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AGRICULTURAL SECTOR PROGRESS REPORT 2016

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AGRICULTURAL SECTOR PROGRESS REPORT, 2016

Ministry of Food and Agriculture

Monitoring and Evaluation Directorate

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ABBREVIATIONS AND ACRONYMS

ABFA	Annual Budget Funding Amount
ACDEP	Association of Church Development Projects
ADB	Agricultural Development Bank
AEA	Agricultural Extension Agent
AESD	Agricultural Engineering Services Directorate
AGI	Association of Ghana Industries
AGRA	Alliance for Green Revolution in Africa
AgSWG	Agriculture Sector Working Group
AMSECs	Agricultural Mechanization Service Centres
APD	Animal Production Directorate
APIP	Accra Plains Irrigation Project
APR	Annual Progress Report
APSP	Agricultural Policy Support Project
ARI	Animal Research Institute
ATVET	Agricultural Technical and Vocational Education Training
AU-IBAR	African Union-Inter-Bureau for Animal Resources
BAC	Business Advisory Centre
BoG	Bank of Ghana
CAADP	Comprehensive Africa Agricultural Development Programme
CABI	Centre for Agriculture and Biosciences International
CAPI	Computer Assisted Personal Interview
CARGS	Competitive Agricultural Research Grants Scheme

CRS	Catholic Relief Services
CSA	Climate-Smart Agriculture
CSIR	Council for Scientific and Industrial Research
CSOs	Civil Society Organizations
DAES	Directorate of Agricultural Extension Services
DDA	District Department of Agriculture
DMISO	District Management and Information System Officer
DOA	Department of Agriculture
DPs	Development Partners
DUS	Distinctiveness, Uniformity and Stability
DVCCs	District Value Chain Committees
ECOWAS	Economic Community of West African States
EDAIF	Export Development and Agricultural Investment Fund
ENVAG	Enhanced Nutrition and Value Chain in Ghana
EWS	Early Warning System
EXIM Bank	Export and Import Bank
FABS	Food and Agriculture Budgetary Support
FAO	Food and Agricultural Organisation
FASDEP	Food and Agricultural Sector Development Programme
FBO	Farmer Based Organisation
FFS	Farmer Field School
FIs	Financial Institutions
FOB	Freight on Board
GADCO	Global Agri-Development Company
GAPs	Good Agriculture Practices
GASIP	Ghana Agriculture Sector Investment Programme
GCAP	Ghana Commercial Agriculture Project
GCX	Ghana Commodity Exchange

GDP	Gross Domestic Product
GEPA	Ghana Export Promotion Authority
GGC	Ghana Grains Council
GHANAP	Ghana National Apiculture Platform
GIDA	Ghana Irrigation Development Authority
GIPC	Ghana Investment Promotion Centre
GIRSAL	Ghana Incentive Based Risk- Sharing System for Agricultural Lending
GIZ	German Agency for International Cooperation
GLDB	Grains and Legumes Development Board
GLSS	Ghana Living Standards Survey
GoG	Government of Ghana
GSA	Ghana Standard Authority
GSFP	Ghana School Feeding Programme
GSGDA	Ghana Shared Growth and Development Agenda
GSOP	Ghana Social Opportunities Project
GSS	Ghana Statistical Service
HACCP	Hazard Analysis Critical Control Point
HQCF	High Quality Cassava Flour
HRDMD	Human Resource Development and Management Directorate
iBMs	inclusive Business Models
ICTs	Information, Communication Technologies
IEC	Information Education Communication
IFDC	International Fertilizer Development Centre
IFPRI	International Food Policy Research Institute
IGF	Internally Generated Fund
IIF	Impact Investment Fund
IPCC	Inter-Governmental Panel on Climate Change
IPM	Integrated Pest Management

IPs	Innovation Platforms
ISC	Irrigation Service Charge
IVRDP	Inland Valley Rice Development Project
JICA	Japanese International Cooperation Agency
JSR	Joint Sector Review
LEAP	Livelihood Empowerment Against Poverty
LSIP	Livelihood Support Improvement Project
M&E	Monitoring and Evaluation
MAG	Modernization of Agriculture in Ghana
MDAs	Ministries, Departments and Agencies
MED	Monitoring and Evaluation Directorate
METASIP	Medium Term Agricultural Sector Investment Plan
METASIPSC	Medium Term Sector Investment Programme Steering Committee
METSS	Monitoring, Evaluation and Technical Support Services
MLA	Model Lease Agreement
MLNR	Ministry of Lands and Natural Resources
MOAP	Market Oriented Agriculture Project
MoFA	Ministry of Food and Agriculture
MoFAD	Ministry of Fisheries and Aquaculture Development
MoFAIR	Ministry of Food and Agriculture Information Resource
MoTI	Ministry of Trade and Industry
MSE	Medium and Small Enterprises
NAFCO	National Food Buffer Stock Company
NAIP	National Agricultural Investment Plans
NARS	National Agriculture Research Systems
NCoS	National Centre of Specialization
NDPC	National Development Planning Commission
NEPAD	New Partnership for Africa Development

NGO	Non-Governmental Organisations
NRGP	Northern Rural Growth Programme
NSAICU	Northern Sector Agriculture Investment Coordination Unit
NSC	National Seed Council
NVRRC	National Varietal Release and Regulation Committee
OFSP	Orange Flesh Sweet Potato
OPV	Open Pollinated Variety
OVCF	Outgrower and Value Chain Fund
PCU	Project Coordination Unit
PEF	Private Enterprise Federation
PEM	Protein Energy Malnutrition
PFIs	Participating Financial Institutions
PMDG	Pest Management Decision Guides
PPP	Public Private Partnership
PPR	Peste de Petits Ruminantes
PPRSD	Plant Protection and Regulatory Services Directorate
PSP	Participatory Scenario Planning
RADU	Regional Agricultural Development Unit
RAOs	Regional Agricultural Officers
RDA	Regional Director of Agriculture
RELC	Research and Extension Linkage Committee
REP	Rural Enterprises Programme
RING	Resilience in Northern Ghana
RSSP	Rice Subsector Support Programme
SADA	Savannah Accelerated Development Authority
SAKSS	Strategic Analysis and Knowledge Support System
SARI	Savannah Agricultural Research Institute
SEC	Securities and Exchange Commission

SFASDEP	Support to Food and Agriculture Sector Development Policy
SLWM	Sustainable Land and Water Management
SLWMP	Sustainable Land and Water Management Programme
SOPs	Standard Operating Procedures
SRID	Statistics Research and Information Directorate
SSIDP	Small Scale Irrigation Development Project
TAD	Transboundary Animal Diseases
TCP	Technical Cooperation Project
TOs	Technical Operators
ToT	Training of Trainers
UER	Upper East Region
UPOV	Union for the Protection of New Varieties of Plants
USAID	United States Agency for International Development
UWR	Upper West Region
VCU	Value for Cultivation and Use
VRA	Volta River Authority
VSD	Veterinary Services Directorate
WAAPP	West African Agricultural Productivity Programme
WARFP	West African Regional Fisheries Programme
WIAD	Women in Agriculture Directorate
WRI	Water Research Institute
WRS	Warehouse Receipt System
WUA	Water User Association

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All errors and omissions in the report are the responsibility of the entire Monitoring and Evaluation Directorate Team of the Ministry of Food and Agriculture.

FOREWORD

The agricultural sector continues to hold the promise for the economic and social transformation of Ghana. The need therefore, for accelerated development of the sector to realize its potential cannot be overemphasized. Significant improvement is required in productivity of all factors of production, particularly in the areas of food crops and livestock to achieve sustainable incomes of agricultural sector workers and Ghanaians.

> In 2015, States and Governments signed onto the Sustainable Development Goals (SDGs), pledging among others to promote inclusive and sustainable economic growth, full and productive employment and decent work for all (Goal 8) and to end hunger, achieve food security and improved nutrition and promote sustainable agriculture (Goal 2). National and sector policies such as the Ghana Shared Growth Development Agenda (GSGDA) and the Medium Term Agricultural Sector Investment Programme (METASIP II) support these goals. These policies also take cognisance of the Comprehensive Africa Agriculture Development Programme (CAADP) and targets of Malabo declaration.

This report presents the results of implementation of METASIP II in 2016 and therefore covers the individual and collective achievements of all major stakeholders in the sector. The high expectations of sustained growth and development cannot be attained without significant investment. Though the sector has so much potential, its growth rate has been slow. Government is however putting in place measures such as the "Planting for Food and Jobs"to transform the the sector to a high growth trajectory. We must all therefore endeavour to redouble our contribution to this sector to enable it achieve the needed impetus to transform the economy.

The ministry takes this opportunity to thank all stakeholders in the sector who have been working assidiously under very trying conditions to feed the nation and industry. The Ministry urges all to put our shoulders to the wheel and push harder to achieve food and nutrition security, create jobs, increase incomes and reduce poverty in an environmentally sustainable manner. This is our goal and our pledge.

EXECUTIVE SUMMARY

The report provides an overview of key indicators used to measure agricultural sector performance. This is to promote and guide the production of crops, livestock and fisheries in order to ensure improved quality and increased quantity of agricultural produce and products for local consumption and export. In 2016, the sector grew by 3% compared to the expected annual GDP growth target of 6%. The livestock-sector has over the past six years experienced consistent growth rate compared to other subsectors. The fisheries subsector recorded the highest growth rate of 5.7% as compared to the other subsectors, followed by livestock (5.3%), crops (2.5%), forestry & lodging (2.5%) with cocoa subsector behind (-7%). The marginal growth rate of agricultural GDP in 2016, can be attributed to the abysmal performance in the cocoa subsector. Statistics on total government expenditure on agriculture in 2016 was not available to assess the impact of 10% government discretionary expenditure on agriculture as stated in Malabo Declaration. With support from World Bank, the ministry is conducting a study to review agricultural expenditure which is expected to be completed by 2017.

The national average rainfall decreased by 8.1% from 908 mm in 2015 to 834 mm in 2016. Although the volume was marginally reduced, there was a better rainfall distribution resulting in improved yields of the various food crops. Acknowledging the effect of climate change on agricultural production coupled with dwindling water resources, the ministry collaborated with many partners to provide irrigation and related infrastructure services to boost agricultural production. With funding from development partners, the ministry implemented an Irrigation and Groundwater Resource Development Project and in addition, supplied sprinkler accessories to Weija Irrigation Scheme which increased cultivation area by 55 hectares and production by 26%, generating employment for additional 45 agricultural households. To further strengthen the production sector to address the effects of climate, high-yielding, short duration, disease and pest-resistant breeder seeds for cowpea, millet and cassava were developed and made available to farmers.

Within the period under review, the country was self-sufficient in food production in all commodities except rice and millet with deficits of 266,278 metric tonnes and 3,132 metric tonnes respectively. A total of 593,069 metric tonnes of rice was imported to supplement domestic rice output which represent 56% of total rice supplied for consumption. The quantity of non-

traditional commodities exported in general decreased by 8.8% in 2016 with a corresponding decrease in non-traditional export revenue by 2.2%. However, fish and sea foods recorded 1% and 132% increase in quantity exported respectively whereas oil seed & nuts (19%), game & wildlife (80%) and coffee/tea/spices (5%) exports decreased.

In 2016, agricultural mechanization concept was given a new policy shift to boost its operations. The new concept of AMSECs outlined a minimum of two tractors at a centre with other implements such as planters, boom sprayers, shellers, etc. for community services. This has increased the total AMSECs from 59 to 138 in 97 districts. An assessment conducted on AMSECs revealed that the beneficiaries of AMSECs reduced from 19,134 to 18,348 in 2016 which implies that farmer access to mechanization services has reduced and therefore the need to identify the factors limiting farmers' access to the centres.

The Credit-In-Kind small ruminants' project supplied 1,200 improved breeds of livestock to 120 farmers in the various regions to enhance productivity, income as well as employment. Progenies of the farm animals recovered are approximately 63%. On the other hand, aquaculture and marine fish production increased by 17.6% and 5.1% respectively whereas inland fish production decreased by 2.2%. The increase in aquaculture production is attributed to Government's focus on aquaculture production to augment the dwindling production from the capture fisheries together with private sector participation in the area of inputs supply and technical support to the sector. In all 29% of the fish consumed in 2016 was imported to supplement domestic production.

A total of 18 scheduled animal disease outbreaks were recorded out of 28 monitored in 2016 which consequently increased the general number of disease outbreaks by 22.4%. This percentage increase in outbreaks is attributed to increased passive disease surveillance occasioned by the sensitization of farmers, to report any disease condition in their poultry in the wake of Avian Influenza outbreak. A total of 73,164 animals (poultry and livestock) were lost through mortalities, costing the country 6.1 million Cedis as compared to about 3.5 million Cedis in 2015. In addition, there was a record of fall armyworm infestation, affecting a total of 4,046.60 hectares of maize fields with Brong Ahafo Region recording the highest attack of almost 2,765 hectares of maize field representing 68.33%. Considering the mean densities of 80% of the larvae per plant during the late whorl stage, it could reduce expected yield by average of 12% if not controlled in good time.

The agricultural sector benefited from loans from various sources and to support various sub-sectors.

The total loan approved to the agricultural sector by ADB increased by 21%with agricultural production receiving the highest followed by agro-marketing (28.1%) though compared to 2015,

loans to the agro-processing industries decreased by 2.6%. Credit provided by EXIM Bank to agro-processing and export increased by 56.9%.

The total budget of GH¢501.5 million has been allocated to the ministry for its operations, of which GoG and development partners contributed 11.9% and 34.9% respectively. In addition, Annual Budget Funding Amount (ABFA) and Internally Generated Funds (IGF) contributed 52.3% and 0.8% respectively. . About 75% of the budget has been released with about 95% of the released amount expended.

During the year under review, the ministry received from the Ghana Infrastructure Fund, an amount of GH¢ 34.2 million. At the same period, an amount of GH¢ 3.0 million was also realized from refunds, interests earned on bank balances and foreign exchange gain / loss on Projects' Accounts. The ministry, therefore, received a total of GH¢ 414.5 million made up of budgeted amount of GH¢ 357.9 million and an unbudgeted amount of GH¢ 37.2 million. The major challenge that confronted the sector is untimely release of funds which hindered the implementation of scheduled activities for the period.

CHAPTER ONE

1.0 Introduction

The Ministry of Food and Agriculture (MoFA) is the lead ministry responsible for the crops (excluding cocoa, *the cocoa subsector falls under the Ministry of Finance*) and livestock subsectors, with the Ministries of Fisheries and Aquaculture Development (MOFAD) and Lands and Natural Resources responsible for the fisheries and forestry & logging subsectors respectively.

The Monitoring and Evaluation Directorate (MED) of MoFA is mandated to produce reports including an Annual Progress Reports (APR) for the agricultural sector. This annual report, outlines the performance and achievements of targets set under National (Ghana Shared Growth and Development Agenda), Regional (CAADP-Malabo Declaration) and Global (Sustainable Development Goals) development frameworks. These targets are operationalised through the Medium Term Agricultural Sector Investment Plan (METASIP II 2014 -2017).

The 2016 APR covers the six METASIP II programme areas, which are:

1. Management and Administration;
2. Food and Nutrition Security and Emergency Preparedness;
3. Increased Growth in Incomes;
4. Marketing of Agricultural Products;
5. Management of Land and Environment; and
6. Science and Technology Applied in Food and Agricultural Development.

1.1 Structure of the Report

This report is organised in seven (7) chapters. Chapter one presents the introduction, including the sector's contribution to global, regional and national targets. Chapters two (2) to seven (7) focus on strategies, initiatives and achievements of the sector based on each of the METASIP II programme areas. It also points out the challenges facing the sector whilst making corresponding recommendations.

