Center for Indigenous Knowledge and Organizational Development

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PEASANT FARMERS ASSOCIATION OF GHANA
MOTTO: MAKING POVERTY HISTORY

A REPORT ON
ASSESSMENT OF GHANA'S AGRICULTURAL DEVELOPMENT BUDGET AND FARM INPUT SUBSIDY PROGRAMMES
2008-2017

Commissioned by Centre for Indigenous Knowledge and Organisation Development (CIKOD)
and Peasant Farmers Association of Ghana (PFAG)

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Foreword

Given the critical importance of agriculture to the livelihoods of millions of Ghana's smallholder farmers, including women, CIKOD and PFAG deem it imperative to assess the efficiency, effectiveness, costs, benefits and impacts of Ghana's increased public investment in agriculture. Policy makers have often been confronted with data inadequate for the requirements of addressing the historical imbalances and inadequacies created, inter alia, by the effects of past policies within the sector. There is a gap in researched policy analysis and recommendations to support the advocacy of small scale family farmers on how to progressively make the transition from Green Revolution inputs to intensified agroecological farming. Within this context and with a view to determining how to best promote sustainable agriculture to benefit smallholder farmers, CIKOD and PFAG commissioned a review and assessment of Ghana's agricultural budget and Farm Input Subsidy Programme (FISPs). The Research conducted shows that the contribution of FISP to increase production and yields are limited at best. The available evidence shows that the FISPs do not appear to help small-scale farmers (particularly the most vulnerable, such as women) in the long-term. There is the need for supportive way or ways to improve their food security and build their resilience. Sustainable farming and food systems are necessary in a world facing diverse ecological, economic and social challenges. This is an effective way to adapt to climate change, strengthen resilience and regenerate soil health.

The purpose of this publication is to offer recommendations for a credible groundswell for policy change.

Executive Summary

Ghana became a middle-income country in 2010, due to significant economic growth post 2005. However, agriculture remains a key sector of her economy, accounting for 20.2% of the national GDP in 2016 (MoFEP, 2017). Agriculture employs 44.7% of the economically active population and 51.5% of households in Ghana owns or operates a farm (GSS, 2014). Farming is mostly rural, engaging about 83% of rural households, on average (GSS, 2014). Since 2003, successive governments have been committed to the African Union's Maputo declaration to spend 10% of national budget in support of agriculture. From 2008 onwards, a large part of Ghana's annual public spending on agriculture has been allocated to farm input subsidy programmes (FISPs).

However, smallholder farmers continue to face increasing challenges in their attempts to sustain their livelihoods. Some of the challenges farmers face include declining soil fertility, and soil organic matter; land degradation caused by reduced vegetative cover and soil and water erosion and, forest depletion. Another major challenge faced by farmers is reduced production, and increased risks of crop failure, caused by reduced and irregular rainfall, and increased spikes in temperature during the growing season, due to climate change. All these factors contribute to making smallholder farmers, particularly those in more ecologically fragile, risk prone agroecological areas, more vulnerable to food and nutrition insecurity.

Given the critical importance of agriculture to the livelihoods of millions of Ghana's smallholder farmers, including women, CIKOD and PFAG deem it imperative to assess the efficiency, effectiveness, costs, benefits, and impact of Ghana's increased public investment in agriculture. Within this context, and with a view to determining how to best promote sustainable agriculture to better benefit smallholder farmers, they commissioned this review and assessment of Ghana's agricultural budget and FISPs.

The main objective of this assignment is to conduct an objective assessment of Ghana's investments in agriculture since 2008, in order to contribute to the debate on:

- The extent to which the sustainability, resilience to climate change, income and food security of small scale farmers has been strengthened.
- The effectiveness, efficiency, impact, sustainability and opportunity costs and economic rate of return of public resources invested in FISPs in the medium and long term, particularly for small scale farmers and for consumers.

The study mainly employed literature search and desk review of information in both published and unpublished reports, papers and policy documents. Secondary data from both domestic sources and international databases was used, and supplemented with key informant interviews involving face to face in-person interviews, telephone and email communication. Qualitative data and information obtained was synthesized and summarized while simple statistical tools are used to analyze the quantitative data obtained for the report.

Ghana's public expenditure on agriculture falls far short of the Maputo Declaration benchmark of 10%. Benin and Yu (2013) estimate that Ghana's CAADP funding gap is above 50%. The share of MoFA's total investment expenditure provided by donors rose from 40% in 2006 to 61% in 2011 (World Bank, 2017). Whilst expenditure on the farm input subsidy programmes increased substantially, the allocation of resources to agriculture-specific expenditures on knowledge transfer activities such as training, technical assistance and extension decreased sharply. In fact, Ghana's public spending on agriculture is low both by regional and international standards; worse still, it has been on the decline in recent years,

and fertilizer subsidies constitute a growing percentage of the total.

In spite of various attempts, at least on paper, to improve targeting and performance the Ghana's farm input subsidy programme remains largely universal though with limited reach. Estimates of inorganic fertilizer use and application rates suggest low and vary widely, and are difficult to verify. There is no consistent and disaggregated data on fertilizer use and application rates. Crop production data show that there's no appreciable increase in the yields of the target crops; maize, rice, sorghum and millet. To a large extent, estimates of value-cost ratios suggest that fertilizer use among maize farmers in Ghana is not profitable, in some cases even under the subsidy. Farmers seldom cover their costs, and can thus not be expected to win themselves off the subsidy.

Yet in some years, expenditure on the subsidy programme has claimed above 40% of total allocation to MoFA. With no exit strategy, the fiscal sustainability of the Ghana's subsidy programme is an open question. Other critical issues are its impact, sustainability and cost effectiveness. Aside its negative long-term effects on soil fertility, the FSP may even pose a danger to the attainment of the long-term objective of sustainable food security driven by domestic production. It is therefore clear that subsidies on inorganic fertilizers alone are not likely to work, a point re-iterated by MoFA when it made provision for organic fertilizer (compost) in the subsidy programme in 2016.

The FISP in its current form cannot deliver the desired crop productivity, production (crop output) and food security to smallholder farmers in Ghana as envisaged. Instead, there is a need for a major shift in approach to one that makes use of integrated soil fertility management systems. This will require some combinations of the following:

- Use subsidized mineral fertilizer only as part of a wider integrated soil fertility management approach
- Promote the joint use of both organic and inorganic fertilizers, including subsidized organic fertilizer.
- Reduce reliance on mineral nitrogen, particularly urea and sulphate of ammonia, by various agronomic methods to increase organic sources of nitrogen (agroforestry, manure, crop rotation with legumes)
- Promote and encourage farmer managed natural regeneration of trees, agroforestry, composting and management of farm yard manure to produce organic sources of nitrogen
- Promote and encourage various approaches to sustainable land management, including agroforestry, inter-cropping and crop rotation with legumes, and soil and water conservation technologies
- Promote conservation agriculture (minimum tillage, not burning, mulch)
- Working to increase availability of quantity and quality organic inputs
- Promoting improved agronomic and soil management practices including soil testing for crop-soil-specific fertilizer recommendations
- Create stronger links with research and development institutions to move towards delivery of packages tailored to specific farmer needs, based on specific crops, types of soils, and variation in the agroecological conditions across Ghana within the context of an integrated soil fertility management approach.
- Promote decentralized, community based small dams for irrigated agriculture in the dry season
- Promote effective land development and management at farmer level.

There is also the need for urgent attention to re-orient public expenditure priorities in order to focus more on important agricultural development priorities such as skills training and knowledge transfer activities. This will also require shifting the burden of critical public expenditure from donors to Government of Ghana in both budgetary and actual expenditure terms; this is quite apart from the need to significantly raise the levels of capital expenditures. This could imply cuts to the expenditure of the current FISP.

1. Background and Rationale

Ghana became a middle-income country in 2010, having experienced significant economic growth from 2005 onwards. This growth has, however, slowed significantly since 2013 in light of macro-economic challenges such as high budget deficit and inflation. In spite of the slow down the economy's real GDP growth rate was 4.2% in 2014, 2.5% in 2015 and 3.6% in 2016 (ISSER, 2017). The country enjoys stable democratic institutions and rich natural resources, with an estimated per capita GDP of US$ 1,858 in 2013 (FAO, 2015). In less than two decades (between 1991 and 2006) Ghana reduced the incidence of extreme poverty from 36.5 % to 18.2 %, one of the best records in sub-Saharan Africa. Nevertheless, over a quarter of the population remain below the poverty line of US$ 1.25/day, particularly in the three regions of Northern Ghana.

The 2012/2013 Ghana Living Standards Survey (GLSS) report indicates that the proportion of female-headed households was 30.5%. This proportion is higher in rural coastal (38.1%) than all other localities, with the least (16.4%) in rural savannah (GSS, 2014). The GSS (2014) estimated that about 75% of the population 15 years and older are employed, with majority of them engaged in Agriculture (44.7%) and Services (40.9%). A little over half (51.5%) of households in Ghana own or operate a farm. Farming is mostly rural, engaging about 83% of rural households; but this proportion is much higher in the rural savannah, estimated at 93% of households. The corresponding figures for the forest and rural coastal areas are 81.2% and 65.4%, respectively. The proportion of females engaged in agriculture in rural coastal (48.7%) is higher than females in the other rural areas (GSS, 2014).

Over a long period (spanning decades) changes in the agricultural sector were primarily responsible for observed changes in the economy of Ghana; the share of agriculture in Ghana's real GDP[1] was very high, about 30% or higher until 2009 (Table 1). The service sector became the largest contributor to real GDP in 2008. Over the period, changes in real GDP growth rates at the national level seemed to closely follow those for agriculture, until 2010. Ghana's Agricultural Gross Domestic Product (AgGDP) consists of crops, livestock, cocoa, forestry/logging, and fisheries. But over the years, the main driver of growth in agriculture has tended to be the cocoa sub-sector. However, much of the growth experienced in the crop sub-sector has largely been achieved through area expansion, and price increases, rather than productivity improvement. The agricultural sector recorded a GDP growth rate of 3.6% in the year 2016 as compared to 5.9% for the services sector; the industrial sector contracted by 1.2% in 2016 (ISSER, 2017).

