Medium / Large Scale Buyers)	4	
		· Input Dealers		
		· Financial Intermediaries		
		Sub-total	9	
E-Agriculture	Registration	· App developers	1	6 x 216=1,296
	Validation	· E-market place managers	1	
	Data Curing	· ICT specialists and repairers	2	

Component	Interventions	Nature of jobs	Number of jobs/district	Total number of jobs
	Data Access Services	· Virtual marketers	2	
		· Database managers		
		· Data collection officers		
		· Cyber security		
		Sub-total	6	
		Total (Maize)		2,531,652
Rice	Input	· Seed producers	2	
		· Seed production trainers	1	
		· Seed processors (treatment and winnowing)	3	
		· Seed packaging manufacturers	1	
		· Seed packaging		
		· Seed Suppliers (including production (of all classes), transportation, distribution)	4	
		· Agro-chemical input Dealers		
		· Extension services (public and private)	1	
		· Security services	1	
		Sub-total	13	13X216 =2,808
	Production	· Rice farmers		
		· Laborers	5	5X14,386.4=71,932
		· Land preparation		
		· Machining services (tractor services)	3	5X216=1,080
		· Financial intermediaries	1	
		· Insurance brokers		
		· Food vendors/canteen services	2	
		Sub-total	10	
	Post-Harvest / Processing			
		· Harvesters	3	3X14,386.4=43,159.2
		· Rice processors (rice mill operators and assistants)	2	
		· Laborers		
		· Food vendors	2	
		· Cleaners	1	
		· Food scientists		11X216=2,376
		· Indirect jobs (increased poultry, piggery production due to availability of feed)	5	
		· Packaging material manufacturers	1	
		Sub-total	14	

Component	Interventions	Nature of jobs	Number of jobs/district	Total number of jobs
	Marketing	· National and regional Distribution agents	5	
		· Agro-logistic and transportation providers	4	
		Sub-total	9	9X216=1,944
		Total (Rice)		123,299.20
Soyabean	Production	· Seed breeders	1	
		· Seed producers	2	
		· Seed packagers	2	
		· Seed distributors	2	
		· Farmers	2	
		· Agro-chemical input suppliers		
		· Extension officers		
		· Financial services	2	
		· Insurance services		
		· Security services		
	Protection	· Crop protection services	1	
		· Crop protection retailers	1	
	Post-Harvest	· Labors	1	
		· Aggregators	1	
		· Processing factory workers	1	
		· Food vendors	1	
		· Cleaners	1	
		· Processing technology developers	1	
	Marketing	· National and international Distributors	2	
		· Exporters	21	21 X 216= 4,536
Sorghum	Production	· Agro-input suppliers ‘		
		· Farmers		
		· Harvester’s		
		· Aggregators		
		· Research and development experts		
		· Security services		
	Protection	· Crop protection manufacturers		
		· Crop protection retailers		
	Post-Harvest	· Ethanol producers		
		· Biofuel sector		
		· Refinery services		
		· Processing plant managers and assistants		
		· Utility service providers		

Component	Interventions	Nature of jobs	Number of jobs/district	Total number of jobs
	Marketing	· Agro logistics and transportation suppliers		
		· Ware house managers		
		· National and international distributors		
Tomato	Input	· Seed Suppliers (including production (of all classes), transportation, distribution)	2	
		· Fertilizer Suppliers (including warehouse operations and transportation)	2	
		· Agro-chemical input Dealers	2	
		· Extension services (public and private)	1	
		Sub-total	7	7x216=1,512
	Production	· Farmers		
		· Land Preparation/Tractor Service Providers	3	
		· Labors	5	5 X 14,281.2=71,406
		· Input Dealers	9	
		· Financial Intermediaries	1	
		· Insurance brokers		
		· Extension services	1	
		· Security services	1	
		· Food vendors	1	
		Sub-total	21	
	Post-Harvest / Processing	· Harvesters/Labors	5	5x14,281.2=71,406
		. Sorting and packing	4	
		· Transportation/cold Service Providers	7	16x216=3,456
		. Processing providers	4	
		Packaging industry providers	1	
		Sub-total	21	
	Marketing	· Middlemen/Intermediary Traders	5	
		· Buyers (Micro / Small / Medium / Large Scale Buyers)	4	
		· Input Dealers		
		· Financial Intermediaries		
		Sub-total	9	9x216=1,944
E-Agriculture	Registration	· App developers	1	
	Validation	· e-market place managers	1	
	Data Curing	· ICT specialists and repairers	1	