1.2 Global, Regional and National Targets

Ghana's Agricultural plans have over the years drawn linkages with global, regional and national targets. Key among the targets are: commitments to 'eradicate extreme poverty by 2030, while ending hunger and achieving food security as a matter of priority and end all forms of malnutrition' at the global level; the Malabo Declaration, with an overall objective to accelerate Agricultural growth and transformation for shared prosperity and improved livelihoods (specifically, spending at least 10% of annual national expenditure on agriculture) at the sub-regional levels; and various national and sectoral targets outlined in the Ghana Shared Growth and Development Agenda (GSGDA).

1.2.1 Global Targets

1.2.1.1 Malnutrition and Poverty Reduction

Food insecurity and malnutrition remain a challenge in many developing economies despite numerous interventions outlined and implemented by the various countries. Ghana has reduced its poverty rate by half, from 52.6% to 21.4% between 1991 and 2012 (GLSS 6, 2013). However, several research findings show that to sustain poverty reduction, the country requires a commitment to reducing inequality and improving access to opportunities for all citizens. This can be achieved by ensuring that prosperity is shared across the entire population. A multifaceted, well-targeted and fiscally sustainable package of policies that balance the needs of the poor with the needs of the economy will be required for ultimate, broad-based and inclusive development.

Interventions by government and its development partners geared towards reducing the poverty gap between the south and the north of the country, whiles addressing malnutrition includes existing and new initiatives such as: (1) Resilience in Northern Ghana (RING) project; (2) Ghana Social Opportunity Programme (GSOP); (3) Savannah Accelerated Development Authority (SADA); and some key targeted social intervention programmes, particularly the (4)Livelihood Empowerment against Poverty (LEAP), (5) Ghana School Feeding Programme (GSFP), and Capitation Grant; among others.

1.2.2 Regional Targets

1.2.2.1 Achievements of Malabo Declaration

The Malabo Declaration is a successor to the Maputo Declaration, which reaffirms the principles and values of the Comprehensive Africa's Agricultural Development Programme (CAADP). There are seven targets however, this section focuses on the target of upholding 10 percent public spending to enhance investment finance in Agriculture. Under this target, governments of member states are expected to allocate at least 10 percent of their discretionary budgeted expenditure to agriculture. This is expected to stimulate at least 6 percent growth in the sector.

Current figures on government expenditure are not available, however, with support from the World Bank, the ministry is currently leading the process to conduct agricultural expenditure review which is expected to generate the total expenditure and the share on agriculture. The next edition of this report will capture information on the actual figures. There are however, Gross Domestic Product (GDP) figures, Figure 1.1. The average agricultural GDP growth rate for the last five years is 3.7% about 62% of the target of 6%. The highest GDP growth of 5.7% was achieved in 2013 with the lowest of 2.3% in 2012.

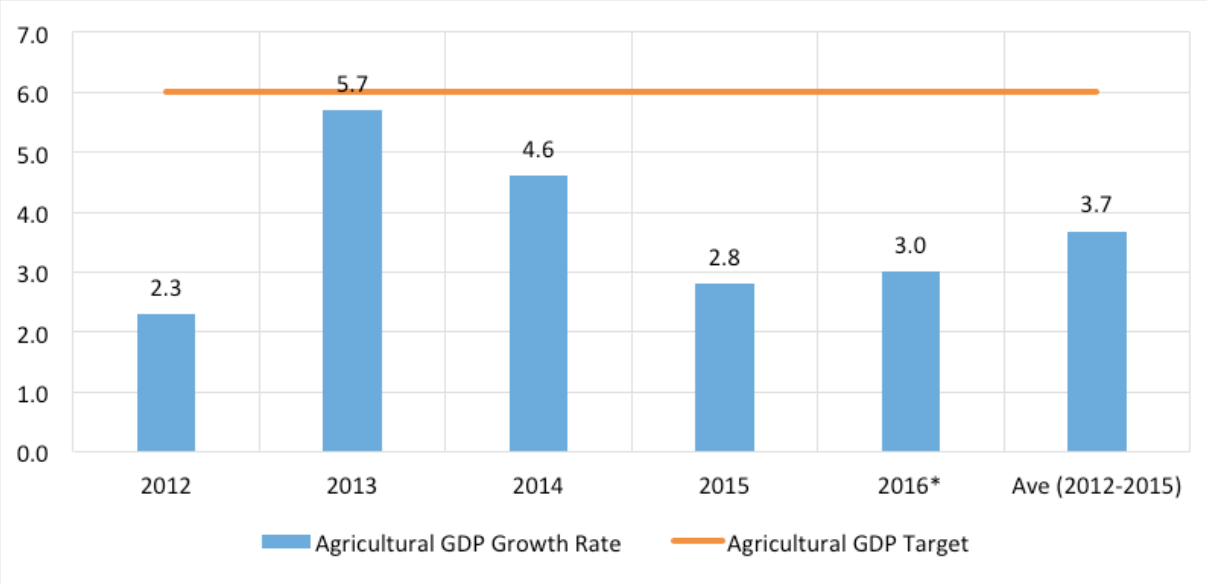


Figure 1. 1: Performance of Agricultural Sector Growth

1.2.3 National Targets

There are several national targets set in the GSGDA II, and sector targets in the FASDEP II and its investment plan (METASIP II). This session of the report however, focused on Performance of Gross Domestic Product (GDP), Share of agriculture in total GDP and Change in Food Self-Sufficiency Levels.

1.2.3.1 Performance of Gross Domestic Product (GDP)

Provisional GDP estimates for 2016 showed a growth rate of 3.5 percent compared to 3.8 percent in 2015. The Services sector recorded the highest growth rate of 5.7 percent, followed by Agriculture (3.0%) and the Industry (-1.4%) sectors (GSS, Provisional 2016 Annual GDP, April, 2017 Edition).

Services remain the largest sector. Its share of GDP increased from 54.6 percent in 2015 to 56.5 percent in 2016. However, the sector's growth rate decreased from 6.3 percent in 2015 to 5.7

percent in 2016. The Industry sector, the least growing sector with a GDP share of 24.3 percent, had its growth rate declining from -0.3 percent in 2015 to -1.4 percent in 2016.

The Agricultural sector expanded marginally from a growth rate of 2.8 percent in 2015 to 3.0 percent in 2016. Its share of GDP, however, declined from 20.3 percent in 2015 to 18.9 percent in 2016. Crops remain the largest activity with a share of 14.6 percent of nominal GDP.

Table 1.1: Growth Rates in Agricultural Sub-Sectors

Year	Sub-sector					National Agric. Real GDP Growth Rate
	Crops	Livestock	Cocoa	Fisheries	Forestry/ Logging	
2011	3.7	5.1	14.0	-8.7	-14.0	0.8
2012	0.8	5.2	-9.5	9.1	6.8	2.3
2013	5.9	5.3	2.6	5.7	4.6	5.7
2014	5.7	5.3	4.3	-5.6	3.8	4.6
2015	2.5	5.3	-8.0	4.3	1.4	2.8
2016*	2.5	5.3	-7.0	5.7	2.5	3.0

*Source: Ghana Statistical Service, Provisional Annual GDP (2016) April 2017 Edition *Provisional*

1.2.3.2 Share of Agriculture in Total GDP

Over the last decade, the share of the agriculture in the national GDP reduced from about 29 percent in 2007 to about 19 percent in 2016, (Figure 1.2), representing annual average decline of 4.3 percent. Policies must be more responsive to the current developmental challenges in the sector to reverse the trend.

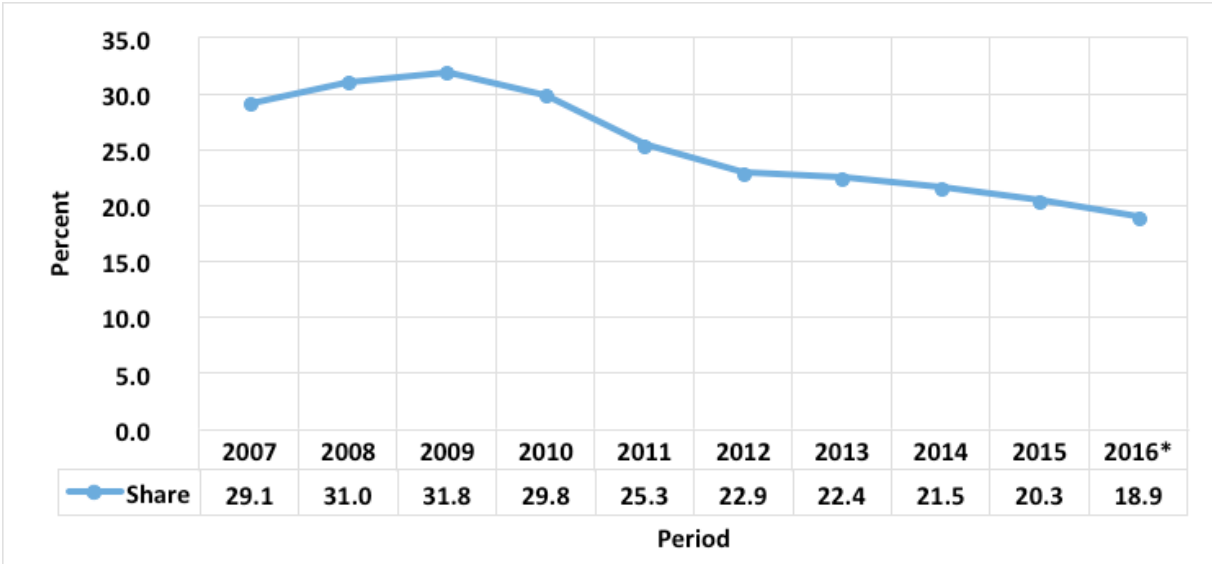


Figure 1. 2: Share of Agriculture in GDP (at Basic Prices) by Economic Activity percent; 2007 - 2016

Source: Drawn from data from Ghana Statistical Services, April, 2017

Figure 1.3 shows percentage shares of the three economic sectors in 2016 on the basis of GDP (at basic prices). From the figure, the services sector contributed the highest share of 56.9 percent to overall GDP whiles the agricultural and industrial sectors contributed 18.9 percent and 24.2 percent respectively.

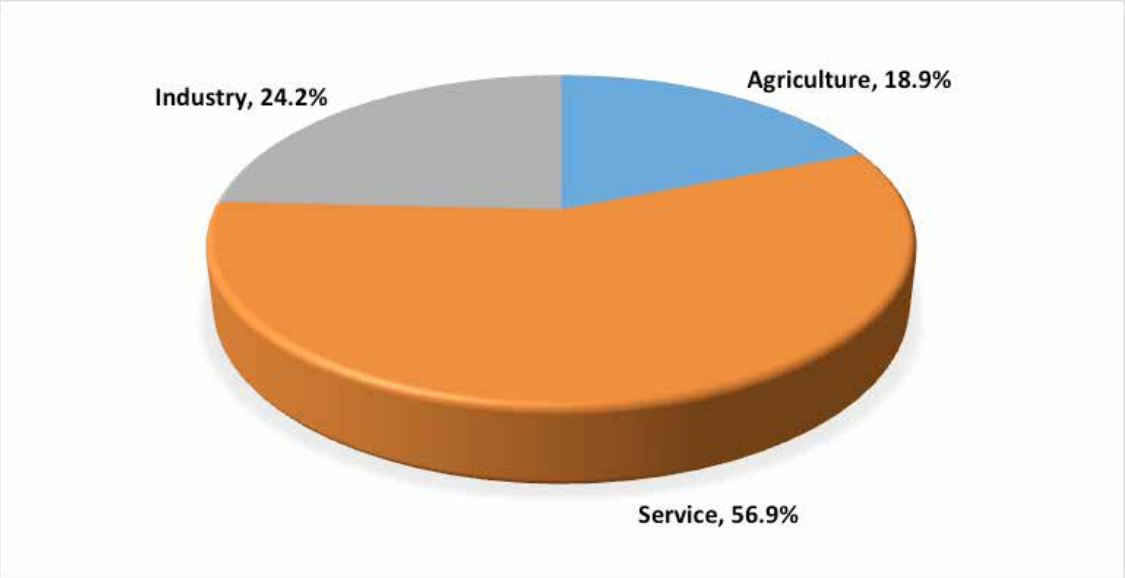


Figure 1. 3: Distribution of GDP (at Basic Prices) by Economic Activity percent; 2016

Source: Drawn from data from Ghana Statistical Services, April, 2017

1.2.3.3 Change in Food Self-Sufficiency Levels

Food self-sufficiency measures the deficits or surpluses recorded in production against consumption of selected key crops produced in the given year.

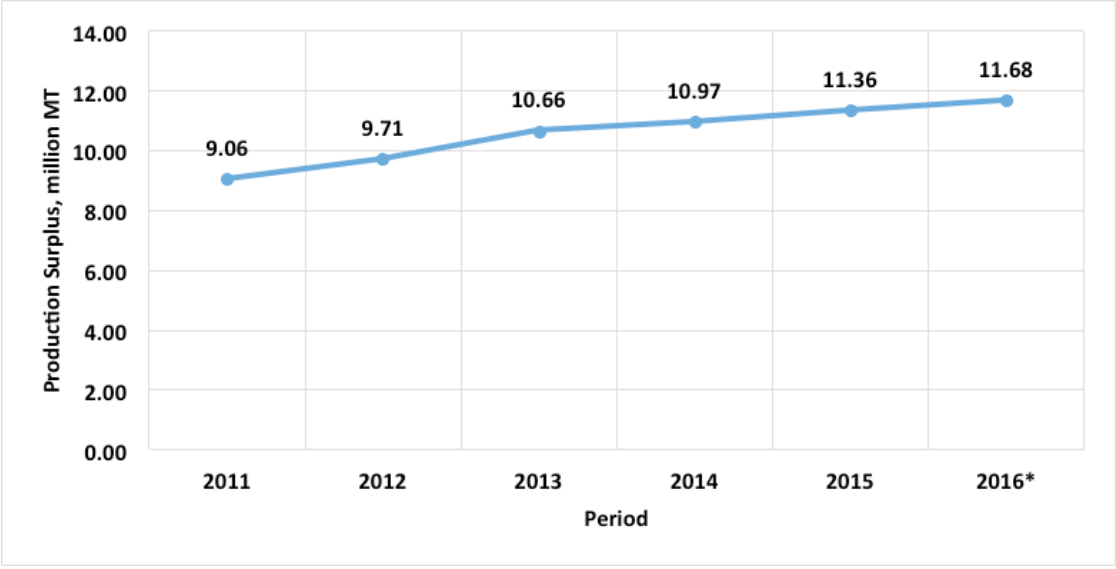


Figure 1. 4: Total Surpluses of Selected Staple Crops

Total production of selected crops (Table 1.2), for the past six years experienced increases growing at an average of about 1 percent per annum. From figure 1.4, percentage change in food self-sufficiency levels of 2016 against 2015, is about 3.

From table 1.2, the country was self-sufficient in food production in selected food commodities during the reporting year except in rice and millet which recorded deficits. The deficit in rice (milled) production however, has been noted to be declining steadily since 2013, and in 2016, it declined by 4% from 278,696 metric tonnes in 2015 to 266,278 metric tonnes. However, the deficit in millet has been rising staggeringly since 2014 and between 2015 and 2016 it rose by 127% from 1,377 metric tonnes to 3,132 metric tonnes.