Agriculture remains a key sector of Ghana's economy, accounting for 20.2% of the national GDP in 2016 (MoFEP, 2017). The sector has grown significantly since 2007, benefiting from high international prices, particularly for its main export, cocoa. Despite this growth, agriculture remains largely rain-fed and subsistence-based, and smallholder farmers with rudimentary technology produce 80% of total output. Production of food crops by smallholders has increased in recent years, mostly through expanded land under cultivation (Jatoe, 2015), but is still characterized by low productivity. Ghana is a net importer of agricultural products, importing mainly consumer-ready commodities such as rice, wheat, sugar and poultry.

[1] Real GDP in 1993 constant prices; Ghana Statistical Service (2012).

Table 1: Percentage contribution to Ghana's GDP by sector

Year	Sector		
	Agriculture	Services	Industry
2006	30.4	48.8	20.8
2007	29.1	50.2	20.7
2008	31.0	48.6	20.4
2009	31.8	49.2	19.0
2010	29.8	51.1	19.1
2011	25.3	49.1	25.6
2012	22.9	49.1	28.0
2013	22.4	49.8	27.8
2014	21.5	51.9	26.6
2015	20.2	53.3	26.6
2016	20.1	54.3	25.6

Source: GSS (2014); ISSER (2017); Revised GDP calculated at 2006 base year

In the face of balance of payments difficulties food self-sufficiency, through domestic production and consumption provides a good proxy for food security, especially where subsistence farming is prevalent. While the agricultural sector remains the main pillar of the country's source of food security, majority of small holder farmers earn their living through a diversity of strategies. Some of these strategies are growing grains and vegetables, keeping livestock, engaging in off-farm activities such as setting up small shops or micro-businesses.

However, farmers continue to face increasing challenges with implementing these strategies making it difficult to sustain their livelihoods. Farmers in many parts of Ghana face challenges including declining soil fertility, which in part is due to shortening of fallow periods between rotations and its associated reductions in soil organic matter. Others are land degradation caused by reduced vegetative cover and soil and water erosion and, forest depletion. Finally, a major challenge faced by farmers is reduced production, and increased risks of crop failure, caused by reduced and irregular rainfall, and increased spikes in temperature during the growing season, due to climate change. All these factors contribute to making smallholder farmers, particularly those in more ecologically fragile, risk prone agroecological areas, more vulnerable to food and nutrition insecurity.

In addition to this, it appears that the consumer price index (general price level) in Ghana is determined by the food price level, suggesting that food constitutes a substantial share of the consumer's budget. GSS (2005) indicates that about 14% and 11.6% of the households in the rural and urban areas, respectively, often or always have difficulty in satisfying their food needs. The 2009 comprehensive food security and vulnerability analysis survey indicates that 34% of the population in Upper West Region was food insecure, followed by Upper East Region with 15% and Northern Region with 10%. The national average of 5% based on households' food consumption only, hides important spatial disparities.

The 2012 estimates show a similar pattern. The proportion of households that are food insecure is 28% for Upper East Region, 16% for the Upper West Region, and 10% for the Northern Region. These regions also harbor high proportions of individuals who are vulnerable to food insecurity. Indeed, food insecurity in Ghana is a rural phenomenon, with a pattern quite similar to that of poverty (see GSS, 2007). The food insecure and vulnerable people are mainly food crop farmers, cash crop farmers, agro-pastoralists, food processors and unskilled labourers.

The Centre for Indigenous Knowledge and Organizational Development (CIKOD) and its partner, the Peasant Farmers Association of Ghana (PFAG) are deeply concerned about these trends affecting majority of small holder farmers. In response, CIKOD and PFAG seek to actively promote a ***"sustainable agriculture"*** approach. This approach seeks to increase farm productivity, production and income,

while preventing negative effects on the environment, restoring vegetative and tree cover, and maintaining soil fertility mostly through ecological processes. Another key dimension of sustainable farming is to help small scale farmers adapt to climate change and improve nutrition through local production and consumption of diverse, nutrition rich foods. The overall aim of CIKOD and PFAG is to enable small scale farmers to make a progressive transition to more sustainable, resilient, ecologically intensive, and nutrition sensitive way of farming.

CIKOD and PFAG note that since 2003, successive Ghana governments have been committed to the African Union's Maputo declaration to spend 10% of its national budget in support of agriculture. Since 2008, a large part of Ghana's increased spending on agriculture has been allocated annually to farm input subsidy programmes (FISPs). Given the critical importance of agriculture to the livelihoods of millions of Ghana's smallholder farmers, including women, it is imperative to assess the efficiency, effectiveness, costs, benefits, and impact of Ghana's increased public investment in agriculture. Within this context, and with a view to determining how to best promote sustainable agriculture to better benefit smallholder farmers, CIKOD and PFAG commissioned this review and assessment of Ghana's agricultural budget and FISPs.

1.1 Objective of the Assignment

The main objective of this assignment is to conduct an objective assessment of Ghana's investments in agriculture since 2008, in order to contribute to the debate on:

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- The effectiveness, efficiency, impact, sustainability and opportunity costs and economic rate of return of public resources invested in FISPs in the medium and long term, particularly for small scale farmers and for consumers.

1.2 Methodology

The study mainly employed literature search and desk review of information in both published and unpublished reports, papers and policy documents. Time series data on several variables was also obtained from domestic sources and international databases, including the Ministry of Food and Agriculture (MoFA), Ghana Statistical Service (GSS), FAO, USDA and the World Bank. Also, data from other secondary sources were incorporated into the report. Sources of large amounts of data are indicated. The study also used key informant interviews involving face to face in-person interviews, telephone and email communication. Qualitative data and information obtained was synthesized and summarized while simple statistical tools are used to analyze the quantitative data obtained for the report. Annex 1 shows the list of organizations and individuals contacted for information for the study.

The remainder of the report is structured as follows. Section 2 presents and discusses various aspects of the farm input subsidy programme, as well as donor support and public expenditure on agriculture in Ghana. In section 3, Ghana's agriculture sector budget for fiscal year 2016 is presented whilst section 4 touches briefly on Government's 'planting for food & jobs' campaign 2017. Section 5 of the report discuses sustainable agriculture as a framework to reform farm input subsidy programmes. Finally, section 6 presents policy implications.

2. Issues from Literature and Consultations

2.1 Allocation of resources to Ghana's Fertilizer Subsidy Programme

Ghanaian farmers normally apply inorganic fertilizer on high value export crops; but also frequently use the input on staple food crops such as rice and maize (Banful, 2009). About 50% of national fertilizer imports is consumed by cocoa, Ghana's main cash crop, with only about 30% going to food crops, and the rest is used by large industrial farms on plantation crops like oil palm, rubber, cotton, pineapple, banana and vegetables. Among staple food crops maize accounts for over 40% of fertilizer use by farmers. The most commonly used fertilizer in Ghana is a compound of Nitrogen, Phosphorus and Potassium (NPK), which accounted for 68% of fertilizer use in 2010, followed by urea and Sulfate of Ammonia (SoA) which provide mostly nitrogen.

Over the period of the implementation of the fertilizer subsidy programme, 2008 - 2016 with a break in 2014, a total of 947,482 metric tons (MT) of fertilizer was subsidized at a total cost of GH¢554.33m (Table 2). The country-wide fertilizer subsidy re-introduced in July 2008 covered four fertilizers in all - two types of compound fertilizers [nitrogen, phosphorous, potassium; NPK 15:15:15 and NPK 23:10:05], urea, and Sulphate of Ammonia (SOA). From approximately 43,000 metric tons in 2008 the quantity of fertilizer distributed under the subsidy programme increased consistently to 176,278MT in 2011, before declining to 166,807MT in 2013 (Table 2).

Table 2: Total fertilizer subsidized and total cost to government 2008 to 2016

Year	Total Fertilizer Subsidized (MT)	Targeted Quantity (MT)	Total Government Subsidy (GH¢ Million)
2008	43,176	30,000	20.654
2009	72,795	-	34.400
2010	91,244	-	30.002
2011	176,278	150,000	78.746,
2012	173,755	176,000	117.437
2013	166,807	180,000	64.005
2014	-	-	-
2015	89200.9	180,000	44.850
2016	134,227	180,000	164.24*
Total	947,482		554.33

Source: MoFA (various); Republic of Ghana 2013.
*Figure includes expenditures on other subsidy programmes in agriculture.

In 2009 for example, Ghana imported and used 218,000 tons of fertilizer products (AFAP, 2015). Indeed the quantity of fertilizer subsidized under the programme rose by almost 70% in its second year of operation, reaching 72,795MT. The quantity of fertilizer subsidized increased by more than 300% by 2011 (compared to 2008) before a decline in 2012 and 2013, prior to the break in 2014 when no subsidies on fertilizer were offered. The break during 2014 however occurred notwithstanding a statement in that year's budget to 'continue the policy by distributing 180,000MT of subsidized fertilizer' (Republic of Ghana 2013, pp. 82). The 89,200.9MT distributed in 2015 was less than half (50%) of the

quantity of subsidized fertilizer promised to farmers at the launch of the programme that year. In 2016 also, total quantity of subsidized fertilizer distributed was 134,227MT, amounting to 74.57% of the target for the year. However, in some years government exceeded the target quantity of fertilizer (e.g. in 2008 and 2011) (see Table 2).

While the fertilizer subsidy covered NPK, urea, and SOA, the bulk of the subsidy went to NPK. From about 66% in 2012 the share of NPK in total subsidized fertilizer reached 82.4% in 2016 (Table 3). The share of urea in total subsidized fertilizer varies between a low of 13.4% in 2013 and a high of 24.5% in 2015; it was 17.6% in 2016. Indeed, the SOA constituted only 14% and 17.4% in 2012 and 2013, respectively, and was eventually discontinued when the programme resumed in 2015. No specific reasons have been provided for this decision to stop subsidizing SOA.

For the first time in its implementation the fertilizer subsidy programme for 2016 was launched in March 2016, to take effect from April 1, 2016. The 2016 fertilizer subsidy was expected to be implemented through an electronic platform (the E-subsidy platform) although the free registration of farmers onto the MoFA e-platform was expected to commence in April 2016. The use of an electronic platform to manage the subsidy programme is described as part of efforts by MoFA to achieve targeting, and improve efficiency, and transparency in the management of Ghana's fertilizer subsidy programme (Andoh, 2016). It, however, did not go into operation.