Component	Interventions	Nature of jobs	Number of jobs/district	Total number of jobs
	Data Access Services	· Virtual marketers	1	
		· Database managers	1	
		· Data collection officers	1	
		· Cyber security	6	6x216=1,296
		Total (vegetables)		151,020
		Grand Total (maize, rice, vegetables and soybean)		2,810,507

6.6. Workplan

	Components/Interventions under the PFJ program	2017				2018				2019				2020			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
1.	Component 1: Seed access and development																
•	Seeds selection and identification of marketable varieties																
•	Selection of partners																
•	Supply of seeds																
•	Timely production of the certified seeds of the desired crop varieties																
•	Establishment of decentralized seed testing and laboratory services																
•	Improve complimentary services on seeds																
•	R&D for development of quality declared seed (QDS) and vegetable seeds																
•	Setting trajectory for graduation (Seeds) sustainability																
-	promote the development and availability of superior alternatives (such as hybrids)																
-	provide embedded extension services on seed																
-	facilitate distribution of the subsidized certified seeds																
-	carry out a gradual reduction in the subsidy rates for the certified seeds																
-	establish functional storage warehouses and infrastructures																
-	widen the available financing options under the PFJ program																
2.	Component 2: Fertilizers																
•	Selection of fertilizers																
•	R&D on inorganic and organic fertilizers																
•	Supporting the private fertilizer supply chain																
•	Distribution																
•	Establishment of local organic fertilizer production enterprises																
•	Complimentary services																

	Components/Interventions under the PFJ program	2017				2018				2019				2020			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
•	Setting trajectory for graduation (Fertilizers)																
3.	Component 3: Extension services																
•	Deployment of extension agents																
•	Mobilization of farmers																
•	Capacity building																
-	Development of local seedling supply base for vegetables																
-	Field visits																
-	Study tours																
-	Facilitate development of certified nurseries																
-	Capacity building of seedling suppliers or nursery operators																
-	Training on GAPs of the various crops																
•	Capacity building for MoFA AEAs and research institutions																
-	Training on GAPs																
-	Establish demonstration and R&D centers in MoFA and Research Centers in all 10 regions																
-	Build capacity of selected centers to support technical backstopping																
-	Establish technical service centers at FOHCREC, (Kade), KNUST (Kumasi), UDS (Tamale)																
-	Technical exchanges																
-	Facilitate development of technical packages																
4.	Component 4: Marketing																
•	Collection/aggregation of outputs and marketing of produce																
•	Facilitation of storage infrastructures																
	Existing warehouses																
	New warehouses																
•	Linkages with public food programs and services																
•	Processing and value addition to produce																
-	Linkages with animal feed industry																

	Components/Interventions under the PFJ program	2017				2018				2019				2020			
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
-	Facilitate private enterprise development for processing and value addition																
-	Facilitate new products development and R&D																
-	Facilitate exploration and Development of new market niches																
-	Facilitate packaging and branding enterprise development																
-	Quality assurance																
-	Stakeholder engagement and awareness creation																
•	Price Volatility																
•	Job creation																
5.	Component 5: E-Agriculture																
•	Establishment of electronic data management centers and systems																
•	Establishment of supply chain management system																
•	Improve communication and coordination																
•	Establishment of early warning and management systems																
•	Facilitate development of market information platform																
•	Web portals																
•	Text based services																
•	Mobile internet based service																
6.	Coordination and management of the program																
•	Establishment and operations of a Program Management Unit (PMU)																
•	Monitoring and Evaluation																