Table 1.2: Deficit/Surplus of Selected Staple Crops (MT)

	Deficit/Surplus (MT)					
	2011	**2012**	**2013**	**2014**	**2015**	**2016***
Maize	158,183	331,803	166,346	142,481	57,328	52,090
Rice (Milled)	-342,995	-347,507	-292,094	-286,135	-278,696	-266,278
Millet	33,893	27,259	2,885	-27	-1,377	-3,132
Sorghum	123,630	114,519	91,281	90,176	90,219	58,278
Cassava	6,111,881	6,236,252	7,153,983	7,433,545	7,820,034	8,132,372
Yam	1,531,130	2,084,440	2,357,685	2,316,255	2,379,714	2,415,348
Cocoyam	225,709	174,223	141,767	152,790	129,816	144,722
Plantain	937,877	834,083	883,941	961,593	1,014,189	1,000,903
Groundnuts	115,906	117,792	50,943	59,594	43,587	43,696
Cowpea	75,058	60,698	38,264	35,920	34,531	33,944
Soya bean	89,387	77,327	65,041	66,187	65,691	65,143

*Source: SRID, 2016 *Provisional*

CHAPTER TWO

2.0 Food and Nutrition Security and Emergency Preparedness

The food and nutrition security and emergency preparedness programme aims at increasing productivity, production, mechanization, irrigation whiles promoting selected staple crops and livestock. It is also aimed at improving food distribution to vulnerable and disadvantage groups to enhance their food and nutrition security status especially in times of disasters and crisis.

2.1 Rainfall and its Effect on Agriculture

Agriculture in Ghana is largely dependent on the amount of rainfall and its distribution. Recent rainfall figures show a declining trend with poor distribution (from 1,276 mm in 2008 to 834mm in 2016). The declining trend may be attributable to the changes in the weather and other climatic factors.

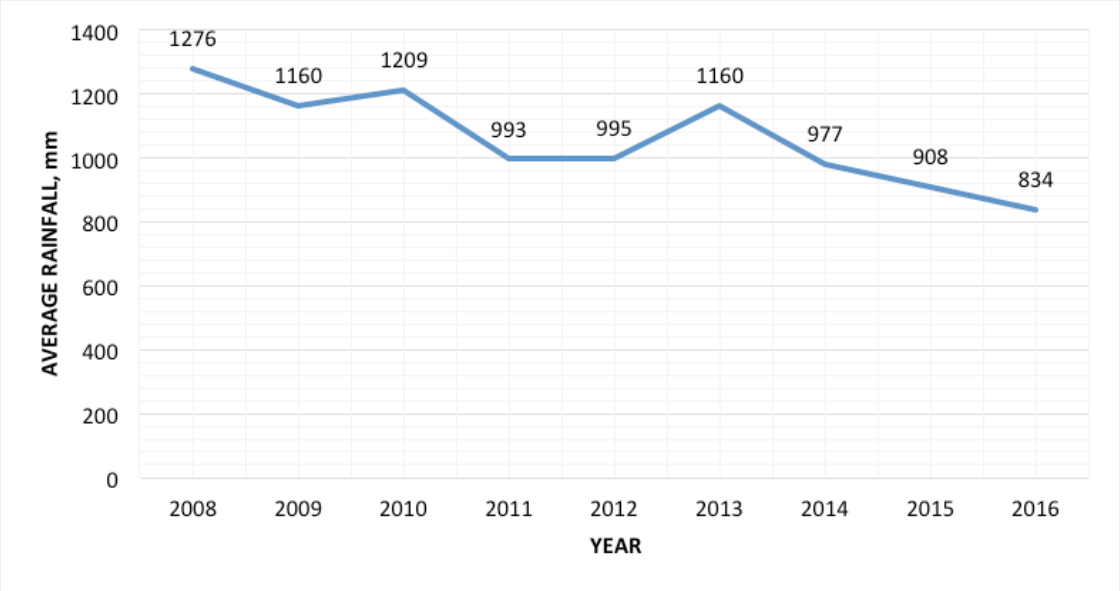


Figure 2. 1: National Average Rainfall (mm), 2008-2016

Source: SRID, 2016

The consistent decline in the volume of rainfall over the period under review (Figure 2.1) has had negative effect on crop production and availability of fodder for livestock. Rainfall data collated in the country in 2016 shows a general decline in volume in 60% of the regions compared with 2015. However, Greater Accra, Volta, Northern and Upper East Regions recorded significant positive changes of 0.50%, 13.05%, 25.65% and 36.96% respectively in rainfall volumes, Figure 2.2. Other regions recorded decreases with the worst recorded by Ashanti (-34.26%).

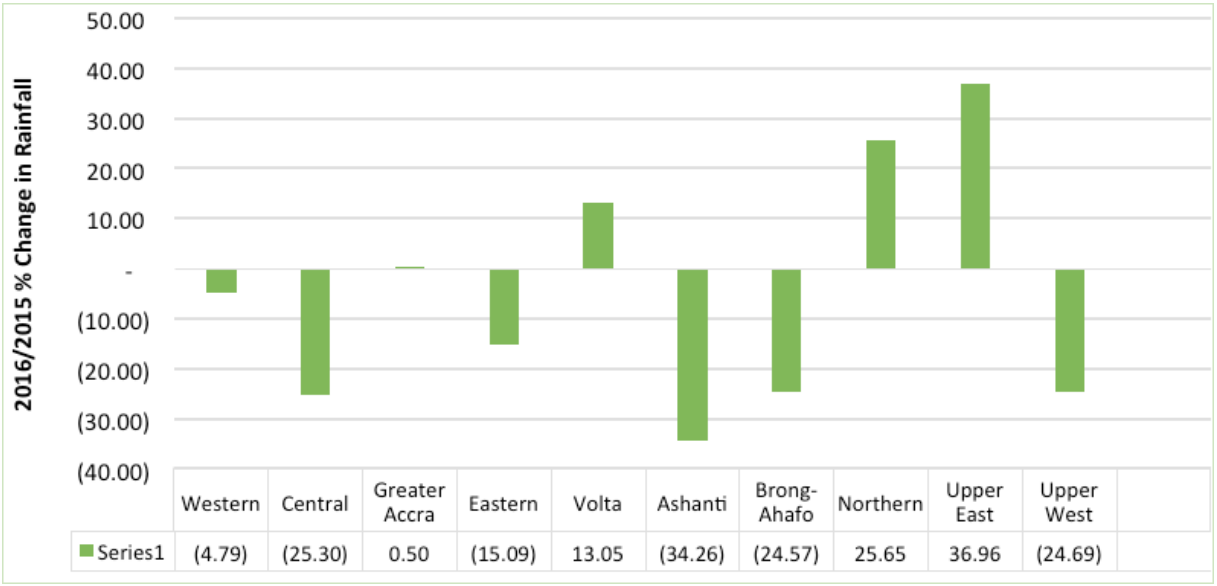


Figure 2. 2: Percentage Change in Rainfall (mm) by Region – 2015-2016

Source: SRID, 2016

2.1.1 Summary of Regional Weather Situation

There was varying amount and distribution of rainfall across the entire country. The months of January, February and December were as usual, generally the driest months throughout the country with some regions recording no rains at all while others recorded minimal quantities, Appendix 1. Ashanti, Upper East and Upper West Regions recorded the lowest average volumes of rainfall in the year. This led to the usual scorching of vegetative cover especially in the savannah and parts of the coastal zones. Furthermore, the low amount of rainfall recorded in these three regions had negative impact on water bodies in general and specifically led to the drying of small streams and decrease in volumes of some rivers. March to November, recorded significant amounts of rainfall resulting in incidences of flood in the Upper East Region in the month of July which submerged about 957.3 hectares of rice fields.

The top three rainiest months were May, September and October. Western Region recorded the highest average amount of rainfall during that period, followed closely by Eastern and Volta Regions. Though, rainfall volumes for 2016 was poor compared with 2015, the distribution was better resulting in modest increases in yield of selected crops.

2.1.2 Impact of Climate Change on Agriculture

According to the Inter-Governmental Panel on Climate Change (IPCC), climate change will lead to increases in the frequency and intensity of natural disasters and extreme weather events such as droughts and floods; rising sea levels and the contamination/salinization of water supplies and agricultural lands; changes in rainfall patterns with an expected reduction in agricultural productivity in already fragile areas, especially in Sub-Saharan Africa and declining water quality and availability in arid and semi-arid regions.

The phenomenon is obvious especially in the three regions of the north. The ministry therefore is taking continues steps to prepare it stakeholders to understand and respond appropriately to reduce the effect on livelihoods. Activities conducted to improve the adaptability of farmers to climate change include sensitization and training of twenty-five (25) extension staff and their supervisors on the use of soil testing kits as well as the use of mini-rain gauges and thermometers. Training for another twenty (20) extension staff and their supervisors, from selected districts on Climate-Smart Agriculture (CSA) using the Participatory Scenario Planning (PSP) tool was also organized. This was expected to improve upon the existing capacity among extension service providers for effective mainstreaming of climate change adaptation into programmed activities. It is expected that all new programmes/projects in MoFA will incorporate climate resilience in their design.

2.2 Early Warning Systems and Emergency Preparedness

The development and implementation of an Early Warning Systems (EWS) helps to better identify and address failures and disasters before they occur. This is even more important on the field of agriculture especially in the developing world since agricultural production is generally dependent on nature.

The ministry makes investments to establish systems for early detection and control of such invents. During the year, the ministry has established four (4) agro-meteorological stations for real time climatic data collection at Bongo, Mankessim, Weija and Wenchi. Other regions have over the years had similar stations established and are in operation.

In 2014, MoFAD also initiated the process of developing EWS in the form of disease database, which is about 95% complete. The EWS will comprise the following: Awareness creation, reporting systems, laboratory infrastructure and available human capital and expertise. The Database will comprise diseases of economic importance to the fisheries sub-sector in the country. So far awareness on fish diseases has been created whiles 30 veterinary and 25 fisheries officers have been trained on signs and prevention mechanisms, pretesting and finalization of reporting formats. One (1) new fish laboratory, constructed in Accra and two (2) in Kumasi and Koforidua were upgraded to facilitate an effective and efficient detection and diagnosis of fish diseases.

2.2.1 Natural Disasters and Other Emergency Events

The dry weather with its accompanying harmattan increased the incidence of bushfire in the Upper West, Upper East, Brong Ahafo, Northern, and Western Regions. In the Western Region, fire outbreaks were reported from Juaboso, Jomoro, Bodi and Bia West districts that mainly destroyed food crops. Part of the Sui Forest Reserves, Krokosue Forest Reserves and some cocoa farms were also destroyed as a result of the bush fires.

Greater Accra Region reported flood in Ga West Municipal where some vegetable farms in the low lying areas especially along the Nsaki were destroyed and also at Teshie Rasta and the Military Camp in the Ledzokuku Krowor Municipality destroying maize farms. Similarly, flood in Upper East Region affected farmlands and destroyed about 2,330 hectares of various crops (rice–957.3ha, maize–935.2ha, sorghum–293.4ha, millet–92.0ha and groundnuts–52.4ha).

Picture 2. 1 Rice Fields Destroyed by Floods at Chuchuliga (Upper East Region)

Reports indicate that Builsa North District was most affected in terms of destruction by the floods, as a result, about 248 hectares of rice fields could not be seeded. Bongo District also had about 55 livestock houses destroyed, dam wall damaged and farm roads destroyed, Picture 2.1.

Pest damage by the Fall Army worm impacted negatively on agriculture production and productivity. In 2016, 4,046.60 hectares of maize fields were attacked by the fall army worm, Table 2.1 and Picture 2.2. Brong Ahafo Region recorded the highest fall armyworm attack of almost 2,765 hectares of maize field representing 68.33%. Considering the mean densities of 80% of the larvae per plant during the late whorl stage, it could reduce expected yield by an average of 12% if not controlled in good time.

Picture 2. 2: Fall Army worm attack on Maize Field at Upper East Region

Table 2. 1: Fall Armyworm Outbreak in Maize – 2016

Region	District	Area (Ha)
Ashanti	Afigya Kwabre	10
	Mampong	8
Regional -Total		18
Brong Ahafo	Wenchi	50
	Atebubu	20
	Sene East	234
	Sene West	356
	Pru	300
	Kintampo North	1,500
	Sunyani Municipal	5
	Nkoranza South	300
Regional -Total		2,765
Eastern	Kwahu Afram plains	112
Regional -Total		112
Greater Accra	Shai Osudoku	10
	Ga East, Ga west, Ga south, La Dadekotopon, Adenta	10
Regional -Total		20

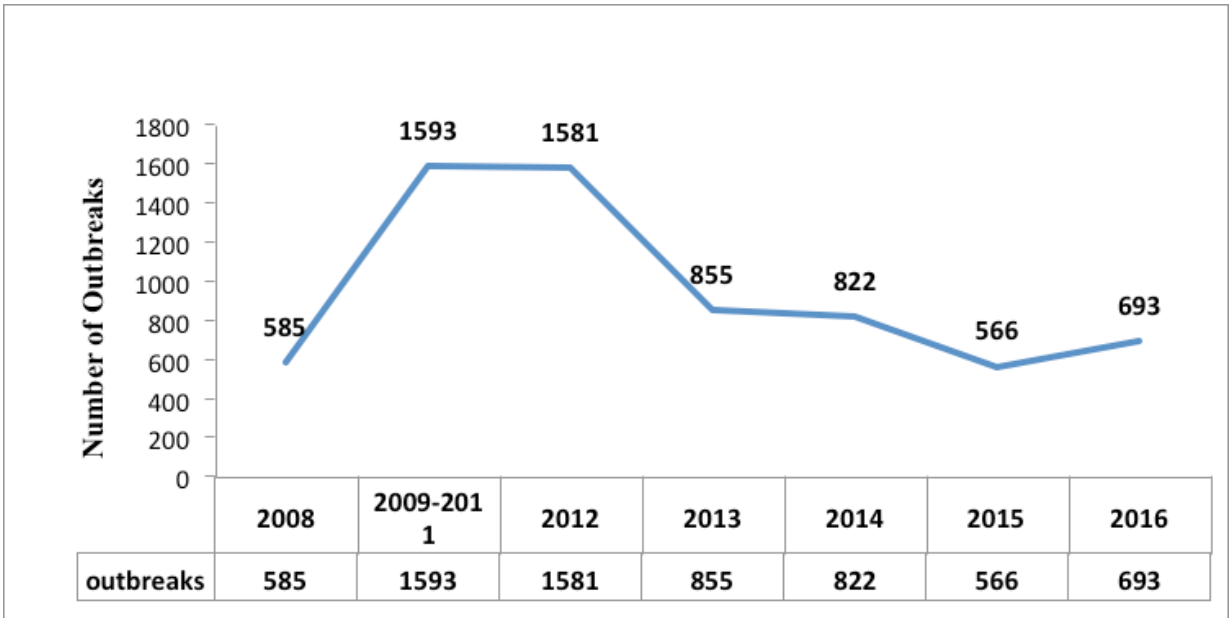
Northern	Mion	60
	Mamprugu Moaduri	11.6
	Tamale Metro	30
	Sagnarigu	38
	Savelugu Nanton	355
	Mamprugu	8
	Karaga	200
	STK	60
	Bole	80
	East Gonja	55
	Yendi	85
	Zabzugu	50
Regional -Total		1,032.6
Upper East	Kasena Nankana	16
	Bawku west	5
Regional -Total		21
Upper West	Sissala East	5
	Sissala West	2
	Wa municipal	3
Regional -Total		10
Volta	Sokode – Ando	16
	South Dayi	2
	Biakoye	2
	Nkwanta North	5
	Nkwanta South	10
	North Tongu	8
Regional -Total		43
Central	Abura Asebu Kwamankese	5
	Awutu Senya District	2.8
	Agona West (Agona Swedru)	1.2
	Agona East (Osamkrom)	4
	Awutu Senya	2
Regional -Total		15.0
TOTAL		4,046.60

Source: PPRSD-2016

2.2.2 *Scheduled Disease Outbreaks*

The ministry continued to monitor the incidence of scheduled disease outbreaks. These diseases are to be monitored by all countries according to the World Organisation for Animal Health, and reported for appropriate actions. In 2016, eighteen (18) scheduled disease outbreaks were recorded out of 28 monitored.