In addition to the target of 180,000MT of subsidized fertilizer the programme introduced a provision for organic fertilizer for the first time in 2016. Government earmarked an amount of GHS 18 million for organic fertilizer, to be distributed under similar arrangements using the Way Bill system operated for chemical fertilizers. MoFA was to work, mainly, with the Accra Compost Recycling Plant which was the only entity with the capacity to produce organic fertilizer in commercial quantities in 2016. Some of the reasons given by MoFA for introducing subsidized organic fertilizer include:

(i) it improves soil structure
(ii) it increases nutrient and water holding capacity,
(iii) it improves aeration
(iv) it promotes the activities of soil micro and macro organisms and,
(v) it increases yields when used in combination with chemical fertilizers,
(vi) In addition, its production and reuse of organic fertilizers also encourages recycling and reuse of domestic waste, which currently poses environmental hazards.

Table 3: Types of fertilizer subsidized by government 2008 to 2016 (MT)*

Year	Type of fertilizer		
	NPK	SOA	UREA
2011	100,000	30,000	20,000
2012	114,629.55	24,411.15	34,712.9
2013	114,878.15	28,965.50	22,202.55
2014	-	-	-
2015	67,390.90	-	21,810.00
2016	111,472.75	-	23,860.25

Source: MoFA (various); *Figures for 2011 are targets in operational guidelines

In terms of quantities, some estimates suggest that the subsidy programme supplied about 40% of the fertilizer imports in Ghana over the period 2011 - 2013. When viewed against the evidence that the cocoa sector consumes roughly 50% of fertilizer imports, it does appear that the subsidy programme may be supplying most of the fertilizer used on food crops.

Given that it is not targeted, the estimated 30% consumption of fertilizer imports by food crops raises interesting scenarios. It may be that there is an expansion in fertilizer consumption by food crops due to the subsidy effect on prices, increases in application rates on food crops, absorption of subsidized fertilizer by plantation crops, among others. In the case of seed, quantities made available under the subsidy remain very small though it is not clear how much of prevailing market demand for certified seed is met through the programme. There are no estimates or forecasts of the demand for certified seed, and its use by farmers especially food crop producers remains rather low. It is generally recognized by stakeholders in Ghana that farmers show a preference for their own seed.

2.2 Use of Improved Seed and the Seed Subsidy Programme

In 2012, the fertilizer subsidy programme was expanded to include certified seeds which are basic for realizing the potential of other factors of production and crop management. The subsidy programme targeted 151000 metric tons of locally produced certified seeds (maize, rice and soya bean) at the cost of GHS4.8 million. The subsidy in 2012 was 37% on certified seeds of maize and soya bean, and 36% for rice seed. Acknowledging challenges in the distribution system the government decided, in 2013, to allow any qualified Seed Company interested in distributing seeds to participate in the subsidy programme. Also, the allocation for the 2013 seed subsidy was lower, an estimated GHS2.6 million (MoFA, 2013). Rice seed was subsidized at 49% whilst maize and soya bean received 37.5% each, in 2013.

MoFA noted that the purpose of the seed subsidy is not only to increase agricultural productivity but also to promote the use of certified seed and to use it as a means to get farmers hooked to certified seed usage thereby promoting the development of the local seed industry. However, the seed component of the subsidy faces formidable challenges. In discussions some MoFA officials suggested that sometimes the announcement of the programme is delayed in order to conclude negotiations on the seed component with GAIDA.

They observed that the seed producers appear much less organized and responsive to requests for quotations to supply the input which often delays the programme. They noted, for example, that MoFA was forced to go ahead and launch the 2015 programme without the seed component due to such delays on the part of the seed producers. On the other hand, some seed producers complain of late payment for services under the programme.

There is currently very little data that allows for tracking use of improved seed and organic fertilizers, over time and space, by crop farmers in Ghana. However information available indicates that while research appears to be active in generating improved varieties, uptake of improved seed technologies remains rather low. Ragasa et al. (2013) indicate that for maize in 2012, Obatanpa, a medium-maturing open-pollinated (OP) quality protein maize variety released in 1992 still remains farmers most popular variety with about 96% of certified seed production from 2001 to 2011 (see annex 1). The authors thus estimated that at an average seed rate of 20 kg/ha current annual certified seed production of Obatanpa could cover 18% of the maize-cropped area with fresh seeds every year.

Data on the use of improved seeds by producers of field crops in Ghana show that relatively few farmers have access, especially to seeds of high-yielding hybrid crops. Domestic seed supply is constrained by inadequate production of both breeder and foundation seed. For example, in 2010 only 19% of the area used for maize production was planted with certified seed; that for rice was only 8%, and soybean recorded 12% (World Bank, 2012). Ragasa et al. (2013) observed that while 61% of the maize area was planted with modern varieties, only 15% was planted with certified seed (with up to two seasons of seed recycling for open-pollinated varieties). In fact the same study noted that hybrids continue to be unpopular and occupy only 3% of Ghana's maize area.

However, it is expected that under the new seed law (Plants and Fertilizer Act 2010 [Act 830]) which opens the door for an increased role for the private sector in producing seeds for a number of grains the situation will improve. Ghana developed both a national seed policy and an action plan for its implementation (see Republic of Ghana, 2013; 2015). World Bank (2012) notes that although the capacity of the private sector seed multiplication industry in Ghana remains limited, investment in seed technology and expanded production of improved seed are increasing. A few private companies have begun to import hybrid maize seed and the number of certified seed growers is increasing. It is also reported that private sector firms are exploring the possibility of producing hybrids and OP varieties for domestic use and for export to regional markets as well.

2.3 Subsidy Levels and Cost

Over the first five years of its implementation the annual cost of the subsidy to the Ghanaian tax payer has risen consistently, except for a slight decline in 2010. From a total of GHS 20.65 million in 2008 the subsidy cost rose sharply, reaching a peak of GHS117.4 million in 2012 (Table 4), and declined to GHS 64 million in 2013. Owing to government's inability to pay for the 2013 supply to importers at the time there was no subsidy programme in 2014. The programme resumed in 2015 with a total cost of GHS44.85 million, which funded less than 50% of the target quantity of subsidized fertilizer for the year as the government was forced to revise its budget to the programme downwards by mid-term.

The burden of the fertilizer subsidy on public expenditures has continued to rise; from 6.8% in 2008 the share of the fertilizer subsidy in total government expenditure on the agriculture sector doubled by 2011 to 13.7%. The weight of this burden appears to be rather heavy for MoFA as the subsidy consumed about 33% of total government expenditure on MoFA. Over time the subsidy levels have declined for all fertilizer types, following an increase in its second year of operation. In fact it appears there was effectively no subsidy on fertilizers in 2013; the subsidy was about 20% in 2015 down from above 40% in 2009 (Table 4). This is in sharp contrast to fertilizers and other inputs for cocoa which continue to be heavily subsidized under the Ghana Cocoa Board.

Table 4: Statistics on fertilizer subsidy in Ghana (2008 – 2016)

		2008	2009	2010	2011	2012	2013	2015	2016
Subsidized Market Price (GHS)	Urea	36	47	41	43	44	54	105	
	SoA	28.1	33	34	33	40	44	-	-
	NPK	38.1	43.4	44	42	42	49	115	
Subsidized Price (GHS)	Urea	26	26	25	29	35	50	84	80
	SoA	18	18	18	26	38	44	-	-
	NPK	26	26	27	30	39	51	89	85
Subsidy (%)	Urea	27.8	44.7	39.0	32.6	20.5	7.4	20.0	
	SoA	35.9	45.5	47.1	21.2	5.0	0.0		
	NPK	31.8	40.1	38.6	28.6	7.1	-4.1	22.6	
Total cost (GHS million)		20.7	34.4	30.0	78.7	117.4	64.0	44.85	138
Total FSP (% of MOFA expenditure)		20.2	23.6	18.9	32.5	-	-	-	-
Total FSP (% of Agriculture expenditure)		6.8	9.5	6.8	13.7	-	-	-	-

Source: MoFA, 2016; Expert panel (2015), http://ghana.gov.gh/ (online news items)

2.4 Public Expenditure on Agriculture

Reports on Ghana's performance on the Maputo Declaration are mixed. MoFA (2016) suggests that Ghana started meeting the Maputo Declaration benchmark (10% of total government expenditure on agriculture) since 2006 but marginally slipped below the target in 2009 when it recorded 9.02% of total public expenditure. Benin and Yu (2013) observed that Ghana was one of many countries reported to have met or exceeded the 10% CAADP target in one or more years between 2003 and 2010. However, FAO (2015) reports that Ghana's public expenditure on agriculture fluctuated between 3% and 5% of total public expenditure between 2006 and 2012. Indeed the World Bank (2017) indicates that Ghana's public expenditure on agriculture as a share of total public expenditure has been falling from a high of 5.7% in 2008 to 1.2% in 2014 (Table 5). The main issues that account for part of the discrepancies in these accounts include the definition of agriculture and composition of agricultural expenditures. Besides the African Union-NEPAD definition which adds agricultural research and development (R&D) expenditures to the UN's Classification of the Functions of Government (COFOG[2]) system, a broader definition adds ***"roads to farming areas and debt service"*** to the AU-NEPAD definition.

The World Bank (2017) notes that its earlier report that suggested Ghana had met its target (in 2009, 2010 and 2011) of the 10% under the Maputo Declaration was doubtful owing to lack of clarity on what counts as part of public agriculture expenditures and the fragmented nature of the budget. This combines with weaknesses in public expenditure reporting in Ghana to pose additional challenges (World Bank, 2017). It is noted for instance that feeder roads and debt service expenditures were

[2] Core areas of Government Functions relevant to the Agriculture Sector based on Classification of the Functions of Government

sometimes counted; also, classification of expenditures is complicated by the Ministries Departments and other Agencies (MDAs) system of accounting in operation (some agriculture-labeled MDAs may undertake non-agriculture related expenditures while some non-agriculture-labeled MDAs may undertake agriculture related expenditures). FAO's Monitoring and Analysing Food and Agricultural Policies (MaFAP) notes that total public expenditure allocated to the food and agriculture sector in Ghana includes administrative costs (FAO, 2015).