Field reports show, there was a general increase in the number of disease outbreaks in 2016 (693) compared to 2015 (566). The increase in 2016 was as a result of increased passive disease surveillance occasioned by the sensitization of farmers, to report any disease condition in their poultry in the wake of Avian Influenza outbreak. This has led to the diagnosis and confirmation of other disease outbreaks in the country. In total 75,129 animals were lost through mortalities, costing the country 6.1 million cedis as compared to about 3.5 million cedis in 2015. Details of the diseases, number of animals involved and the total losses are shown in appendix 3.



	2008	2009-2011	2012	2013	2014	2015	2016
outbreaks	585	1593	1581	855	822	566	693

Figure 2. 3: Trend of Schedule Disease Outbreaks

Notable among the recorded diseases were rabies and Avian Influenza (AI). Nineteen (19) human cases of rabies were recorded nationwide with Upper West and Upper East Regions recording one (1) and five (5) deaths respectively. Figure 2.3 gives a trend for schedule disease outbreaks. It must be noted that most of these schedule diseases can be prevented using recommended vaccines.

For AI, five regions located in the southern and middle zones of the country were affected by the outbreaks. A total of 57,087 birds from 29 farms were affected and subsequently lost through deaths and destruction as part of measures to control the spread of the disease, Table 2.2. Payment of compensation is normally recommended to motivate farmers to cooperate with the ministry to implement control measures. However, for 2016, there has not been payment of compensation for any of the farmers affected by the disease and this has contributed to the prolonged outbreak.

Table 2.2: Avian Influenza (HPAI-H5N1) Outbreak by Region, 2016

REGION	NUMBER OF OUTBREAKS	NUMBER OF FARMS	POPULATION OF BIRDS IN FARM	NUMBER OF BIRDS DESTROYED	NATURAL DEATH (BIRDS)
		A	B	C	D=(B-C)
Greater Accra	21	21	31,641	22,393	9,248
Ashanti	1	1	4,808	1,686	3,122
Western	1	1	252	150	102
Eastern	2	2	8,731	4,414	4,317
Central	4	4	11,655	8,638	3,017
TOTAL	**29**	**29**	**57,087**	**37,281**	**19,806**

Source: VSD, 2016

In a related development, International Food Policy Research Institute (IFPRI) in collaboration with the ministry, carried out a survey on "Ghana's Poultry Sector to assess the availability and affordability of veterinary vaccines and drugs and prevalence of diseases. As part of the findings, shortfalls in the supply of vaccines and drugs as well as inadequate numbers of staff were identified to be negatively affecting the poultry industry. To partly address situation, the ministry increased the production of NDI-2Vaccine for the control of Newcastle Disease in poultry.

2.2.3 Establishment of Strategic Stocks

The National Buffer Stock Company (NAFCO), a sub-vented organisation of the ministry, was established in 2010 to store strategic food stocks and release in times of emergency to stabilize domestic prices. During the year, a total of 2,820 metric tonnes of yellow maize, purchased in the previous year, was sold at GHC 55.00 per 50kg at a period where the general market price was GHC 60.00. Even though this quantity was not enough to stabilize the general market prices, it helped government institutions which benefitted from these purchases to make some savings. Table 2.3 indicates the sale of produce by NAFCO over the period, 2011-2016.

Table 2.3: Sales by NAFCO (Metric tonne) 2011-2016

Period	Rice (milled)	White Maize	Yellow Maize
2011	700	5,100	n/a
2012	13,886	n/a	7,354
2013	6,926	50	4,813
2014	6,228	11,364	1,333
2015	n/a	10,000	5,000
2016*	**n/a**	**n/a**	**2,820**

Source: NAFCO Provisional

2.3 Domestic Food Supply and Demand

The 2016 food balance sheet, Appendix 2, shows that the country recorded surpluses in all the major staples with the exception of rice and millet. The deficit of about 266,278 metric tonnes for rice was largely due to an incidence of flood experienced in the northern part of the country. Upper East Region recorded incidence of flood which affected farmlands and destroyed about 957.3 hectares of rice fields.

2.3.1 Domestic Production and Supply of Crops

Table 2.4 shows production levels of selected staple crops. The sum of all selected staples grew by about 1% from 2015. All the selected staple crops recorded increases except sorghum (-12.58%). Rice, maize, and cassava recorded 7.20%, 1.79% and 3.40% respectively. Further analysis revealed that the increase in production was mainly as a result of increase in yield. Efforts towards increasing production through yield increment should be encouraged.

Table 2.4: Volume of Production of Key Staples (Metric Tonnes) 2011 -2016

Commodity	2011	2012	2013	2014	2015	2016*	% difference (2015/16)
Maize	1,683,984	1,949,897	1,764,477	1,768,577	1,691,644	1,721,910	1.79
Rice (milled)	301,583	312,656	392,972	416,788	442,629	474,498	7.20
Millet	183,922	179,684	155,131	155,319	157,369	159,017	1.05
Sorghum	287,069	279,983	256,736	259,000	262,652	229,604	-12.58
Cassava	14,240,867	14,547,279	15,989,940	16,523,661	17,212,698	17,798,217	3.40
Yam	5,855,138	6,638,867	7,074,575	7,118,890	7,296,150	7,440,354	1.98
Cocoyam	1,299,645	1,270,266	1,261,473	1,298,973	1,301,181	1,343,728	3.27
Plantain	3,619,834	3,556,524	3,675,295	3,828,011	3,952,421	4,000,424	1.21
Groundnut	465,103	475,056	408,814	426,627	417,199	425,825	2.07
Cowpea	236,679	223,253	200,404	201,264	203,317	206,378	1.51
Soybean	164,511	151,709	138,673	141,469	142,360	143,216	0.60

Source: SRID ****Provisional***

2.3.2 Domestic Production and Supply of Livestock

The country in the last three decades estimates its livestock population using the results of 1996 livestock census as a base. This is due to the country's inability to carry out an agricultural census. Plans are however, far advanced in conducting this census, for a more accurate data. Table 2.5 indicates a projections of livestock population.

Table 2.5: Livestock Production ('000)

Livestock	Average (2011-2013)	2014	2015	2016*	% Change (2016 vs 2015)
Cattle	1,544	1657	1734	1,815	4.7
Sheep	4,021	4335	4522	4,744	4.9
Goats	5,441	6044	6352	6,740	6.1
Pigs	603	682	730	777	6.5
Poultry	58,064	68511	71594	73,885	3.2

Source: SRID, 2016 **Provisional*

This, notwithstanding, the ministry continued to carryout activities that promote livestock production; including breed improvement, husbandry practices and the "pass on the gift" (credit in kind) as well as training for both farmers and extension staff for better service delivery. Monitoring reports revealed that some of these interventions are producing desired outcomes – improved incomes of Ghanaians. Under the guinea fowl project of WAAPP 2A, for example, twenty (20) farmers were provided with solar panels to enhance electricity supply to the hatcheries to incubate guinea fowl eggs for better performance. Mr.Edward Yenli a beneficiary farmer in the Wa Municipality, by adopting technologies introduced by the Department of Agriculture, was adjudged the National Best Guinea Fowl Farmer for 2016. His success story is detailed in Box 2.1.

Due to his keen interest in the business, he purchased an additional incubator from the proceeds realised from the sale of guinea fowls. He sells fertile guinea fowl eggs as well as guinea keets to other farmers. Last year he hatched 1,600 guinea keets for himself and for other farmers. Currently, he has 549 guinea fowls

Box 2. 1: Success of a Technology Beneficiary

As part of efforts towards the prevention of the introduction of disease into the country from movement of livestock from neighbouring countries, the ministry, rehabilitated the Paga Livestock Quarantine Station. The rehabilitation included the construction of the Veterinary Doctor's resident , a new office accommodation with a clinic as well as provision of basic equipment for diagnosis and surgery. Further, the facility was fenced to keep livestock under inspection from straying.

This has attracted the movement of animals through the quarantine station and has created an opportunity to detect Transboundary Animal Diseases (TAD) for control. This has resulted in an increase in the number of livestock passing through the quarantine station from an average of 300 cattle per month to about 700 a month last year (2016). In the case of small ruminants, this has increased from 200 a month to about 950 a month, 2016. The table 2.6 indicate the diseases detected during the period from September to December 2016.

Table 2.6: ***Animal Diseases Detected at the Paga Quarantine Station, 2016***

Month	Origin of Animals	Disease Detected	Method Of Detection	Species of Animals	Number of Animals	Action Taken
September	Burkina Faso	PPR	Clinical Symptoms	Ovine	50	Entry permit refused and truck load returned to origin escorted.
October	Burkina Faso	Brucellosis	Clinical Symptoms	Bovine	35	Entry permit refused and truck load returned to origin escorted
November	-	-	-	-	0	-
December	Burkina Faso	Sheep pox	Symptoms	Ovine	30	Entry permit refused and truck load returned to origin escorted

Source: VSD, 2016

There have been an increase in monitoring by both the officers at the border and the Regional and National head offices of VSD to ensure effective and efficient operation of the station. As a result, there has also been a corresponding increase in revenue generated from the facility. The total revenue generated increased from GH¢ 274,564 in 2015 to GH¢ 552,186 in 2016 by 101.1 % (September to December), Table 2.7. The renovated facility was reopened in August, 2016.

Table 2.7: Revenue Generated from Paga Quarantine Station (GH¢)

MONTH	2015	2016	% CHANGE
August	38,574	75,800	96.51
September	50,080	76,491	52.74
October	62,302	79,902	28.25
November	66,408	134,342	102.30
December	57,200	185,651	224.56
Total	**274,564**	**552,186**	**101.11**

Source: VSD, 2016

2.3.2.1 Development of Non-Conventional Livestock

Support to the production of rabbits, grass-cutters and apiculture development continued over the period. This is expected to contribute significantly to household food security and income and aimed at establishing linkages which will help promote the production and consumption of non-conventional livestock meat. Various activities were therefore undertaken in this regard. The Tokyo University in Japan in collaboration with Japanese International Cooperation Agency (JICA) and University of Ghana (UG) promoted grass cutter rearing in the Upper West Region in which forty five farmers received three (3) breeding stocks each. This project ended in 2016 and monitoring process will be continued by the Department of Agriculture.

The Ghana National Apiculture Platform (GHANAP), a multi sectoral platform coordinated by the Animal Production Directorate (APD) was formed. The main objective of the platform is to enhance networking, advocacy and information sharing among players in the apiculture industry. Also, the ministry in collaboration with the Bee Project of the African Union Inter-Bureau for Animal Resources (AU-IBAR) organized a three day training workshop and practical apiary for ninety participants drawn from the 10 regions, at Ho in the Volta Region. They included; beekeepers, processors, packers, Civil Society Organisations (CSOs) Regional Veterinary Officers (RVOs) and Regional Livestock Officers.

2.3.3 Domestic Production and Supply of Fish

The fishery industry encompasses marine, fresh water and aquaculture, contributing 6.1% to Agricultural GDP in 2016 and about 60% of the protein needs of Ghanaians. The performances of these subsectors are outlined in this section.

2.3.3.1Aquaculture Production

Aquaculture production shows an increasing trend since 2011. The average aquaculture fish production for METASIP I period increased by 32% from 26,352 metric tonnes to 38,547 metric tonnes (2014) and averagely increased by 15% yearly to 52,470 metric tonnes in 2016. Figure 2.4 shows levels of aquaculture fish production.

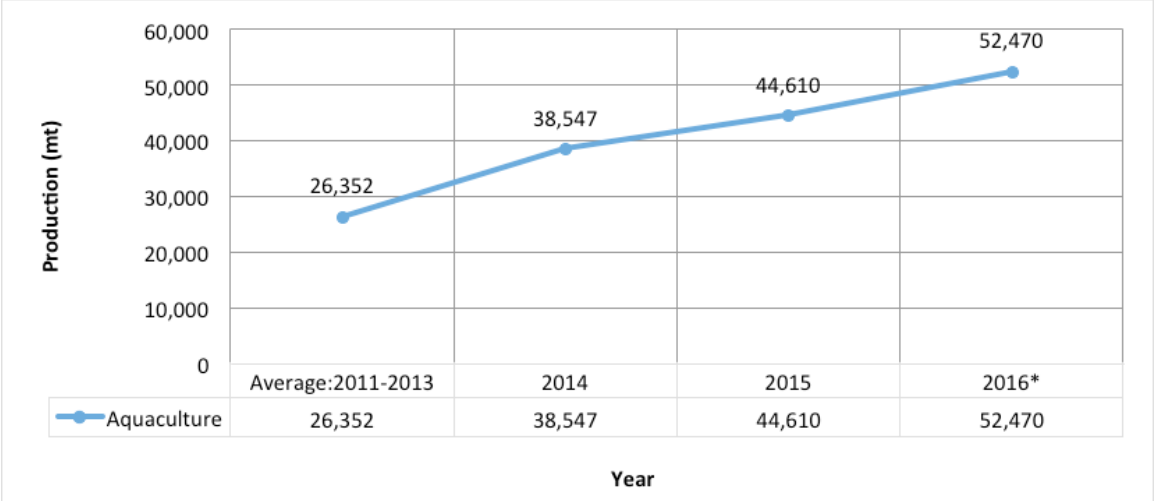


Figure 2. 4: Aquaculture Production *Source: MoFAD-2016*

The fast growth trend observed in aquaculture production could be attributed to Government's focus on aquaculture production to augment the dwindling production from the capture fisheries. This involved the promotion of private sector participation in the area of inputs (fingerlings, feed, etc.) supply, production and rendering of technical support to the private sector throughout the production stages. It was also government's intention to freeze the capacity of the artisanal sector at current levels and sequentially reduce vessels capacity in the industrial and semi-industrial sectors through the introduction of alternative/additional livelihoods for fishermen in order to maintain current production levels of the capture fisheries. During this reduction process, aquaculture production levels are expected to increase. This will be done through the provision of credit for small scale aquaculture farmers under the West Africa Regional Fisheries Programme and creation of awareness of the potentials of aquaculture through aquaculture investment fora.

2.3.3.2 Marine Fish Production

Marine fish production is one of the captured fishes. Over the years, marine fishery has accounted for about 80% of the total fish produced by Ghanaians. Production from marine capture increased by 5%, from 312,535 metric tonnes (2015) to 328,541 metric tonnes (2016). Apart from the artisanal sub-sector which declined by 1% in 2016 compared to 2015, the other sub-sectors, Semi Industrial, Industrial and Tuna, increased by 45%, 21% and 11%, respectively.

Marine fish production generally averaged 320,000 metric tonnes between 2011 and 2016 reaching its lowest of 290,612 metric tonnes in 2014 (Table 2.8). It declined by 12% from an average of 325,210 metric tonnes (2011 -2013) to 290,612 metric tonnes (2014). Production for the years, 2015 and 2016 increased by 7% and 5% over the year 2014 (290,612mt) and 2015 (312,535mt) respectively. Although the sub-sector is still challenged by the mitigating effects of climate change, use of light attractants and other unorthodox methods, environmental parameters favoured marine fish production.