Table 5: Public agriculture expenditures

Year	2008	2009	2010	2011	2012	2013	2014
Total public expenditure (million GHS)	305	364	442	576	540	300	400
Agriculture as % of total public expenditure	5.7	4.9	4.2	4.2	2.4	1.2	1.2

Source: World Bank (2017); Table 5.2, p. 140

Benin and Yu (2013) estimate that Ghana's CAADP funding gap is above 50%. It is estimated that the share of MoFA's total investment expenditure funded by donors rose from 40% in 2006 to 61% in 2011 (World Bank, 2017). Whilst expenditure on the farm input subsidy programmes increased substantially, the allocation of resources to agriculture-specific expenditures on knowledge transfer activities such as training, technical assistance and extension decreased sharply. Not only did public agriculture expenditure decline, 35% of it was also administrative costs though Benin and Yu (2013) found that productivity enhancing expenditures in the sector should focus on agricultural R&D, knowledge transfer and rural roads.

The average annual growth in real GDP for the agriculture sector in Ghana was 3.7% between 2009 and 2012, which falls short of the projected annual growth rate of at least 6% envisaged under the Maputo Declaration (Government of Ghana, 2014). Also, the share of research and development (R&D) expenditure remained at 0.5% of GDP between 2010 and 2012. In additon, the extension-farmer ratio remained 1:1500 in 2012 compared to 1:700 envisaged under the GSGDA, 2010 – 2013. More importantly, it is noted that structural issues may mean that the allocation of 10% of public expenditure to agriculture in Ghana is not sufficient to bring about the needed development results envisaged under CAADP. Yet the evidence is that public spending on agricultural development in Ghana is low both by regional and international standards as observed by World Bank (2017). Worse still, it has been on the decline in recent years, and that within this decline, fertilizer subsidies constitute a growing percentage of the total public expenditure on agriculture.

2.5 Donor Funding to Agriculture

Ghana currently lacks an institutional mechanism to systematically collect, process, and publish data on public expenditure on agriculture (World Bank, 2017). This makes any systematic assessment of public expenditure on the sector challenging due to data quality and comparability issues. However, available data show that the share of donor funds in total agriculture expenditure in Ghana ranged from a low of 17% in 2006 to a high of 39% 2009 (Table 6). The share of donor funds in total agriculture expenditure in Ghana was 37% in 2011.

Whilst funding priorities of donors often differ, agriculture generally receives significant donor support in Ghana relative to other sectors. For example, in the 2014 financial year, donors' contribution to agriculture was GH¢178.77 million representing 59% of the sector budget for the year. There is no direct donor funding to the fertilizer subsidy programme. As World Bank (2013) notes, donor expenditure on agriculture in Ghana is biased towards investment activities unlike corresponding expenditures by the Government of Ghana. Indeed, World Bank (2017) observes that donor funding expanded from 40% of MoFA's investment expenditure in 2006 to 61% in 2011. The same source projects that the share of donor funding in MoFA's investment expenditure is likely to exceed 80% by 2014.

Table 6: Government expenditure on agriculture in Ghana by source

Year	Agriculture Expenditure (million GHS)	Source of funds		
		Government (million GHS)	Donors (million GHS)	Share of Donor (%)
2005	138.3	101.0	37.3	27
2006	161.9	134.5	27.4	17
2007	207.7	163.7	44.0	21
2008	265.0	186.5	78.5	30
2009	254.1	156.1	97.9	39
2010	268.0	169.1	98.9	37
2011	302.7	190.3	112.4	37

World Bank (2013); Table 3.3, p. 38

It is also important to note that donors play a critical role in infrastructure development, and provided 45% of total funding for roads in 2009. Also, with the increased involvement of the Government in the mechanization sector and through grant funding from some donors, the number of agricultural tractors in the country has grown. For example, in 2015 India supported Ghana's agriculture with USD150 million, part of which was used to import tractors from that country.

2.6 Stated Objectives and Targeting of the Farm Input Subsidy Programme

In 2008 the Government of Ghana introduced a fertilizer and seed subsidy programme to promote the use of fertilizers and certified seeds among farmers. This move was in response to rising food and input (energy) prices during the 2007/ 2008 worldwide food and financial crisis. For example, the price of maize in Accra and Tamale rose by 77% between May 2007 and May 2008 (Banful, 2009). Also, between June 2007 and March 2008 the price of a 50kg bag of NPK 15:15:15 rose by about 35% (MoFA, 2008).

Available evidence also showed that fertilizer application rates in Ghana were among the lowest in Sub-Saharan Africa which, combined with declining soil productivity, caused persistent low yields of all major staple cereal crops. Increased food production in Ghana is presently due mostly to expansion of area under cultivation. Average yields of most of the crops are 20% - 60% below their achievable yields, indicating that there is significant potential for improvement (Expert panel, 2015). Yet, the country's national development agenda sought to use the agriculture sector to contribute to structural

transformation of the economy in order to maximize the benefits of accelerated growth.

Given the distribution of poverty in the country – poverty is rural and associated with food crop production – transforming agriculture is viewed as the most potent weapon in the fight against poverty. Stakeholders recognize that transforming agriculture in Ghana requires significant improvements in the productivity of the sector, which is largely dominated by smallholders but there's no strong consensus on how such a transformation is to be brought about.

In general, however, most influential stakeholders see increasing the rate of adoption of improved technologies with accompanying improvements in infrastructure as holding the key to transforming agriculture in Ghana. This is partially reflected in Ghana's agreement to sign the Abuja Declaration on Fertilizer for an African Green Revolution under which member states resolved to increase fertilizer use to 50 kg/ha by 2015 (AU, 2006). Thus in the immediate or short-term, the fertilizer and seed subsidy was intended to provide the inputs at affordable prices to farmers, assure a good harvest, and prevent food prices from escalating further. The move was part of efforts on the part of the Government of Ghana to mitigate the hardship of the population due to high food and fuel costs in 2008, which also happened to be a year of parliamentary and presidential elections in the country.

The objectives of the fertilizer and seed subsidy programme are to improve or enhance farmers' access to inputs and also raise adoption and use rates and therefore raise farmers' incomes. Benin et al (2013) noted that under the waybill system the fertilizer subsidy aims at increasing the national average rate of fertilizer use from 8 kg per hectare (kg/ha) to 20 kg/ha to increase crop yields and production, to raise the profitability of farm production, and to improve private-sector development in the fertilizer market. However, it also helped government to contribute towards much broader and long-term goals such as promoting the uptake of these inputs, in order to stimulate agricultural productivity whilst working towards its political commitments. Indeed, the fertilizer subsidy program is viewed as a poverty fighting tool designed to make fertilizer and seeds available at affordable prices to smallholder farmers, many of whom would otherwise not use these inputs.

In the fifth year of the fertilizer subsidy programme, in 2012, the government added seeds of maize, rice and soybeans. The purpose of the seed subsidy is not only to increase agricultural productivity but also to promote the use of certified seed and to use it as a means to get farmers hooked to certified seed usage thereby promoting the development of the local seed industry (MoFA, 2013).

In 2013, instead of a universal fertilizer subsidy, the subsidy programme introduced targeting measures as follows:

- Smallholder farmers cultivating maize, rice, sorghum and millet with priority on food crop farmers in the savannah areas of the country.
- Out-grower farmers registered under recognised Nucleus Farmers/Companies will be considered. Nucleus farmers/ Companies with verifiable list of out-growers cultivating maize, rice, sorghum and millet will have to apply to MoFA to procure at such subsidized rates.
- Food crop farmers, either on their own or as a member of an out-grower scheme shall be entitled to NOT more than the fertilizer inputs for 2 hectares, amounting to 10 bags of compound fertilizer (NPK) and 5 bags of sulphate of ammonia or urea.
- Women farmers would receive priority as much as possible.

These measures, with modifications to include vegetables and cotton farmers, were continued in the 2015 programme 'to ensure maximum reach to resource poor farmers and greater efficiency and value for money' (MoFA, 2015). Cotton farmers operating under recognized nucleus farmers in the north of

the country were to be considered for subsidized fertilizer to continue with government policy to revive the cotton industry.

However, a monitoring exercise undertaken by the PFAG in 2015 found no evidence of cotton farmers receiving subsidized fertilizers, and the 2016 fertilizer subsidy did not include any provision for cotton farmers. The monitoring exercise also found no specific arrangements put in place to enforce or assure the ***"priority"*** that women farmers were to receive as provided for in the targeting measures. Yet, it is argued that these targeting measures are meant to ensure that more resource poor farmers get access to subsidized fertilizers throughout the year (see Republic of Ghana, ud., p. 3)

2.7 Trends in Average Chemical Fertilizer use in Ghana

Application of mineral fertilizers in Ghana post structural adjustment and economic recovery programmes remained low until the re-introduction of the FSP in 2008. Several factors including the removal of input subsidies, and structural bottlenecks that squeezed imports and raised its price are responsible for the continuing decline in fertilizer use by farmers. Data from FAOSTAT show that total fertilizer consumption was lowest between 1986 and 1995. Total fertilizer use has been increasing after 1995, and more recent data confirm this upward trend (see data on imports, Table 7). From about 189.6 thousand metric tons in 2007, total annual imports of fertilizer increased to 299,030 MT in 2013, and reached an estimated at 357.8 thousand metric tons in 2015. It is clear from import statistics that current consumption of fertilizer has increased under the FSP since there is very little official re-export of fertilizer from Ghana.

Table 7: Fertilizer Imports to Ghana ('000 metric tons)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
NPK	87.4	18.9	197.6	67.07	50.46	127.4	117.1	44.9	138.1
SOA	17.5	4.2	4.6	39.53	38.47	61.59	54.86	6.3	64.0
MOP	0.1	8.9	15	37.99	27.59	43.42	19.85	23.0	19.2
UREA	5	13.8	25	14.03	2.84	17.68	36.1	0.4	18.5
SSP/TSP	0.5	15.4	66.5	79.04	50.18	92.46	47.17	21.3	-
Potassium and Calcium Nitrate	52.8	64.1	0.1	-	-	-	-	0.5	0.4
Potassium Sulfate	0.3	0.4	-	-	-	-	-	0.3	0.2
Others	26	61.5	26.3	29.25	30.49	32.14	23.99	116.8	117.4
TOTAL	189.6	187.2	335.1	266.9	178.3	374.6	299.0		357.8

Source: AfricaFertilizer.org Fertilizer Statistics Overview GHANA 2010-2013 (CountrySTAT); Ghana Fertilizer Assessment (IFDC 2012); MoFA

With no comprehensive survey data, it is difficult to make an accurate assessment of the adoption of fertilizer and seed as well as their application rates. However, prior to the 2008 fertilizer subsidy some reports noted that Ghanaian farmers had some of the lowest fertilizer application rates in Sub-Saharan Africa. Quinones and Diao (2011) reported wide variation in the use of fertilizer and improved seed among farm households in Ghana by location; both being higher in the northern savannah areas (Table 8).

In 2011 an estimated 19% of farm households used inorganic fertilizer while 22% reported purchasing seed. A recent expert panel estimate of the proportion of farm households using inorganic fertilizer in Ghana is about 33%, with wide variation across the country; less than 2% of farmers use both organic and inorganic fertilizers (see Expert panel, 2015).

While fertilizer use among farmers is generally low, consistent and disaggregated data on application rates is not available. A nation-wide household survey in the 2006/7 production season found that only 19% of households in Ghana reported buying inorganic fertilizer (GSS, 2008). Also, GSS (2014) indicates that 52% of households reported that inorganic fertilizers were difficult to obtain in 2012/2013.

Table 8: Percent of households using inorganic fertilizer and seed in Ghana

	National	Coast	Forest	Southern Savannah	Northern Savannah
Purchased seed	22	17	23	22	27
Inorganic fertilizer	19	16	15	20	31
Organic fertilizer	6	4	5	3	13

Quinones and Diao (2011); Table 15, p. 30

It is indeed difficult to pin down the average fertilizer application rate for the country as different sources continue to report different figures, sometimes for the same year. MOFA documents on the FSP suggest that application rates have increased from 8kg/ha through 12kg/ha to about 15kg/ha under the program. Other sources suggest that fertilizer consumption (kilograms per hectare of arable land) in Ghana was 34.94kg/ha as of 2012, its highest value over the previous 10 years. However, World Bank (2014) reported that total fertilizer consumption per hectare of arable land increased from 6kg in 2005 to 20kg in 2006, before taking a slight dip to 18.7kg in 2010 (see Table 9). Indeed, World Bank (2012) estimated that application rates in Ghana average 40kg/ha and projected that if the 10% rate of growth in fertilizer use Ghana has experienced in recent years persists, the country is likely to reach the average 50 kg per hectare prescribed by the Abuja Declaration by 2015.

Table 9: Average fertilizer application rate (kg/ha of arable land), Ghana

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Kg/ha	3.75	6.84	13.2	6	20.06	17.76	14.55	18.98	18.7	13.23	34.76	35.82

Source: http://data.worldbank.org/indicator/AG.CON.FERT.ZS

2.8 Cost Effectiveness, and Profitability of Subsidized Inorganic Fertilizer

Inorganic fertilizers are expected to play a major role in agricultural productivity growth in Ghana due to the poor nutrient quality of its soils. The levels of organic carbon, nitrogen and available phosphorus are generally very low and almost all the crop balances in Ghana show a nutrient deficit (FAO, 2004). Table 10 shows the fertility status of soils in various agro-ecological zones of the country.

Table 10: Soil Fertility Status of the Various Agro-ecological zones

Agro-Ecological Zones	Soil pH	Organic C	Total N	Available P	Available K
		(%)		(mg/kg soil)	
High Rainforest	3.8 – 5.5	1.52 – 4.24	0.12 – 0.38	0.12 – 5.42	63.57 – 150.41
Forest-Transition	5.1 – 6.4	0.59 – 0.99	0.04 – 0.16	0.30 – 4.68	58.29 – 72.53
Semi-Deciduous Forest	5.5 – 6.2	1.59 – 4.80	0.15 – 0.42	0.36 – 5.22	62.01 – 84.82
Coastal Savanna	5.6 – 6.4	0.61 – 1.24	0.05 – 1.16	0.28 – 4.10	48.02 – 58.71
Guinea Savanna	6.2 – 6.6	0.51 – 0.99	0.05 – 0.12	0.18 – 3.60	46.23 – 55.27
Sudan Savanna	6.4 - 6.7	0.48 – 0.98	0.06 - 0.14	0.06 – 1.80	36.96 – 44.51

Source: Expert Panel, 2015; Table 4, p.16

From table 10 it is generally to be expected that the fertilizer response rates for any given crop will vary across the country. The varied agro-ecologies of Ghana would require specific (more or less tailor made) soil-crop-fertilizer combinations for optimal crop response and hence profitable use of the input. This is particularly important for the smallholder farmer who may be more risk averse and rather sensitive to relatively small adverse variations in yields or profits. Unfortunately, such information is currently not available and maize farmers, for example, are generally given a uniform fertilizer recommendation across the country. It is also common knowledge that many farmers do not even follow the blanket recommended rates either; many are those who just try to stretch whatever little fertilizer they have acquired to reach their whole cropped area.

It is indeed not surprising that an expert panel noted that many smallholder farmers in Ghana obtain very low fertilizer response rates and cannot therefore use it profitably (Expert Panel, 2015). The profitability of using fertilizer is determined by relative prices of farm produce and fertilizer. In other words, the price the farmer can get for a unit of his or her farm produce compared to the price the farmer must pay for the required fertilizer.

A simple measure of the profitability of fertilizer use, the value-cost ratio (VCR) described above, has been reported by two studies for Ghana. The more optimistic reported VCRs of urea fertilizer at market prices used on maize over the period 2007 – 2013 ranged from a low of 1.42 at a response rate of 4 for 2010 to a high of 3.23 for 2012. The corresponding ratios rose to 1.77 and 4.03 respectively at a response rate of 5 (Table 11). Hill (2014) employed different models and using yield distribution estimated VCRs that are generally lower than reported earlier. Based on farm level data, the results from ordinary least squares model varied from 0.66 for unsubsidized fertilizers in Northern Ghana to 1.67 under the 2012/2013 subsidy in Southern Ghana (see Table 12)

Table 11: Value cost ratio (VCR) of urea fertilizer at market prices used on maize in Ghana

	2007	2008	2009	2010	2011	2012	2013
Urea - market price (GHS/50kg bag)	25.8	36.0	47.0	41.0	43.0	44.0	54.0
Average Ghana farm-gate price (GHS/ metric tonne)	238	318	347	291	366	710	831
VCR at response rate of 4 (12 kgs maize per kg N)	1.84	1.77	1.48	1.42	1.70	3.23	3.08
VCR at response rate of 5 (15 kgs maize per kg N)	2.30	2.21	1.85	1.77	2.13	4.03	3.85

Expert panel (2015), Table 2, p14.

Table 12: VCR using the OLS yield model for maize in Ghana

Output-Nutrient Price Ratio Used	VCR: North	VCR: South	VCR: Total sample
Unsubsidized	0.66	1.12	0.81
2011/2012 Subsidy	1.28	2.20	1.59
2012/2013 Subsidy	0.98	1.67	1.21

Hill (2014); Table 6.4 & Table 6.5, p. 43

For smallholder farmers to demand fertilizer on a sustained basis a VCR above 2 is generally required (Crawford and Kelly, 2002). Though a VCR of one should indicate that the revenues outweigh the costs, two is a more certain indication of profitability, considering that the actual VCR may fluctuate with prices, weather, and other uncontrollable exogenous factors.

The fertilizer prices used were 3.38GH¢/kg of unsubsidized fertilizer, 1.73GH¢/kg for subsidized fertilizer in 2011/2012, and 2.27GH¢/kg for subsidized fertilizer in 2012/2013. Results from quantile regression model showed more variation from 0.47 to 1.79 (see Table 13). The quantile yield model accounts for the amount of fertilizer farmers are currently applying as well as their current yields, and thus more

accurately reflects the farmer's situation. The above results (VCR of 0.47 – 1.79) therefore indicate that fertilizer use by maize farmers is not profitable.

Table 13: VCR using the quantile yield model for maize in Ghana

Output-Nutrient Price Ratio Used	VCR Using $Y_{.25}$	VCR Using $Y_{.5}$	VCR Using $Y_{.75}$
Unsubsidized	0.47	0.75	0.92
2011/2012 Subsidy	0.92	1.46	1.79
2012/2013 Subsidy	0.70	1.11	1.37

Hill (2014); Table 6.8, p. 45

The above results suggest that fertilizer use among maize farmers in Ghana is not profitable, unless under the subsidy. Even with the fertilizer subsidy a fall in prices of farm produce such as maize (a characteristic feature of that market in Ghana) is likely to render fertilizer use unprofitable for a large number of farmers. This is particularly the case for farmers who may have to sell off their produce immediately following harvests when prices are very low.

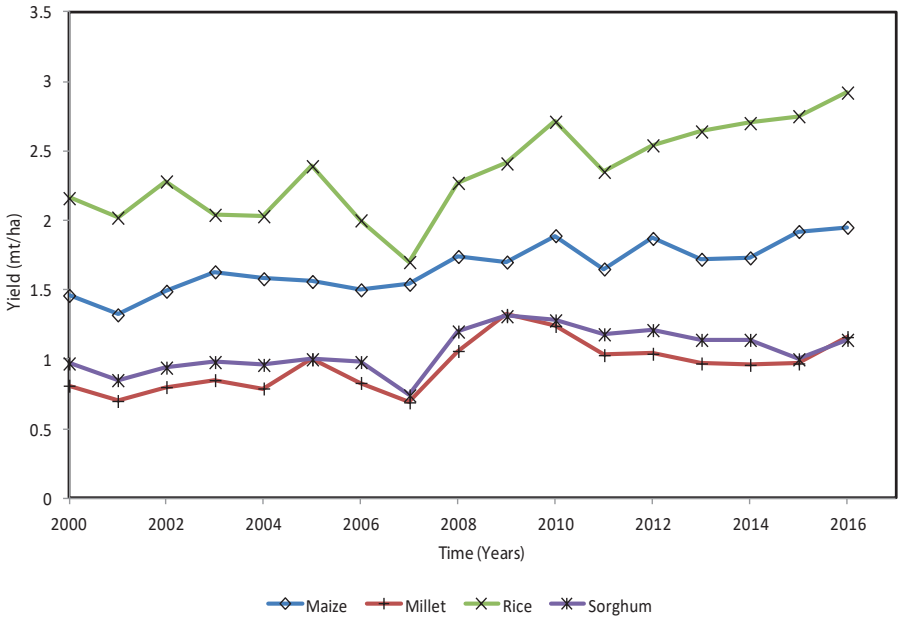
The results of analyses on profitability of fertilizer use do not appear surprising as the expert panel noted that average yields of most crops are 20 – 60% below their achievable yields in Ghana (Expert Panel, 2015). It is important to note that use of improved seeds by producers of field crops in Ghana remains very low as relatively few farmers have access, especially to seeds of high-yielding hybrid crops. Yet it is such seeds that usually show the highest response rates to chemical fertilizers.