Table 2.8: Marine Fish Production by Sub-Sectors

Fleet	Av2011-2013	2014	2015	2016*
Artisanal	214,685	198,656	223,774	221,356
Semi Industrial	10,100	9,961	6,679	12,132
Industrial	19,644	19,557	19,560	24,780
Tuna	80,782	62,438	62,521	70,274
Total	**325,210**	**290,612**	**312,535**	**328,541**

Source: MoFAD-2016 **Provisional*

2.3.3.3 Inland Fish Production

The Volta Lake, lagoons, reservoirs, irrigation dams and dugouts as well as other inland water bodies are the main sources of inland captured fisheries production. The Volta Lake contributes about 90% of the total inland fishery production and forms the backbone of the entire inland captured fisheries. Inland fish production has generally seen a decline since 2011. Inland fish production averaged 92,365 metric tonnes for the period 2011 -2013. The years, 2014, 2015 and 2016 recorded lower productions than this average recording -8%, -7% and -9% respectively. Comparing 2016 to 2015, inland fisheries experienced a negative growth of -2.23%. Figure 2.5 shows the fluctuations in inland fish production.

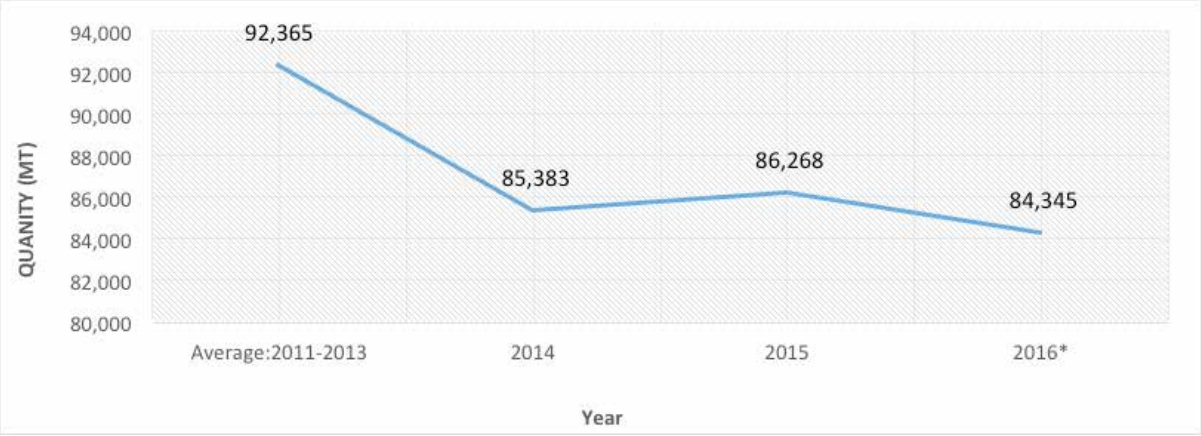


Figure 2. 5: Inland Fish Production *Source: MoFAD*

2.4 Productivity Improvement

Agricultural productivity measures agricultural outputs in relation to unit input used. This section reports on the productivity in crops, livestock and fisheries production.

2.4.1 Crop Productivity

The weather condition was fairly favourable across the southern sector of the country compared to the previous year. Though the volumes were lower, there was a better distribution, resulting in improved yields of the various food crops. The climatic conditions across the northern savannah agro-ecological zone was generally favourable for good crop production especially, cereals. Provisional yield data indicated that, with the exception of soybean (-0.10%) all other commodities recorded increases in productivity, Table 2.9.

From table 2.9, the average growth in production of all selected crops is 6.59% for 2015 over 2016. Millet recorded the highest growth of about 20%, sorghum 14% and cowpea 13%. In addition to the favourable weather, government also implemented interventions which contributed to the increases recorded in yield. This success can be attributed to the use of improved technologies, fertilizer subsidy programme and provision of technical support services.

Table 2.9: Yields of Major Crops (2011 - 2016)

Commodity	2011	2012	2013	2014	2015	2016*	% difference (2015 and 2016)
Maize	1.65	1.87	1.72	1.73	1.92	1.95	1.56
Rice(milled)	2.35	2.54	2.64	2.69	2.75	2.92	6.18
Millet	1.03	1.04	0.97	0.96	0.97	1.16	19.73
Sorghum	1.18	1.21	1.14	1.14	1.00	1.14	14.14
Cassava	16.01	16.75	18.27	18.59	18.78	20.25	7.81
Yam	14.50	15.57	16.78	16.63	16.96	17.42	2.69
Cocoyam	6.36	6.47	6.50	6.48	6.49	6.53	0.58
Plantain	10.76	10.54	10.81	10.74	10.90	11.17	2.46
Groundnut	1.30	1.38	1.24	1.24	1.24	1.30	4.90
Cowpea	1.30	1.32	1.24	1.24	1.25	1.41	12.58
Soybean	1.91	1.78	1.64	1.64	1.65	1.65	-0.10

Source: SRID, 2016 ***Provisional***

2.4.1.1 Seed and Planting Material Development

The use of high quality certified seed and planting materials is very important for improving agricultural productivity. In recent times there has been the development and introduction of climate resilient, high-yielding, disease and pest-resistant, short duration crop varieties. The Cowpea Improvement Programme by West African Agricultural Productivity Program (WAAPP), has developed breeder seeds of four released varieties namely Songotra, Zaayura, Padituya and Apagbaala to make available enough seed for foundation seed production. Foundation seed production of these varieties were cultivated in the main season and also in the off season at the Bontanga irrigation facility in the Northern Region.

The production of four elite lines, SARV-09-001, SARV-09-002, SARV-09-003 and SARV-09-004 was also done under irrigation at Bontanga to increase the seed stock of cowpea. A total of 105.5 kilogram and 371 kilogram of seeds of both released varieties and elite lines respectively, has been given out for multiplication in 2015 and 2016. Also under the Pearl Millet Program a total seed stock of 355.7 kilogram has been produced as at December, 2016. All five released early maturing varieties (Kaanati, Akad-kom, Naad-kohblug, Afribeh-Naara and WAAPP-Naara) have been processed and stored at Manga Station in the Upper East Region.

Additionally, efforts were centred on the production of cassava, seed yam, cocoyam, sweet potato, maize, rice, cowpea, soya beans and groundnut resulting in the supply of over seven million cassava cuttings of different varieties (Ampong, SikaBankye, Bankyehemaa, DokuDuade, Nkabom, Essambankye and Cape Vars) to farmers across the country. Released yam varieties; CRI-Kukrupa, CRI-MankrongPona, and CRI-Pona were also promoted.

To sustain progress made in seed development, the capacities of selected breeders, seed growers and inspectors were built during the period. A total of 102 eligible candidates comprising 31 PhDs and 71 MSc have been enrolled under the sponsorship programme. The support has resulted in improved quality of research teams and MoFA technical staff.

> In a related development, Plant Protection and Regulatory Services Directorate (PPRSD) of the ministry in collaboration with the International Fertilizer Development Centre (IFDC)-GH and Alliance for Green Revolution in Africa (AGRA) facilitated the ratification of the Seed Regulation and Plant Fertilizer Regulation 2012, (L.I.2194) with the ECOWAS Seed and Fertilizer Regulations. This is to ensure smooth trade relations and quality control purposes of seeds and fertilizers in the West African Sub-Region. The Ghana seed regulation was harmonised with the ECOWAS protocol in 2015 with the support of USAID-Agricultural Policy Support Project (APSP) and is expected to be passed by parliament in 2017.

There was also production of foundation and certified seeds over the period. From table 2.10, there is a constant decline of foundation seeds produced per annum of the major staple with rice, sorghum and groundnut recording no productions since 2013. Available quantity for maize in 2016 is 5.9 metric tonnes which can plant an area of 295.0 hectares with an estimated certified seed generation of 442.5 metric tonnes. This limited production of foundation seed can be attributed to a number of constraints including inadequate resource allocation, poor forecasting to determine farmers' seed demands and requirements, among others.

Table 2.10: Volume (Mt) of Foundation Seed Produced (2013-2016)

Year	Maize	Sorghum	Rice	Cowpea	Soybean	Groundnut
2013	21.0	n/a	n/a	1.5	1.0	n/a
2014	16.1	n/a	n/a	n/a	n/a	n/a
2015	10.8	n/a	n/a	1.5	1.2	n/a
2016*	5.9	n/a	n/a	n/a	n/a	n/a

Source: GLDB 2016 Annual Reports ****Provisional***

As part of the mandate, the ministry continued with registration and enforcement of seed certification. Currently, a total of 1,850.35 metric tonnes of maize, rice, cowpea, soybean and groundnut are available for farmers' use in the next cropping season. This, when cultivated, is expected to generate 116,160 metric tonnes of grains. Table 2.11 gives the breakdown by crop.

Table 2.11: Production of Expected Grains

Crop	Certified Seed Available (Mt)	Expected Grain	
		Area (ha)	Production (Mt)
Maize	796.97	39,848.5	59,772.75
Rice	806.57	16,131.4	48,394.20
Cowpea	14.00	350.0	420.00
Soybean	173.85	3,477.0	5,215.50
Groundnut	58.96	1,179.2	2,358.4

Source: PPRSD 2016 Annual Report

The ministry also established foundation seed fields at the Babile Agricultural Station (savannah agro - ecological zone) during the 2016 cropping season for subsequent production of certified seeds, Table 2.12. A total output of 8,918 kilograms of foundation seeds, estimated to cultivate 3,840 hectares of certified seed was obtained. In the same vein, a three (3) hectare of sweet potato planting material multiplication field was established at Asuansi and Babile Agricultural Stations in the transitional and guinea savannah agro-ecological zones respectively. Consequently, an output of 149,985 vine cuttings of Ligri, Otoo and Apomuden varieties were distributed to farmers in the Central and Upper West Regions. This is also estimated to cultivate a total area of 15 hectares of certified planting materials. A Cassava Museum was established at Wenchi in the Brong Ahafo Region (Transitional Zone) to serve as a source of different planting materials for different consumer needs and also as a learning and exhibition reference point.

Table 2.12: Area of Certified Seeds to be Produced

Crop	Foundation Seed(Ha)	Seeding Rate (Kg/Ha)	Certified Seed(Ha)
Sorghum	14	5	2,800
Maize	11	20	550
Soya bean	2	50	40
Millet	1	5	200
Groundnut	10	50	200
Cowpea	2	40	50

Source: Computation from GLDB Data, 2016.

2.4.2 Livestock Productivity

In the quest to improve productivity of livestock, the ministry through the National Livestock Breeding Stations continued to supply improved livestock progenies to farmers. This was, in the main, to increase productivity, ensure food security and improve incomes of beneficiaries. In 2016 a total of 1,216 animals were birthed out of a target of 1,887, representing a 64.4% achievement. Out of the 1,077 births in 2015, 693 were supplied to farmers in 2016, representing 42.3% decrease over that of 2015. Table 2.13 shows the trend of livestock birthed, target against achieved and the numbers supplied to farmers for breed improvement on their farms.

Table 2. 13: Improved Breed of Animals Supplied to Farmers

Livestock	Births						Percent Achieved			No. of Breeding Stock Supplied		
	2014		2015		2016							
	Target	Actual	Target	Actual	Target	Actual	2014	2015	2016	2014	2015	2016
Pigs(LW)	350	305	383	287	283	242	87	75	85.5	202	262	173
Sheep	250	171	588	268	419	230	68	46	54.9	347	565	132
Goats	200	146	224	161	444	277	73	72	62.4	118	105	102
Cattle	60	41	133	68	96	51	68	51.1	53.1	115	100	40
Rabbits	230	115	204	151	293	196	50	74	66.9	67	35	118
Pigs(ABP)	150	83	254	142	352	220	55	56	62.5	110	133	128
Total	1240	861	1786	1077	1887	1216	67	60.3	64.4	959	1200	693

Source: APD 2016 Annual Report

In addition to the supply of improved livestock breeds,, the ministry continued with the "pass on the gift" (Credit- in-Kind) programmes. The Credit-In-Kind small ruminants project is an intervention to supply improved breeds of livestock to farmers to enhance productivity, income as well as to create employment. To make the project sustainable, 1,200 animals were recovered and pass-on to 120 additional farmers in the various regions. Recovery of progenies stood at 62.7% as at December 2016. Pictures 2.3 and 2.4 show the impact of the Credit–In - Kind project on a beneficiary and his household.

Picture 2. 3 Mr. Emmanuel Sarpong's Flock

Picture 2. 4: Mr. Sarpong's Borehole and generator

Mr. Emmanuel Sarpong, a beneficiary of the sheep Credit-In-Kind-Scheme under the Livestock Development Project at Adomano, Kintampo North Municipal, received 10 gimmers in 2010 as a beginner. Through strict adherence to technical advice from AEAs, he has a current stock size of 78. He feeds the animals with pasture, crop residue and agro by-products. He has paid back the ten (10) sheep to be pass -on to other farmers. He also sold a total of 75 sheep in 2014 and realized an amount of GH¢ 14,300.00 out of which he spent GH¢ 12,000.00 for the construction of a mechanised borehole, which he uses to water his animals and crops. He also used part of the proceeds to purchase a generator for the borehole, payment of his wards' school fees, payment of his labourers and expansion of his crop farm.

2.4.3 Fisheries Productivity

Fish is one of the cheapest sources of protein and so efforts are made to increase its productivity and production to meet total national requirement. Some of the interventions include provision of outboard motors to fishers, provision of cages to interested fishers, construction of ponds and formation of Fisheries Community Management Committees. Individual fishers are also making investments in their businesses. Canoe frame surveys in 2013 and 2016 reported availability and use of 12,728 and 11,583 canoes respectively. The interventions have resulted in an increase in catch per unit effort, an indirect measure of abundance of target species, from 15.9mt/canoe/year in 2013 to 19.1mt/canoe/year in 2016 generating about 17% increase in productivity. Current productivity data for aquaculture (cage and pond) productions are not available.

2.4.3.1 Productivity of Cultured Fish

To meet the demand for fingerlings, the MoFAD in 2016 collaborated with the Water Research Institute (WRI) to train farmers who want to produce fingerlings. The fish farmers were provided with the brood stocks needed to produce quality fingerlings at GHC5.00 each. MoFAD also trained both staff and fish farmers in hatchery management and this has increased the production of quality fingerlings. As part of efforts to catalyze the development of the aquaculture sector, the Government completed rehabilitation of three (3) public hatcheries at Ashaiman, Akosombo and Kona-Odumasi. This capital investment is expected to bring about a significant boost in the production of fingerlings for fish farmers in addition to enhancing research and training in aquaculture.

Picture 2. 5 : Rehabilitated Public Hatcheries

Increase in the availability of fingerlings promotes the production of cultured fish. Figure 2.6 shows that, fingerlings production generally has increased since 2011. Fingerling production increased by 24% from an average of 81,979,386 singles (2011 - 2013) to 107,292,000 singles (2014). Production for 2015 also increased by 38% and further by 4% in 2016.