Indeed available evidence on yields of selected cereals suggest rather modest, if any, increases in crop productivity in Ghana under the fertilizer subsidy programme. It is therefore clear that increase in fertilizer use is not delivering the desired impact on crop yields. One wonders if the inorganic fertilizer use is only adequate for preventing or slowing down what would have been a greater decline in yields due to continuing soil degradation.

For example, an expert panel observed that though the substantial increase in fertilizer use since 2009 would lead one to expect major impact on agricultural productivity, increases in crop yields have only been modest. It may be noted that maize yields in Ghana have continued to rise only slowly at long-term trend growth rates, and show no obvious jump during the post-2008 FSP period compared to the pre-2008 trend (see Figure 1). From the figure, it is only in the case of rice that an upward trend appears obvious from the yield available data since the re-introduction of the fertilizer subsidy.

The correlation between government expenditure on the FSP per annum and yield for selected target crops ranges from -0.12 for sorghum to 0.46 for maize; with those for millet and rice lying in-between.

Figure 1: Yields of Selected Crops in Ghana 2000 – 2016



Source: Data from MoFA-SRID

2.9 Impacts of Subsidized Inorganic Fertilizer on Soils

The conventional thinking on how to modernize agriculture in Ghana is heavily oriented to use, mineral fertilizers, along with improved seed varieties through plant breeding. These are seen as the most important steps towards increasing yields and securing food. This argument is so pervasive that the negative impact of fertilizers on the soil, environment and climate are often suppressed or treated as unavoidable external costs.

The reality, however, is that synthetic nitrogen has, over the long run, negative impacts on soil. Most nitrogen fertilizers cause soil acidification, nitrate leaching and pollution of ground water, nitrate loading, and soil humus depletion (see for example, Khan et al. 2007; Mulvaney et al. 2010). Moreover, its production and use increase greenhouse gas emissions, which are big contributors to climate change (Erisman et al., 2008).

Soil acidity is an outstanding parameter in the complex soil fertility system. In strongly acidic soils, the availability of nutrients, above all phosphate, becomes limited, and the concentrations of toxic metals in the soil solution rises. At the same time, the life of microorganisms in the soil is heavily impaired and overall soil productivity is lower. Acidifcation of soil reduces the supply of phosphorus to plants and thereby limits the effectiveness of phosphate fertilizers. Phosphate is readily fixed in acidic soils, making it unavailable to plants. Urea and ammonium sulphate all of them accelerate soil acidifcation.

A second key parameter of soil fertility and sustainable production is the amount of humus in the soil. Soils with high humus content can utilize mineral fertilizers especially well. The yield-increasing effect of well-dosed mineral fertilization can be very high. Humus relies on the supply of organic matter such as plant residues and animal manure. Sustainable soil fertility relies on the supply and consumption of organic matter. Soils with high organic matter can provide temporary storage for nutrients from chemical fertilizers whereas in soils with low humus content, a large portion of the nutrients dispensed via mineral fertilizers is lost to leaching.

Numerous long-term trials have concluded that routine NPK fertilization, unlike organic fertilization, depletes the humus and organic matter content in soil in the long run. The higher the N application, the faster is the humus decomposition (see, for example, Mulvaney et al. 2010). Further details and sources are provided in Kotschi (2013). The lower the organic matter in the soil, the less the soil is able to absorb and retain water. Crops grown on soils with low organic matter are much more prone to suffer from drought.

In summary, subsidies on mineral fertilizers in Ghana may result in modest overall production increases in the short term, but have a negative long-term effect on soil fertility. This conclusion is confirmed by the analysis above of very low return on funds invested. In economic terms, subsidized fertilizer, in the absence of an integrated soil fertility management strategy is, at best a provisional, makeshift measure. In the short run, the impact can cushion temporary price increases and boost food production, but by itself, subsidized fertilizer cannot serve as a sustainable food security, or sustainable agricultural intensification strategy.

2.10 Administrative Management of FISP

While the programme was supportive of the private sector by having minimal government involvement in the procurement and distribution of fertilizer, it may have constrained competition and strengthened the business position of major importers. Due to the fact that vouchers were only redeemable with the importers, fertilizer retailers that did not have contracts with them were effectively excluded from the subsidized fertilizer market. Field observations by Banful (2009) suggest such retailers without the links were unable to even sell unsubsidized fertilizer because they are unable to obtain their supply from the privileged retailers. This constricted the network of fertilizer retailers during the subsidy programme while having potential long-term deleterious effects on competitive growth in the fertilizer sector by strengthening the oligopolistic hold of retailers controlled by fertilizer importers.

One other potential adverse impact of the fertilizer subsidy could be perverse incentives, whereby farmers continue to use fertilizer when it is unprofitable to do so only because it is being subsidized (they don't directly pay the full price of fertilizer). This clearly will constitute a waste of tax payer resources.

There are indications that the FSP also suffers from elite capture as the true gainers from the programme are not the smallholder farmers – its intended beneficiaries. Issues of high administrative costs and corruption (especially diversion) continue to dog the programme.

Finally, we cannot rule out the possibility of displacement of organic fertilizer, especially prior to the inclusion of organic fertilizer (compost) in the subsidy programme in 2016.

2.11 Timeliness and Quality of Subsidized Fertilizer and Seed

The timeliness of input delivery to farmers under the re-introduced fertilizer and seed subsidy programme has been an issue since it was first implemented in 2008. The first edition of the programme was launched in July 2008 by which time the farming season was already well underway. Indeed Banful (2009) reported that the late announcement and start of the programme denied many farmers in southern Ghana (Central, Greater Accra, and Western) the opportunity to benefit from lowered fertilizer prices during the major season.

With the exception of 2016 each year's edition of the programme has always come very late, never before April and as late as July in 2008 and 2010. As the Expert panel (2015) pointed out such delays in programme announcement and commencement contribute to delays in fertilizer delivery to farmers, which reduces response rates when applied. Given the situation farmers in areas where the season starts relatively early (that is, in the south to the middle belt of Ghana) it often means that there was no subsidized fertilizer at the onset of the cropping season, when it is most needed (Benin et al 2013). There is also the issue of delays in reimbursing importers and distributors by the government, thereby increasing the costs involved in fertilizer trade (Bumb et al., 2011).

A few issues of input quality, especially fertilizer, have been raised on occasion. Chemico officials confirmed the arrest of individuals with a truck load of adulterated fertilizers that had been bagged in its branded bags, at Kumasi which was being transported to the north of the country. Benin et al. (2013) reported that in 2010, some farmers in northern Ghana complained of damage to crops following the application of a compound fertilizer which extension agents and officials could not diagnose. This situation, the authors seem to attribute to the quality of the fertilizer used, pointing out that quality control of the fertilizers supplied to farmers seems weak.

Under the Plant and Fertilizer Act 2010 (Act 803) a new effort, though slow, is being made on enforcement. For example, in 2015 out of 60 samples of introduced fertilizers 11 were analyzed to check for conformity with the technical and regulatory requirements under Act 803. However, the results showed that only four (4) out of the 11 met those requirements; the remaining 49 samples were to be analyzed in 2016 in order to ensure good quality fertilizer is being delivered to farmers. This calls for more diligent efforts and commitment by the enforcement agencies in order to guarantee the quality of fertilizer for use by farmers in Ghana.

These issues hold for seed as well. In discussions some MoFA officials have suggested that sometimes the announcement of the programme is held back or delayed in order to conclude negotiations on the seed component with GAIDA. They observed that the seed producers appear much less organized and responsive to requests for quotations to supply the input which often delays the programme. It was reported that MoFA was forced to go ahead and launch the 2015 programme without the seed component due to such delays on the part of the seed producers.

Quality issues for the seed component relate to what some have described as sale of 'fake' seeds; which may be related to the other, low or poor germination rates. It is suggested that some individuals may be taking advantage of the limited availability and supply of certified seed, and limited or weak enforcement of standards to pass ordinary or regular grain as certified seed.

2.12 Improvement of the Subsidy Programme – How to Make it Work Better

The 2008 fertilizer subsidy programme, as announced at the time, was clearly an ad-hoc measure in the face of a crisis to help food producers increase use of the input in order to increase food production (***"to assure good harvest"***) and stem high and rising food prices during the 2007/2008 food and fuel crises. Some or many would have expected it to be a one-off intervention; but it appeared to quickly take on a different dimension after a new government took office in 2009. The programme was expanded to near double the initial quantity of fertilizer subsidized for 2009, and then the discussion appeared to have shifted; programme objectives featured increase in fertilizer use, fertilizer application rates, and productivity and farmer incomes. There was also a shift to the waybill receipt system in 2010 along with

use of a farmer's passbook, and the seed subsidy added in 2012 to strengthen the productivity drive. Targeting, with guidelines or criteria, was introduced though not effectively implemented.

Aside the critical issues of impact, sustainability and cost effectiveness (addressed further below), the current programme, as being run, could benefit from various improvements including the following:

- Since roads are the primary mode of transport, the current system of logistics will requires significant improvement. Ghana's Logistics Performance Index (LPI), achieved an overall rating of 2.47 out of 5 in the enabling the business of agriculture report for 2016 (World Bank, 2016).
- Quality control and standards should be strengthened, including training and education in proper management, packaging, storage, handling, and use of agrochemicals.
- Also, stronger links with research and development institutions should be promoted to move towards delivery of packages tailored to specific farmer needs.
- Open up participation in FSP to all willing agro-input dealers; current system limits competition.
- Involve private deposit money banks in the redemption process.
- To better serve smallholders producing staple food crops the programme needs to work through farmer organizations, producer associations, or cooperatives to create better-integrated supply chains. This will help reduce transaction costs in accessing fertilizer and also help remove constraints imposed by inadequate agro-input dealer networks.
- Make targeting criteria more specific and put in mechanisms to ensure their enforcement, particularly for women farmers and resource poor small farmers.
- Design and implement a protocol for data gathering and analysis on the programme to improve tracking of progress.

2.13 Programme Sustainability or Exit Strategy

Given the low profitability reaped from mineral fertilizer subsidies, the scale of public funding channeled into the FSP in Ghana is startling. The subsidy programme poses a huge burden on an already insufficient national agricultural budget. In 2008, about 6.8% of Ghana's public expenditure on agriculture went to support the subsidy programme. By 2011, that proportion had risen to 13.7% and the fiscal sustainability of the Government's subsidy programme had been called into question.

Indeed, as a proportion of total MoFA's expenditure the cost of the FSP rose from about 20% in 2008 to 32.5% in 2011 (Expert panel, 2015) and according to MoFA's own planning documents to a projected 46% in 2012. Other researchers have also raised concerns about the financial sustainability of the FSP due to rapid increases (%) in cost of such programs (see Chinsinga and O'Brien, 2008; Druilhe and Barreiro-Hurle, 2012).

The subsidy program is based on an annual 'decree' from the Government, which was often announced between May and July. The arrangement was fraught with delays in fertilizer imports due to the delays in payment from the Government for the fertilizer subsidy programme. For example, significant delay in payment in 2010 led to late distribution of imported fertilizers as 37% of imported fertilizer was delayed (World Bank, 2012). These obviously point to an absence of a dedicated source of funding for the programme.

At the same time, there's no provision of any sort for an exit out of the programme. For most FSPs, the rationale is that the increase in crop yields will enable farmers to increase their incomes, and gradually be able to afford the chemical fertilizers and seeds with their own resources. As this study indicates, the

available evidence is that the value of the increased production, on average, is barely sufficient even to cover the cost of the subsidized fertilizer, and is not at all sufficient to cover the full cost.

Another critical issue which emerged in discussions with MoFA officials, including the national coordinator of the programme, is that it will be political suicide for any particular government or political party to attempt to stop the fertilizer subsidy. It is not clear why this is the case but this argument mirrors an observation by Ricker-Gilbert and Jayne (2015) that fertilizer subsidy programmes are politically popular and difficult to remove once introduced, and more likely to continue.

However, with an ever tightening government budget constraint, Benin et al. (2013) suggest setting a maximum threshold for Ghana's FSP. This will impose a cap above which no further funds would be made available under the programme in the short term while a gradual and clear exit strategy is crafted and laid out over time.

As a medium term option for improving the programme the Expert panel (2015) suggests the adoption of the policy of gradual reduction in the subsidy rate along with reforms towards a smarter subsidy. Long-term options suggested include: (i) to encourage increased participation of private sector in FSP; (ii) Government to provide regulatory and quality control oversight and; (iii) to encourage development of the regional market for produce and inputs. In addition, it is necessary to conduct a study on cost-effective subsidy policy options that would best benefit targeted farmers; options not limited to inorganic fertilizers only.

Another issue that raises concerns for its sustainability is the apparent attempts by government to use the FSP to jointly target increasing farm productivity and poverty reduction. As Ellis and Maliro (2013) note this can be difficult as many poor smallholder farmers may not be capable of making productive use of subsidized fertilizers. Indeed, ACBio (2016) notes that such objectives can often be contradictory. One other issue is the lack of disaggregated data even at MoFA that allows for independent, accurate and objective assessment of the programme.

Aside its negative long term effects on soil fertility, the FSP may even pose a danger to the attainment of the long term objective of sustainable food security driven by domestic production. Druilhe and Barreiro-Hurle (2012) note that rising cost of the programme often precludes pursuit of other important agricultural development priorities such as training farmers on eco-friendly ISFM and/ or conservation farming. Earlier studies point to not only low public expenditures but sharp declines in expenditure on knowledge transfer activities such as training, technical assistance and extension in Ghana (for example, see Benin and Yu, 2013). In addition, the FSP is found to encourage cultivation of maize on otherwise marginal lands leading to rapid declines in soil productivity, with serious implications for future production especially if farmers are unable to access such inorganic fertilizers (Mason, Jayne and Mofya-Mukuka, 2013).

Ghana's FSP bears many of the symptoms observed in previous assessments of similar programs across Africa, which indicate that such programmes often entail a misuse of scarce public funds. Chisanga and Poulton (2014) point to use of farm input subsidy programme to gain political patronage and personal profits in Malawi; and elsewhere (ACBio, 2016) due to weak or poor monitoring and evaluation.

3. Ghana's Agriculture Sector Budget for Fiscal Year 2016

The 2016 budget allocated GHS 501,501,708 to the agriculture sector (including cocoa), 52.31% of which was statutory (see Table 14). The appropriation bill breaks down allocation of resources to the sector in the national budget into compensation to employees, goods and services and capital expenditure. A breakdown of planned public expenditure for 2016 in the Appropriation Act 2015 shows that 23.23% of it is targeted at capital expenditure; which shares rises to 48.71% if one considers only discretionary expenditure.

This overview does appear encouraging until one begins to interrogate the details. It is rather striking to note that virtually all of the planned capital expenditure in the agriculture sector for the year is from donors (98.92%), with only a miserable 1.08% from IGF. In addition, about 91.55% of the total agriculture sector expenditure on goods and services derives from donors. In a nutshell, the government of Ghana is just responsible for compensation to employees in the agriculture sector. The above picture raises genuine and serious questions of commitment to the goal of sustainable food security hinged on domestic production.

Other details show that planned public agriculture sector expenditure focuses on six broad areas. As Table 15 shows there are no line items focusing on support to women farmers or extension on agro-ecological innovations such as agroforestry, soil and water conservation, composting, bio-pesticides, etc. Indeed, total planned public agriculture sector expenditure on management of land and environment is an estimated GHS10,000 (less than 0.01%).

Table 14: Planned public expenditure on agriculture sector for 2016

	Compensation to employees	Goods & services	Capital expenditure	Statutory fund (non-IGF)	Total
GoG	57,042,535	2,733,788			59,776,323
IGF		2,810,326	1,255,324		4,065,650
Donors		60,102,522	115,239,309		75,341,831
Statutory fund (non-IGF)				262,317,904	262,317,904
Total	57,042,535	65,646,636	116,494,633		239,183,804
Share (%) without statutory funds	23.85	27.45	48.71		
Share (%) with statutory funds	11.37	13.09	23.23	52.31	
Grand total					501,501,708

Source: Republic of Ghana (2015). Appropriation Act 2015

Table 15: Areas of planned public agriculture expenditure in Ghana for 2016

Budget line items	Share (%)
Management and administration	5.55
Food security and emergency preparedness	77.57
Increased growth in incomes	6.52
Marketing of agricultural produce/ products	0.01
Management of land and environment	0.00*
Application of technology to food and agriculture development	10.35
Total	100.00

*share less than 0.01%; see appendix.
Source: Republic of Ghana (2015). Appropriation Act 2015

Whilst the bulk of the sector expenditure is on food security and emergency preparedness, it is very difficult to assess what activities or actions are being carried out to strengthen the capacity and begin movement towards more sustainable food and agricultural systems. What is however clear is that 32.77% of total public expenditure on food security and emergency preparedness is from donor funds, with another 57.66% from the Annual Budget Funding Amount (ABFA). Also, on the application of technology to food and agriculture development donor funds account for 32.38% with 67.45% from the ABFA. Planned public discretionary expenditure accounts for only 0.16% on the application of technology to food and agriculture development in Ghana for 2016.

4. Government's 'Planting for Food & Jobs' Campaign 2017

In 2017 the new government launched a programme code-named 'Planting for Food and Jobs' (PFJ), under which the FSP is being continued. At its launch, the President observed that the programme will be anchored on the pillars that will transform Ghanaian agriculture: the provision of improved seeds, the supply of fertilizers, the provision of dedicated extension services, a marketing strategy and the use of e-Agriculture. He announced a 50% subsidy on both organic and inorganic fertilizers for participating farmers. He also indicated that PFJ was allocated GHS370 million in the annual budget for 2017 (Republic of Ghana, 2017).

The President noted that the programme is expected to increase the production of maize by 30%; rice by 49%; soybean by 25; and sorghum by 28% from current production levels. Under the programme MoFA was to register farmers across all 216 districts for subsidized fertilizers and, improved seeds and high yielding planting materials. In all, the programme targeted to create 750,000 jobs in both direct and indirect employment, in its first year (2017).

Whilst PFJ is supposed to have other components, in 2017, its main element was the fertilizer subsidy. Currently, there is no verifiable data on participation rates and performance of the programme for 2017.

5. Sustainable Agriculture: A Framework to Reform FISP

The objectives of Ghana's fertilizer subsidy programme include improving farmer's access to and adoption or use rates of the input for the purpose of increasing domestic food production and stem rising food prices. Ultimately, the fertilizer subsidy aims at ensuring sustainable food security hinged on profitable domestic farm production. Sustaining low food prices or low food price inflation for the long term requires increases in productivity at levels that more than compensate for increases in population and other pressures on food demand. This notion is reflected in the other objectives of the programme which deal with increasing yields of crops, raising farm profitability and achieving agricultural productivity growth in the long term.

These objectives, among other things, raise questions about more sustainable alternatives to a subsidy on chemical fertilizers as a means given the national context and the living conditions of Ghanaian farmers.

In recent times pressure on land has seen increasing trends towards shorter fallow periods, and disappearance of shifting cultivation and land rotation in many areas. These changes towards more continuous cropping increase the pressure on already low quality of soils and limits the ability of soils to recover important nutrients (see Nye and Greenland, 1960; Szott and Palm, 1986). Together with low and erratic rainfall, the low quality of agricultural lands and high soil erosion rates have been identified as important constraints to increasing agricultural productivity (Pearce, Barbier and Markandya, 1988). It is thus not surprising that a recent assessment of the Ghana's fertilizer subsidy programme concluded that the FSP is not a strong enough instrument for improving productivity of farm households (see Wiredu, Zeller and Diagne, 2013). The study which sampled 820 rice producing households recommended training farmers on sustainable land use, and introducing labour-saving technologies to help improve agricultural productivity.