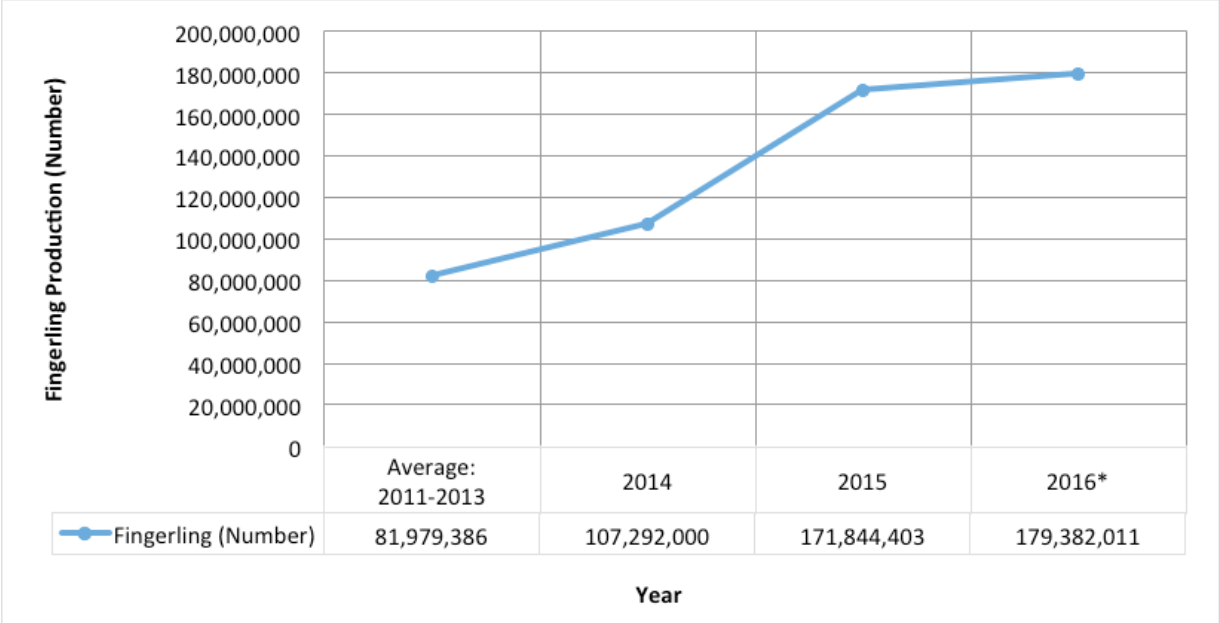


Figure 2. 6: Trend in Fingerlings Production *Source: MoFAD-2016*

2.5 Domestic Supply and Import of Crops, Meat and Fish

Ghana imports several food commodities to augment domestic production. These include tomatoes, onions and rice. Available data show that Ghana is not food sufficient in rice and millet production. While rice is noted for recording deficits over the years, millet started recording deficits from 2014. Government is determined to close this gap and therefore has developed and is implementing policies, projects and programmes to achieve this.

2.5.1 Domestic Supply and Imports of Rice

Even though the country still records deficits in rice production, the effects of policies and programmes in the subsector are leading to increases in production of the crop. In 2016, rice production has increased by 48.21% and 7.11% respectively over 2011 and 2015 production volumes. Similarly, estimated national consumption for the year 2016, increased by 12.18% and 2.31% over 2011 and 2015 values respectively, Table 2.14. Quantities imported have also grown by 28.39% and 12.39% from 2011 and 2015 respectively. At this rates, growth in import in 2016 is higher than production which is also higher than in consumption. The higher growth in import has resulted in an increase in the share of import in total rice available for consumption. Efforts in the subsector, should be intensified to reverse completely the situation.

Table 2.14: Rice Production and Import

Item	2011	2012	2013	2014	2015	2016*
Transit (@15% Import)	81,520	76,288	96,650	62,041	93,122	104,659
Total Imports	543,465	508,587	644,334	413,609	620,811	697,728
Imports Available (Total less Transit)	461,945	432,299	547,684	351,568	527,689	593,069
Domestic Milled Rice (@69% Extraction Rate)	320,142	331,898	392,972	422,829	443,000	474,498
Total Rice Available (Mt)	782,087	764,197	940,656	774,397	970,689	1,067,567
Share to Total Supply by Source						
	2011	**2012**	**2013**	**2014**	**2015**	**2016***
Domestic Rice	41%	43%	42%	55%	46%	44%
Imports	59%	57%	58%	45%	54%	56%

Source: Computation from SRID Figures ****Provisional***

2.5.2 Domestic Supply and Imports of Meat

Import of meat and other livestock products is regulated by the Veterinary Services Directorate through the issuance of import permits. Meat consumption is largely based on availability, price and tradition.

Table 2.15: Domestic Production and Import of Meat, 'Metric Tonnes'

Items	Average (2011-2013)	2014	2015	2016*
Import	99,087	45,817	48,144	21,142
Domestic Production	126,984	143,603	150,751	157,810
Total	226,071	189,420	198,895	178,952

Source: SRID, 2016 ****Provisional***

From table 2.15, domestic production of meat improved by about 5% from 198,895 metric tonnes in 2015. Conversely, import has reduced by about 56% from 48,144 metric tonnes. The reduction in import may be attributed to;

(1) Exchange rate volatility recorded during the year. The average exchange rate of the cedi to the USD for the year was about 4% as against 3.7% for 2015;

(2) Challenges of electricity experienced by the country from 2015 also contributed to the reduction in meat imports. Only about 12% of the national meat requirement was from import for the year, 2016; and

(3) A ban on frozen chicken imports from the European market due to avian influenza outbreaks in that region.

2.5.3 Domestic Fish Supply, Export and Import

over the period 2011 to 2013, an average of 174,651 metric tonnes of fish valued at US$144 million was imported as compared to 145,910 metric tonnes (US$120 million) in 2014 representing, 20% and 19% decline in volume and value respectively. In 2016, although the quantity of imported fish increased by 6%, the value of fish declined by 17% over that of 2015. The reduction in value could be attributed to the importation of high quantity of low value fish species. Table 2.16 and Figure 2.7 show the changes in quantity and value of fish imports from 2011-2016.

Table 2.16: Annual Imports, Export and FOB Values of Fish

Item	**Average (2011-2013)**	**2014**	**2015**	**2016***
Imports (Mt)	174,651	145,910	180,802	192,131
FOB ($)	143,704,520	120,443,785	154,019,585	131,388,230
Estimated Price per tonne, ($)	829	825	852	869
Exports (Mt)				
Quantity (mt)	54,585	57,358	53,750	
Value (US$) FOB	224,490,537.00	318,036,064.00	309,790,723.92	

Source: MOFAD, 2016 ****Provisional***

\Table 2.17: Fish, Production, Import and Exports

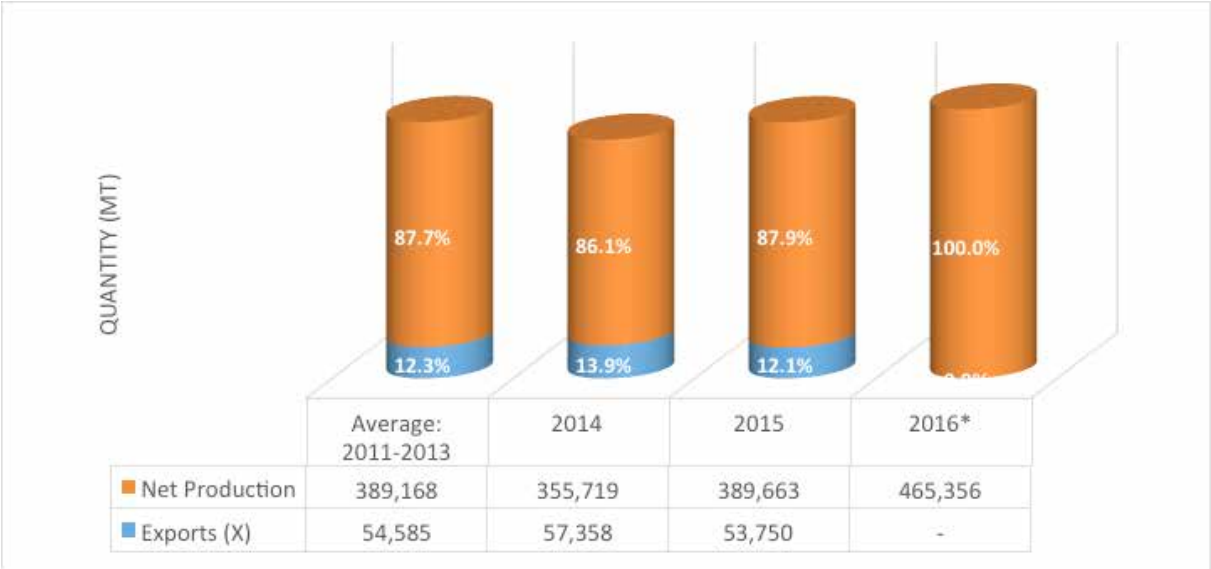
ITEM	Average (2011-2013)	2014	2015	2016*
Production (P)	443,753	413,077	443,413	465,356
Imports (M)	174,651	145,910	180,802	192,131
Exports (X)	54,585	57,358	53,750	-
Transshipment (T)	19,569	33,041	38,477	28,640
Net Production (N= P-X)	389,168	355,719	389,663	465,356
Fish Stock Available for Consumption (FSAC = (P+M)-X)	563,820	501,629	570,465	657,488

Source: MOFAD, 2016 ****Provisional***

Figure 2.7 compares net fish production and imports from 2011 to 2016. Since 2011, the volume of fish imports averaged 30% of total fish available for consumption whiles that of net production averaged 70%. Total fish imports decline by 20% from an average of 174,651 metric tonnes (2011 -2013) to 145,910 metric tonnes (2014) whiles the net fish production also declined from 389,168 metric tonnes to 355,719 metric tonnes, representing 9%. However, in 2015 and 2016, fish imports increased by 19% and 6% respectively, whiles net production also increased by 9% and 16% respectively. This implies that marginal growth in imports outweighs the net production.

Figure 2. 7: Fish Import and Net Production *Source: MoFAD-2016*

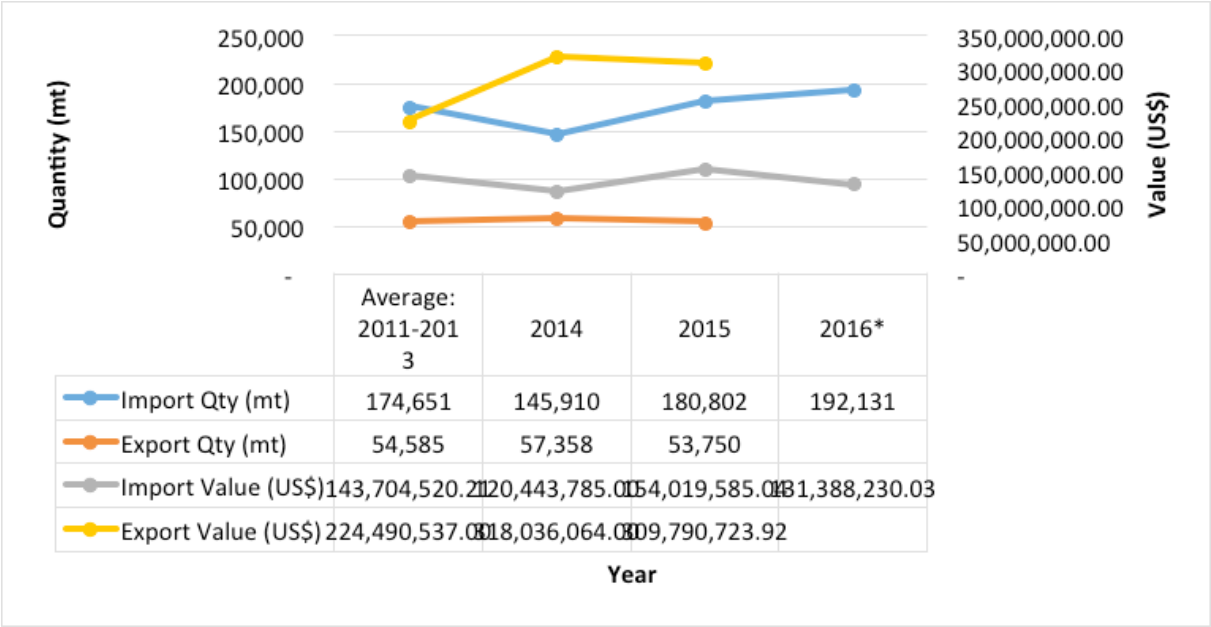
The average proportion of fish exported since 2011 is 13% whiles that of the domestic fish production left for local consumption is 87%. over the period 2011 to 2013, the average fish export was 12%, whiles 88% was for domestic consumption. The percentage change in the proportion of fish exported was 11% increase from 12% (2011 - 2013) to 14% (2014) whiles that of domestic consumption declined by 2% from 88% (2011 - 2013) to 86% (2014). In 2015, a negative growth of 15% was experienced, in terms of proportion of fish exported as compared to a positive growth of 2% proportion of fish consumed domestically over 2014. Percentage change in the proportion of domestic consumption increased by 12% in 2016.



	Average: 2011-2013	2014	2015	2016*
Net Production	389,168	355,719	389,663	465,356
Exports (X)	54,585	57,358	53,750	-

Figure 2. 8: Fish Export and Net Production *Source: MoFAD*

Fish trade is very essential since it contributes to the foreign exchange earnings of the country and increases incomes of the fishers as well as improves livelihoods. Figure 2.8 shows that volume of fish imports has always been higher than fish exports since 2011, however, the inverse occurs with the value where the foreign exchange earnings from exports are generally higher than the imports. The average net value of export increased from US$80.8 million (2011 - 2013) to US$197.6 million (2014) representing 59%. The value of export however, decline by 27% to US$155.8 million in 2015.



	Average: 2011-2013	2014	2015	2016*
Import Qty (mt)	174,651	145,910	180,802	192,131
Export Qty (mt)	54,585	57,358	53,750	
Import Value (US$)	143,704,520.21	120,443,785.01	154,019,585.01	131,388,230.03
Export Value (US$)	224,490,537.03	318,036,064.03	309,790,723.92	

Figure 2. 9: Fish Exports and Imports (2011-2016) **Provisional*

2.6 Nutrition Sensitive Agriculture.

Nutrition sensitive agriculture is a food-based approach to agricultural development that puts nutritionally rich foods, dietary diversity, and food fortification at the heart of overcoming malnutrition and micronutrient deficiencies. Activities implemented centred around promotion of micro-nutrient rich foods, trainings, sensitization and research.

The ministry carried out nutrition training sections across the country which benefitted over 100,000 peoples, Table 2.18. The ministry engaged in educational campaign activities including awareness creation on food-based nutrition in relation to food production, basic nutrition education - using the three food groups chart and the calabash game and Protein Energy Malnutrition (PEM). Table 2.18 indicates that, the number of beneficiaries reduced by about 12% similarly, female participation decreased by about 2%, from about 78% to about 76%.

Table 2. 18: Beneficiaries of Nutrition Training

Region	2016			2015		
	Male	Female	Total	Male	Female	Total
Upper East	7,102	23,480	30,582	7,201	37,042	44,243
Volta	370	796	1,166	2,505	3,235	5,533
Western	21	26	47	50	65	105
Eastern	985	7,486	8,471	722	5,317	6,039
Central	2,477	3,744	6,221	346	584	1,010
Greater Accra	878	2,828	3,706	878	2,828	3,706
Brong Ahafo	466	1,025	1,491	197	717	914
Ashanti	4,639	8,528	13,167	4,592	6,620	11,212
Upper West	7,450	30,653	38,103	7,450	30,653	38,103
Northern	-	-	-	1,934	3,737	5,671
TOTAL	24,388	78,566	102,954	25,875	90,798	116,536

Source: WIAD-2016

Efforts were also centred on training in the preparation, trials and dissemination of Orange-Fleshed Sweet Potato (OFSP) and soya utilization as a food base approach to addressing Vitamin A deficiency. This promotion was done through a training session for Flour Users Associations in Sokpe in the South-Tongu District and Dzodze in the Ketu North Districts all in the Volta Region. The program brought together 70 flour users from the two districts.