Whilst the fertilizer subsidy lowers fertilizer cost to farmers it does not guarantee efficient or productive use by farmers. Snapp et al. (2014) note that efficiency of fertilizer use is more important than just increasing use and this often requires a holistic, integrated approach based strongly on improving soil health and fertility through increased organic matter content. Indeed the expert panel report notes evidence of low efficiency of fertilizer use in Ghana, together with widely varying response rates (e.g. 5 – 20 kg maize per kg N).

Others reporting low quality of soils and low response rates are Marenya and Barrett (2009) and Sheahan et al (2013). Indeed, Ricker-Gilbert and Jayne (2015) note that low response rates of crops to inorganic fertilizers are a bigger problem to its use in Africa; with little evidence that the marginal benefits are greater than marginal costs of its use. This is often compounded by the non-use of improved crop varieties, a key complementary input, by farmers.

The Expert Panel (2015) argues that using inorganic fertilizer profitably requires improved agronomic and soil management practices that enable farmers to achieve higher crop responses. It indicates that farmers are not using best practices due to many constraints, and crop response to inorganic fertilizer is depressed by a variety of soil degradation problems. The panel also observes that soil fertility management is crucial but often underappreciated dimension of sustainable agricultural productivity. In fact the report states: ***"If soil fertility problems remain unaddressed, Ghana's agricultural growth will be impeded, its agricultural lands will become increasingly degraded, its use of inorganic***

fertilizer will continue to be low, and it is likely to become more dependent on food imports as the rate of growth of population or consumption outstrips that of food production" (Expert Panel, 2015; p.8).

In addition to low application rates by farmers in Ghana, Vanlauwe et al. (2011) argue that inorganic fertilizer does not necessarily improve agricultural productivity in isolation. Complementary investments in soil and water management for efficient and optimal nutrient release and uptake are crucial to raise profitability of fertilizer use. Indeed the expert panel maintains that such investments are particularly necessary not only to raise profitability but also to achieve a sustainable agricultural system.

Though other studies show organic fertilizers (e.g. compost, manure, and other sources of organic matter) (see Tinotell and Giller, 2013; Vanlauwe et al., 2011) as the most important soil augmenting compliment to inorganic fertilizers their use in Ghana is abysmally low. This is in sharp contrast with evidence that sustainable agricultural intensification and productivity growth require the joint use of both organic and inorganic fertilizers (see Snapp and Grandy, 2011).

In fact some researchers point out that the foundation of a sustainable agricultural growth strategy is the joint adoption of both organic and inorganic fertilizer (see Shaxson and Barber, 2003; Powlson et al., 2011).

It is therefore clear that subsidies on inorganic fertilizers alone are not likely to work, a point re-iterated by MoFA when it made provision for organic fertilizer (compost) in the subsidy programme in 2016.

In order to improve the chances of achieving sustainable food security, with domestic production as its main pillar, a more concerted effort is required. In addition to high prices being the cause of low use of inorganic fertilizers, IFDC (2012) identified limited availability of quantity and quality organic inputs (manure, compost, crop residues, etc.) as contributory factors to low use of these nutrients in Sub-Sahara Africa. IFDC (2012) therefore calls for policy that emphasizes the integrated soil fertility management approach. What is envisaged is a situation which encourages coordination among institutions such that the Integrated Soil Fertility Management (ISFM) system will make available to farmers packages that are holistic in addressing productivity problems, including increased nitrogen from organic sources, through agroforestry (i.e. Farmer Managed Natural Regeneration – FMNR) of trees, use of complementary crop production methods such as conservation agriculture, minimum tillage, mulching, crop rotation, and inter-cropping, not single technologies. As IFDC (2012) notes though low productivity can be due to many factors, using ISFM system is an important ingredient in any effort to overcome the problem.

There is the need for a re-think of Ghana's approach or strategy if the goal of 'sustainable food security hinged on domestic production' is to be given any meaning. In a review of FISPs in the SADC region ACBio (2016) concluded that the programmes do not contribute to building sustainable (ecological, social and economic) and resilient farming systems capable of adapting to a changing climate and global market. It therefore recommends a re-framing of Africa's agricultural future.

6. Policy Implications

The FSP in its current form cannot deliver the desired crop productivity, production (crop output) and food security to smallholder farmers in Ghana as envisaged. Instead, there is a need for a major shift in approach.

For moving along the path towards sustainable agricultural intensification, government use of public funds should give precedence to measures that raise the humus content in the soil and enhance nutrient and energy cycles within a framework of ***"sustainable land management."***

Sustainable land management ranges from the use of animal manure and compost to green manuring, intensive fallowing and establishing agroforestry systems. Farmer managed natural regeneration of trees can quickly ***"re-green"*** rural environments, produce organic matter, fodder for animals, firewood for households, mulch for increased soil water retention, and reduce the impact of high temperature on crops through dispersed shade. Equally important are soil and water conservation measures which prevent soil erosion, harvest water, raise the water storage capacity of soil, and increase biomass yields.

Sustainable land management and soil and water conservation bring organic matter to the soil, create a means of compensating for continuous humus mineralization and present an opportunity for raising the level of humus content in the soil. All these measures require finding organic alternatives to mineral nitrogen. Within the three principal nutrients, nitrogen is the only renewable resource. Atmospheric nitrogen can be fixed biologically and enriched in soil by microorganisms, with more emphasis on

promoting and encouraging the adoption of sustainable and resilient farming and food systems capable of adapting to the changing climate.

Such a shift will make use of integrated soil fertility management systems and require a combination of some of the following:

- Use subsidized mineral fertilizer only as part of a wider integrated soil fertility management approach
- Promote the joint use of both organic and inorganic fertilizers, including subsidized organic fertilizer.
- Reduce reliance on mineral nitrogen, particularly urea and sulphate of ammonia, by various agro nomic methods to increase organic sources of nitrogen (agroforestry, manure, crop rotation with legumes)
- Promote and encourage farmer managed natural regeneration of trees, agroforestry, composting and management of farm yard manure to produce organic sources of nitrogen
- Promoteand encourage various approaches to sustainable land management, including agroforestry, inter-cropping and crop rotation with legumes, and soil and water conservation technologies
- Promote conservation agriculture (minimum tillage, not burning, mulch)
- Working to increase availability of quantity and quality organic inputs
- Promoting improved agronomic and soil management practices including soil testing for crop-soil-specific fertilizer recommendations
- Create stronger links with research and development institutions to move towards delivery of packages tailored to specific farmer needs, based on specific crops, types of soils, and variation in the agroecological conditions across Ghana within the context of an integrated soil fertility management approach.
- Promote decentralized, community based small dams for irrigated agriculture in the dry season
- Promote effective land development and management at farmer level.

There is also the need for urgent attention to re-orient public expenditure priorities in order to focus more on important agricultural development priorities such as skills training and knowledge transfer activities. This will also require shifting the burden of critical public expenditure from donors to Government of Ghana in both budgetary and actual expenditure terms; this is quite apart from the need to significantly raise the levels of capital expenditures. This could imply cuts to the expenditure of the current FSP.

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Annexes

Annex 1: Yields of selected crops in Ghana (metric ton/ha)

Year	FSP Exp	Maize	Millet	Rice	Sorghum
2008	20.65	1.74	1.06	2.27	1.2
2009	34.40	1.7	1.32	2.41	1.31
2010	30.00	1.89	1.24	2.71	1.28
2011	78.75	1.65	1.03	2.35	1.18
2012	117.44	1.87	1.04	2.54	1.21
2013	64.01	1.72	0.97	2.64	1.14
2014	0.00	1.73	0.96	2.7	1.14
2015	44.85	1.92	0.97	2.75	1
2016	164.24	1.95	1.16	2.92	1.14

Source: FAOSTAT (2014)

Annex 2. Producer price of selected crops in Ghana (USD/tonne)

Year	Maize	Millet	Rice, Paddy	Sorghum
2000	171.7	205.9	306.6	153.1
2001	209.4	320.6	355.4	242.5
2002	169.1	283.6	349.3	242.8
2003	172.5	263.9	370.9	216.1
2004	235.3	299.5	471.6	264.4
2005	366.5	495.3	577.8	424.4
2006	254.4	474.6	600	362.7
2007	290.7	433.7	624.1	350.2
2008	445.6	619.6	826	514.9
2009	384.8	570	506.8	469.5
2010	341	568.1	488.7	469
2011	429.8	592.4	504	505.3

Source: FAOSTAT (2014)

Annex 3: Distribution of planned public expenditure on agriculture in Ghana for 2016

	GoG			IGF			Funds/ others	Donors			Grand Total
	Compensation to employees	Goods & services	Total	Goods & services	Capex	Total	ABFA	Goods & services	Capex	Total	
MoFA	57,042,535	2,733,788	59,776,323	2,810,326	1,255,324	4,065,650	262,317,904	60,102,522	115,239,309	175,341,831	501,501,708
Management and administration	14,706,367	1,526,013	16,232,380	166,235		166,235	3,000,000	1,687,801	6,751,203	8,439,004	27,837,619
Food security and emergency preparedness	35,084,945	716,892	35,801,837	983,252	450,884	1,434,136	224,317,904	37,273,097	90,208,988	127,482,085	389,035,962
Increased growth in incomes	7,251,222	361,662	7,612,884	1,660,839	804,440	2,465,279		17,681,331	4,935,998	22,617,329	32,695,492
Marketing of agricultural produce/ products		35,350	35,350								35,350
Management of land and environment		10,000	10,000								10,000

Annex 4: List of individuals and organizations contacted

1. Former Deputy Minister in Charge of Crops
2. Director of Crop Services (coordinator of the subsidy program), MoFA
3. Assistant to the National Coordinator of the FSP
4. Former Director of Crop Services, MoFA
5. Deputy Director of Extension Services
6. Former Director of PPRSD
7. YARA
8. Chemico
9. PFAG representatives
10. AGRA Office in Accra
11. AFAP
12. IFPRI

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