In addition, trials were conducted at the Women in Agriculture Development Directorate (WIAD)'s food laboratory for the promote the use of Orange-Fleshed Sweet Potato (OFSP)in the

preparation of local foods. The recipes assayed included: OFSP Porridge, One pot dish (OFSP + Legumes), TZ with sweet potato leaves soup, Banku (proportion of OFSP & corn dough) and OFSP - Agbele kaklo. The dishes turned out satisfactory and therefore recommended for promotion to farm families for improved nutrition across the country.

To make nutritive food substances cheaper and readily available, Centre for Scientific and Industrial Research (CSIR), identified maize, sweet potato and cassava as suitable parental lines to develop bio-fortified high nutrient crops in the coming years. The institute also carry out extensive evaluations and demonstrations and released progenies for production by farmers in 2016. One of the key planned activities for the period is to organise sensory evaluations for school children under the School Feeding Programme.

The ministry also carries out an education campaign to support dietary diversification which resulted in an organoleptic tests for different flavours on gari with garlic, coconut, pawpaw, ginger and soybean with a collaborator. OFSP is also being used to make gari which has been highly accepted. In addition, in collaboration with CRS, 128 women in Talensi, Nabdam, Kassena Nankana West, received training which addressed utilisation of moringa, agushie and soya beans.

The Catholic Relief Services (CRS) funded the training of their Nutrition Champions at the community level in 3 districts, namely, Kassena/Nankana West, Talensi and Bongo. Twenty-eight (28) champions were trained in each district. The training covered basic nutrition education and utilization demonstrations on OFSP, soya beans, moringa and agushie. Dishes prepared included: OFSP fortified T.Z with moringa soup; OFSP fortified banku with soya and groundnut soup; Soya–millet tubaani; Soya appapransa; kooko; mpotompoto and local porridge; and boiled and fried OFSP with soya and agushie palava sauce. These champions are expected to replicate the training in their various communities/zones of influence.

2.7 Availability of and access to Food

One of the major indicators of food security is food availability and access. Food situation report during the year suggested the availability of foodstuffs in all major markets over the period is generally satisfactory. To draw this conclusion, the ministry monitored the performance of at least 3,342 major market outlets in 2015 as against 3,526 in 2016.

There is an average of 371 market centres in each region. Most of these markets operate weekly whiles the others operate daily thus making foodstuffs readily available/accessible for sale in the regions. Table 2.19 indicates that Ashanti Region has largest number of market outlets with Greater Accra registering the least.

Table 2.19: Number of Food Markets by Region

Region	Number of District Food Markets (Daily to Weekly) All Year Round	
	2015	2016
Total	3,342	3,526
Average per region	371	392
Minimum per region	51	49
Maximum per region	1,550	1,639
Ashanti	1,550	1,639
Brong Ahafo	479	537
Central	500	498
Eastern	417	458
Greater Accra	51	49
Volta	128	128
UER	82	82
UWR	79	79
Western	56	56

Source: Compiled from RADU 2016 Reports

The Techiman market is one of the biggest food markets in Ghana. It serves as a major transit point for maize produced both from the northern and middle belts of Ghana. Maize is also imported from neighbouring countries to Techiman during scarcity and exported during gluts. In view of this, the market is extremely congested, with no proper infrastructure to support trading activities. Maize is therefore found being dried on tarpaulin on the floor and stored in makeshift structures.

To improve the situation, GIZ/MOAP facilitated a Public Private Partnership arrangement between the Techiman Municipal Assembly and traders at the maize market to build 238 new market sheds and construct a bridge to ease the traffic in the market. About 1,100 traders benefited from this PPP facilitation. On average about 1,950 metric tonnes of maize is traded in the newly built maize market weekly.

2.8 Support to Diversification of Livelihood Options

The Government through MoFA and MoTI has initiated a programme dubbed Rural Enterprises Programme (REP) to reduce poverty and improve the livelihoods and incomes of rural poor, micro and small entrepreneurs. The specific objective is to increase the number of rural Medium and Small Enterprises (MSEs) that generate profit, grow and create employment opportunities,

wealth and improve living conditions. The programme has created 34,402 (11,927 male and 22,475 female) new jobs by 2016. As a result, there are very strong indications of a general improvement in the livelihoods of the beneficiaries and their households. Text Box 2.2 shows a beneficiary of REP's Business Advisory Services(BACs).

Mr. Akwasi Asomani, aged 24, is a beneficiary located at Besease in the Kwahu South District in the Eastern Region. Akwasi could not proceed beyond secondary school education due to poverty, even though he passed his examination. Prior to meeting the Mpraeso BAC in 2013, Akwasi was into cassava and plantain farming and had just started producing palm oil for sale using indigenous methods. He received basic and advanced trainings in oil palm processing as well as business management training. He was later assisted to secure an EDAIF credit of GH¢ 8,000 to acquire oil palm processing equipment.

Today, Akwasi is a proud owner of the Pasomani Enterprise, duly registered with the Registrar General's Department. The oil palm processing business is his main source of livelihood and has now partnered with his father to run the business. Akwasi who was earning an average income of GH¢200 a month from his farming business now makes about GH¢500/month profit from his business. At his current age, Akwasi is the breadwinner for his family.

Box 2. 2: REP BAC Beneficiary

Source: 2016 REP Report

In the Upper East Region the main off-farm activities were on craft works (baskets and hat weaving and pottery), shea, dawadawa, rice parboiling and groundnut processing, pito brewing, and petty trading. These provide sources of income and livelihood to farmers especially women during the off-farm season. The ministry provides training to farmers on improved processing of agricultural commodities, thus reduced post-harvest losses as well as improving the quality and shelf life of the produce to attract better prices for farmers.

With Government efforts to reduce the vulnerability of the poor and increase investments in the agricultural sector, the Rural Enterprise Programme (REP) collaborated with the three (3) Farm Institutes to undertake skill training for the youth. A total of Nine hundred and ninety (990) youth, comprising 368 females and 622 males were trained in various agribusinesses including the production of poultry, mushroom, cattle, pig, fish, goat, sheep and beekeeping.

Table 2.20: Training in Agribusiness

NAME OF TRAINING INSTITUTION	TITLE OF COURSE	No. OF PARTICIPANTS		
		MALE	FEMALE	TOTAL
WENCHI	Baking and Confectionery	7	120	127
	Rabbit and Grasscutter	13	54	67
	Mushroom Production	92	69	161
	Pig Production	40	11	51
	Sheep and goats production	126	41	167
	Poultry Production	42	25	67
	Cattle Production	29	2	31
	Bee-keeping	14	2	16
	Sub Total	**363**	**324**	**687**
ADIDOME	Poultry production	46	19	65
	Pig production	39	1	40
	Beekeeping	12	1	13
	Sheep and Goats	31	4	35
	Sub Total	**128**	**25**	**153**
ASUANSI	Sheep and goats production	22	3	25
	Pig production	41	2	43
	Mushroom	42	10	52
	Poultry Production	26	4	30
	Sub Total	**131**	**19**	**150**
	Grand Total	**622**	**368**	**990**

Source: HRDMD, 2016

A total number of two hundred and twenty seven (227) youth were trained in sheep and goats production whilst bee keeping recorded the lowest number of trainees (29), Table 2.20. Unfortunately, none of the trainees received any start-up package after completion. The ministry also trained three hundred and fifty (350) farmers and twenty (20) AEAs in innovations at its Technology Dissemination and Training Centres at Kpeve, Babile and Wenchi. The training modules included improved livestock and poultry production; processing of cassava and sweet potato into various products; GAPs on sweet potato; CSA technologies; use of crop by-products as animal feed, and management of post-harvest losses in cereals.

2.9 Improvement in Storage and Distribution

Efforts towards improving storage and distribution are expected to lead to increased availability, access to food at moderate prices on the local market.

2.9.1 Private Sector Capacity Developed in Grain Processing and Storage

Through Public Private Partnership (PPP) approach, the Ghana Grains Council (GGC) has trained private sector operators in grain processing and storage processes. In 2016, a total of 981 (574 males and 407 females) were trained on maize standards, quality improvement, weights and measures, Table 2.21. The overall objective was to promote safe and efficient handling of harvested produce to ensure increase in profit margins by smallholder farmers.

\Table 2. 21: Private Sector Operators Trained in Grain Storage

Years	Training Topics	No. of Beneficiaries			Output of the Training
		M	F	T	
2014	Post-harvest handling / Warehouse Receipts System	2,018	865	2,883	Improved knowledge on grain quality standard and benefits of Warehouse Receipt System
2015	Grain quality standard & warehouse storage management	1,374	1,317	2,691	Improved knowledge on grain quality standard better post-harvest management & storage.
2016	Awareness creation on Maize standard & quality improvement, Weight and measures (NRD Decree 326,1975), Network of food testing labs	574	407	981	Improved knowledge on grain quality standard and benefits of food testing & calibration services.

Source: GGC, 2016

To reduce postharvest losses with minimal investment, GrainPro cocoons are used by some individuals and companies including NAFCO. At the household level, super grain bag has been identified as a farmer-friendly storage bag that allows cereal/grains and other crops to be safely stored for extended periods. This technology was also introduced by MoFA and private companies to improve storage. Promotion of this technology was through demonstration to farmers, traders and households at strategic maize producing areas. In 2016, demonstration of the super bag storage technology was done for grain storage in Ejura, Kpasa, Ajumako, Jasikan, Cape Coast, Denu, Sekyedumase, Asebu and Amasaman for maize farmers and traders.

2.10 Irrigation Development

The ministry through Ghana Irrigation Development Authority (GIDA) in collaboration with its partners, provided irrigation and related infrastructure and services to improve upon the agricultural production of farmers. In the year under review the Government has promulgated L.I. 2230 of 2016 to promote establishment of Water User Associations (WUAs) on public and community-managed irrigation schemes and dams nationwide. This is part of the effort to promote private sector participation in irrigation development, management and utilisation.

For private participation, irrigation must be cost -effective. To promote cost-effective irrigated agriculture in the country, the ministry embarked on groundwater and surface water development in 2016. With funding from the Spanish Government, the ministry implemented an Irrigation and Groundwater Resource Development Project. This was to ensure sustainable crop production especially in the dry season. Sprinkler accessories were supplied to Weija Irrigation Scheme which resulted in the cultivation of additional 55 hectares of land generating employment for 45 agricultural households. This intervention also resulted in a 26% increase in production from 10.17 metric tonnes to 12.81 metric tonnes per hectare.

The main canal and three (3) sumps on the Mankesim Irrigation Scheme were also rehabilitated coupled with the construction of a warehouse with a storage capacity of two (2) tonnes. Four (4) agro-meteorological stations were also established for real time climatic data collection at Bongo, Mankessim, Weija and Wenchi. Additionally, five (5) tube-wells have been constructed at Shime in the Volta Region to promote irrigated agriculture.

surface water development for irrigation, the ministry is constructing 10 schemes to promote export trade. This includes construction of Mprumem and Tamne Irrigation Projects which are on-going at 30% and 20% completion respectively while construction works on Kiape and Mandari Projects were completed and handed over to farmers. Pre-feasibility studies were also completed at Kpli, Ho-Keta Plains and Sabare while that of Kamba is on-going. Studies and draft designs were also completed on the Amate Irrigation Project while review of designs is completed at Nasia-Libga. Funding for these projects was obtained from EDAIF and are available.

On the other hand, provision of irrigation infrastructure for selected communities in Upper East, Eastern and Volta Regions under Livelihood Support Improvement Project (LSIP) is at various stages of completion. At Atidzive-Ayiteykofe and Aka Basin, construction works has been completed. Construction work is on-going and at 95% and 20% completion at Kornorkle, and Uasi respectively.

2.10.1 Formal Irrigation

In 2016, area developed under formal irrigation increased marginally by 2.9% over 2015 figure of 10,867 hectares. An overall increase of about 85% in the area of 9,367.90 hectares that was cropped in 2015 was observed leading to crop production increase of 179% over the same period. The increase in production was as a result of improvement in monitoring of the schemes. The overall performance of vegetable production increased by 196% while cereal production increased by about 129% with legumes also recording significant increases. Average yield of notable crops are rice - 4 tonne per hectare, tomato - 29 tonne per hectare, pepper – 9.8 tonne per hectare and okra – 13.2 tonnes per hectare.

2.10.2 Informal Irrigation

Informal irrigation may be defined as irrigation practised by individuals who cultivate an area of about 0.5 hectare or more using infrastructure or equipment for water storage, conveyance and distribution usually funded by a private individuals or NGOs. Informal irrigation was carried out in all regions except the Western Region. Area cropped in 2016 increased by 61% compared to that of 2015. The increment came mainly from Volta Region. This can be attributed to improvement in data collection in the region.

Three cropping cycles were recorded in five regions (Greater Accra, Upper East, Eastern, Northern and Central Regions) while two were recorded in Volta, Ashanti, Brong Ahafo and Upper West Regions. The combined area cropped under both formal and informal irrigation in 2016 was 66,871.66 hectares, an increase of 68% over 2015 which stood at 39,711.79 hectares (This excludes large scale commercial irrigation.

2.10.3 Rehabilitation of Irrigation Infrastructure

To promote efficient irrigation infrastructure utilisation, the ministry through NRGP in provided technical support in the rehabilitation of 11 irrigation schemes. A total of 285 prospective irrigation farmers were trained under the re-organization and sensitization of WUAs. This included 40 farmers in Dordoekope, 23 in Tordzinu, 39 in Tokpo, 33 in Volo, and 30 each in Afaode, Agorveme, Sogo, Dipali and Dinga. Farmers were trained on formation of WUAs, land allocation and determination, collection and use of Irrigation Service Charge (ISC). Other training areas include, farm business management and marketing, water management, record keeping, agricultural finance and credit and maintenance of irrigation infrastructure. In addition to this, the ministry in collaboration with Ghana Social Opportunities Project (GSOP) provided technical support for rehabilitation of dams and dugouts in the three (3) regions of the north, Table 2.22.

Table 2.22: Summary of Dams and Dugouts in the 3 Regions of the North

Name of Region	Number of Dams and Dugouts Rehabilitated		
	Completed	On-going	Total
Upper East	44	20	64
Upper West	51	12	63
Northern	22	30	52
Total	117	62	179

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2.10.4 Irrigated Land Use Efficiency

Irrigated land use efficiency is expressed in intensification ratio and it is a measure of how developed lands have been judiciously used for irrigation. It shows the number of times the land has been cropped within a year and normally reported on formal irrigation schemes. The land intensification ratio for irrigation schemes in 2016 was 1.57, 78% improvement over 2015. The improvement in intensification ratio was accounted for by improvement in monitoring of the irrigation schemes.

2.10.5 Transportation of Agricultural Produce

Seasonally impassable roads or slow and infrequent transport services, coupled with poor storage, can lead to losses as certain crops (e.g. fresh vegetables, fruits etc.) deteriorate quickly over time. Roads, especially farm and feeder roads need to be improved to enhance easy passage. Over the period, spot improvement and rehabilitation of feeder roads improved significantly. Under spot improvement, a total of 3,717.62 kilometres of feeder roads was carried out between 2011 and 2016. With regard to routine maintenance, 16,182.68 kilometres was covered as indicated in table 2.23. This opened up more access roads and improved movement of goods and people to and from marketing centres. It is expected that this would ultimately improve the livelihood of rural farmers.

Table 2.23: Length of Feeder Roads and Bridges Constructed and Rehabilitated

Item	2011	2012	2013	2014	2015	2016
Spot improvement (km)	469	1,285	530	948	373	112.62
Rehabilitation (km)	623	1,325	1,395	418	469	16,182.68
Bituminous surfacing (km)	-	-	-	195.95	N/A	417.74
Steel bridges (No)	17	16	21	-	N/A	n/a

Source: Department of Feeder Roads

2.11 Promotion of Agricultural Mechanization

To facilitate the transformation from the use of rudimentary tools to mechanization, the ministry initiated the establishment of Agricultural Mechanization Services Centres (AMSECs) in all ten (10) regions in collaboration with the private sector.

2.11.1 Establishment of AMSECs

The number of operational AMSECs has reduced from 82 in 2014 to 48 in 2015. This was mainly because of lack of spare parts to fix the broken machinery and inadequate managerial skills. In an attempt to revamp this initiative, agricultural machinery/equipment worth USD 32,366,200 under the 1st tranche of Brazil More Food International Programme was imported to establish more AMSECs. The items imported are indicated in table 2.23. The Government of Ghana

subsidized (60% subsidy) the machinery to enable more farmers and other interested Ghanaians afford it. It is worth noting that, as part of equipment, is 224 gender friendly shellers and 112 multi-crop threshers. These equipment are easy operated by women farmers and hence expected to improve their productivity. The impact of this singular effort will be monitored and results reported in subsequent years.

Table 2.24: Agricultural Machinery/Equipment Purchased

No.	Item	Total Quantity Imported
1	New Holland Tractor	111
2	Massey Ferguson Tractor	150
3	Valtra Tractor	288
4	Maize Sheller	224
5	Multi-crop Thresher	112
6	Cereal Harvester	21
7	Cassava Harvester	50
8	Cassava Planter	25
9	Mechanical Planter	60
10	Pneumatic Planter	15
11	Seed Drill	36
12	Boom Sprayer	20
13	Mobile Mechanical Workshop	12
14	Trailers only	102
15	Ploughs only	102
16	Harrows only (18 discs)	102

Source: AESD, 2016

In 2016, the ministry made a policy shift on the concept of the AMSEC. Accordingly, the AMSEC is defined to include a minimum of two tractors with other implements such as planters, boom sprayers, shellers, etc, and put at the service of a community. There was also rehabilitation of four existing AMSECs increasing the total AMSECs from 59 in 62 districts to 142 in 97 districts in 2016.

An assessment carried out on the performance of the existing AMSECs (59 operational AMSECs) by the ministry revealed that about 81% were operational. Comparing 2015 AMSEC beneficiaries of 19,134 to 2016 of about 18,348, and the reducing numbers of operational AMSECs, it is indicative that, farmer access to mechanization services has reduced. From figure 2.10, the area ploughed by the AMSECs declined by about 77% from 2013 to 2016, and about 44% from 2015 to 2016. Details of these are shown in Appendix 8.

The importation of these new tractors and implements has helped made available additional 549

variant equipment's to the Ghanaian farmer, reducing the tractor to farmer ratio by about 18%. This improved the current tractor to farmer ratio of 1:1,500 to 1:1,230 by December, 2016.

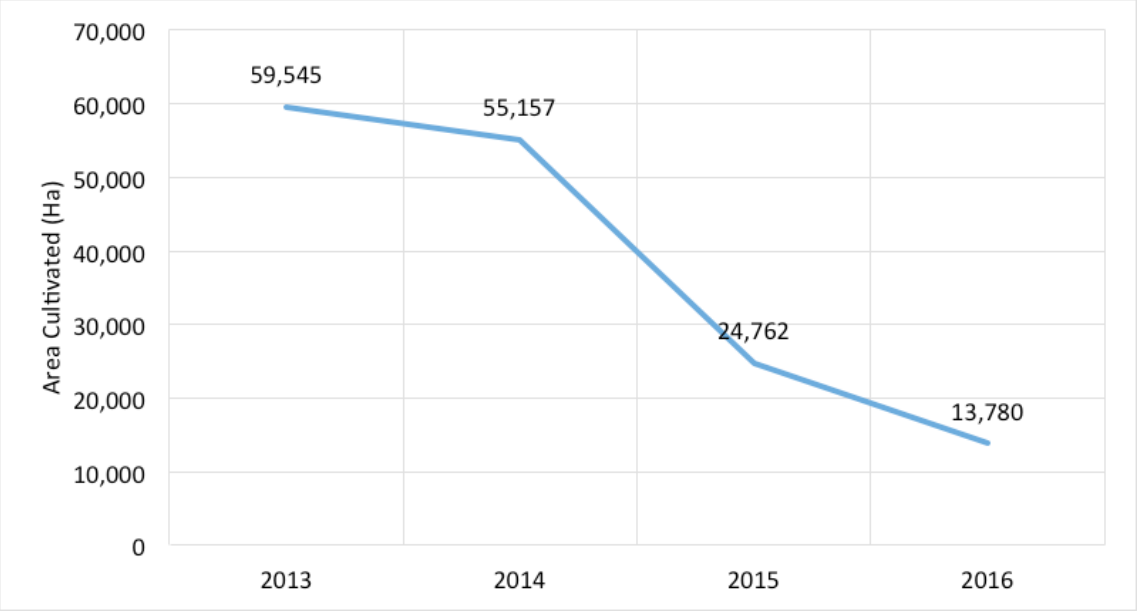

Figure 2. 10: Area Cultivated (Ha) by AMSECs Source: AESD

2.11.2 Promotion of Appropriate Agricultural Machinery Through Capacity Building

The country is challenged with low level of agricultural mechanization as a result of limited local capacity for machinery fabrication and manufacturing. To address this situation, the REP helped to upgrade the capacity of local fabricators through technical skills training and technology dissemination. A total of 102,530 master crafts persons and apprentices in welding and fabrication, blacksmithing, and automobile servicing were upgraded. Thirteen thousand eight hundred and eighty three (13,883) of these participants have so far been supported as master crafts persons and apprentices to set up service centres across the country. The result of this PPP is expected to improve access to mechanization services.

In a similar development, in collaboration with the Japanese International Cooperation Agency (JICA), two (2) training centres under the ministry (Wenchi and Adidome Farm Institutes) were re-equipped to train agricultural machinery/equipment operators. Hundred (100) beneficiaries including tractor operators, AMSEC managers and students were trained at the centres in 2016. Machinery received in the country are mostly in Semi Knocked down form. Assembling of this machinery is done in collaboration with the suppliers' agent as a form of capacity building of mechanics, technicians and engineers. This would ensure that the capacity of local technicians and beneficiaries are built to

facilitate timely repairs and regular maintenance of the machinery/equipment and to improve handling and maintenance of the machinery.

WAAPP funded the manufacture of five thousand (5,000) hand peelers and twenty (20) mechanical peelers which were distributed to cassava processors in the Eastern, Ashanti, Brong Ahafo, Central, Greater Accra, Northern and Volta Regions. This was done in collaboration with WIAD to reduce drudgery and increase efficiency of processing for predominantly female labour force.

CHAPTER THREE

3.0 Increase Growth in Incomes

Ghana's agriculture and agribusiness sector is estimated to currently employ about 46 percent of the nation's employable work force (GLSS 6, 2013). Exploiting value addition along the chain with adequate private sector involvement further enhances the potential of the sector to create more jobs and grow incomes of beneficiaries. This chapter analyses interventions to promote increased growth in incomes in the sector as described under programme 3 of METASIP II. It covers private sector investment into agriculture, improvement in agricultural financing and development of selected cash crop value chains.

3.1 Promotion of Cash Crops for Income

In recent times, efforts are being made to improve the relationship between industry and agriculture. This has resulted in agricultural sector enjoying the patronage of key agro based industries. The Ghana brewery industries; Guinness Ghana Breweries Limited (GGBL) and Accra Brewery Limited (ABL), have continued to show interest in the processing of local raw materials into finished products. During the year, the two industries used local materials in their respective breweries. The introduction of beer and malt made from cassava, rice, maize and sorghum is providing ready market for these crops especially cassava and sorghum. In tables 3.1 and 3.2 are the quantities and values of raw materials purchased by these companies.

Table 3. 1 : Local Raw Materials Purchased by Accra Brewery Limited

Year	Commodity	Quantity (Mt)	Value (GH¢)
2013	Cassava	1.214	n/a
2014	Cassava	794.6	488,431.77
	Red Sorghum	161.1	233,196.40
	Maize Grits	2,994.5	4,299,936.10
	Whole Grain	270.35	279,348.96
2015	Cassava Flour	85	192,256.00
	Red Sorghum	584	884,400.00
	Paddy Rice	825	1,155,000.00
	Whole Maize	25,900.00	36,460,000.00
2016	Maize Grits	7,204.95	20,332,263.28
	Whole Maize	171.60	292,462.01
	Red Sorghum	93.45	185,427.32
	Cassava Flour	107.60	243,581.02
Total		39,192.15	65,046,302.86

Source: Accra Brewery Limited

Table 3. 2: Local Raw Material Purchase by Guinness Ghana Breweries Limited

Commodity	**Year**	**Quantity (Mt)**	**Value (GH¢)**
Cassava	2013	3,527.00	n/a
	2014	7,368.32	1,105,248.00
	2015	6,409.70	1,153,747.00
Maize	2015	4,813.00	n/a
Sorghum	2015	4,885.00	n/a
Sorghum	2016	2,014.00	n/a
Total		29,017.02	2,258,995.00

Source: Guinness Ghana Breweries Limited

During the year, ABL alone purchased maize, sorghum and cassava flour to the value of over Twenty One million (Gh ₵21.054 million) Ghana cedis. These raw materials were bought mainly through Premium Foods and Yedent Agro Proc. Ltd, and Caltech Ventures Ltd. both indigenous suppliers. This made this sum of money available to the individual farmers whose produce were bought.

3.2 Private Sector Investment in Agriculture

In line with the objective to promote private sector investment in agriculture, the Agribusiness Unit of the ministry was established to provide technical advice and necessary information to investors to aid the establishment of businesses in the sector. Information on access to markets, finance, vegetable production and acquisition of land etc., are the most frequently requested by

patrons of the unit. During the year under review, the unit received forty-eight (48) prospective investors. Eighty-four percent (84%) of these clients were satisfied with services received per a survey conducted. Match making activities were also provided to investors, through various financial institutions, Ministries, Departments and Agencies as well as projects for assistance.

As part of the third and final phase of JICA's Technical Cooperation Project (TCP) on "Capacity Development of the Agribusiness Unit for Promoting Agriculture Investment by the Private Sector", the unit collected data along selected commodity value chains which was used to produce commodity profiles. This was to make data on production, trade channels, yield, price (in comparison with neighbouring countries), cropping areas, suitable soils and soil variety, readily available to investors. Data on processed products, investment potential, successful case studies, are as well available, to prospective investors.

The ministry in collaboration with Ghana Investment Promotion Centre (GIPC) is developing an investor tracking system to track the activities of investors in all sectors including sector. Other partner institutions such as the Registrar General's Department and the Ghana Revenue Authority are intended to be linked to the system to enable sharing of information and the establishment of a "one-stop shop" for the management of investors in Ghana. The system will be adequately protected from unauthorized usage. Additionally, the Savannah Accelerated Development Authority (SADA) in collaboration with GCAP have developed a road map for investment into agriculture within the Northern Savannah Ecological Zone.

3.3 Improvements in Agricultural Financing

Financing in the agricultural sector is a major challenge, mainly due to the high risk nature of sector primary activities. The ministry in collaboration with Bank of Ghana and other stakeholders in the financial sector drafted the Ghana Incentive Based Risk- Sharing System for Agricultural Lending (GIRSAL) project. It is an Impact Investment Fund (IIF) employing a holistic approach to address challenges faced by agricultural value chain actors in accessing finance. The main objective is to reduce the overall risk in agricultural financing to boost agricultural production, productivity and export with the aim of increasing foreign exchange earnings, supporting import substitution, and promoting economic growth and development. The project was launched in October 2016, and would operate under six (6) pillars namely:

1. *Risk Sharing Facility: to develop appropriate risk-sharing instruments to reduce lending risk of banks and to leverage their balance sheets into strategically selected agriculture value chain.*
2. *Technical Assistance Facility: to strengthen the capacity of commercial banks and other financial intermediaries in risk assessment and pricing in the agricultural value chain.*

Additionally, this is to develop new platforms for loan delivery to financially excluded agricultural business communities, as well as the provision of technical assistance to farmer groups and agribusinesses.

3. *Agribusiness Insurance: to develop and deploy appropriate insurance products for agriculture and agribusiness to lower risks faced by smallholder farmers and 'agripreneur'.*

4. *Bank Rating Scheme: to rate banks in terms of volume and effectiveness of lending delivery to the actors in the agricultural value chain, with the goal of creating additional incentives for banks that are achieving impact on agricultural lending.*

5. *Bank Incentive Mechanism: to develop appropriate incentives to reward banks that excels in the "GIRSAL" agriculture rating scheme.*

6. *Digital Finance: to scale-up low-cost delivery of financial services, particularly in rural areas and other financially excluded areas of the country, through development and adoption of innovative digital technology such as mobile phone banking and other digital service platform.*

3.4 FBO Development

In the current face of dwindling AEA numbers, one sure way to maintain dissemination of improved technologies is through the use of FBOs. The capacities of 4,219 farmers (Male: 2,604; Female: 1,615) comprising 2,687 beneficiaries from 409 FBOs, 1,532 individual farmers and other actors were built along the agricultural value chain in 21 districts. Sixty two percent (62.0%), 38% 28% were males, females and persons with disabilities (PWDs) respectively, about 39.8% were youth. The training covered the following areas:

1. Agribusiness,
2. Farm Management,
3. Post-Harvest Management,
4. Agricultural Value Chain Financing Analysis and
5. Safe Use and Handling of Agrochemicals.

NRGP and its implementing partners have been key players in building the capacity of farmers in the beneficiary communities. The programme mobilizes farmers into FBOs and links them to processors, marketers and distributors through the District Value Chain Committees (DVCCs). To date, 8,127 FBOs have been formed through this process.

DVCCs are innovative creations of the programme that assist members of FBOs in the districts to be linked to other actors such as aggregators, finanacial institutions, input dealers, processors and distributors in the value chain. The DVCCs have impacted positively in some beneficiary districts. In the Garu-Tempane District, for example, the DVCC has opened an account with BESSFA Rural Bank Limited using funds from farmer groups' registration fees. It has facilitated

GH₵ 1.8 million (USD 683,773.87) worth of credit for 5,495 smallholder farmers in 448 FBOs since 2010 with 63% of the beneficiaries being female. The DVCC has also established an Animal Traction Users Association. Through the effort of DVCCs, the number of input dealers who participated in the cashless model increased from 1 in 2010 to 7 in 2015. Number of FBOs represented in the DVCC has increased from 15 in 2010 to 74 in 2015. The participating financial institution (BESSFA Rural Bank) consistently recorded 100% recovery rate from 2010 to 2013, 97% recovery in 2013 and 95.72% in 2014.

In the Bawku West District, the Toende Rural Bank disbursed through the Cashless Credit Model, an amount of GH₵ 286,843.00 has been advanced to 626 farmers in 53 farmer groups in 2015. Since the inception of the cashless model, the number of participating groups has increased from 7 in 2010 to 438 in 2015. Also, total savings balance increased from GH₵ 6,434.67 in 2010 to GH₵ 79,750.36 in 2015. Farmers' income has grown by 101% from 2010 to 2012 mainly due to a sharp increase in disbursement in the district. Growth in income from 2013 to 2015 farming seasons has been between 35% and 57%. Participating financial institutions are also benefiting from the cashless model. Recovery rates of loans have increased, and so have guaranteed interest and fees income. There are also increases in number of FBOs' account/deposit base, and training of banks' credit staff.

3.5 Rural Infrastructure Development

Provision of rural infrastructure, including small dams, should boost production, marketing and processing which should result in improved living standards for rural dwellers in Ghana. Small dams are important tool for improving livelihood and income in the three regions of the northern.

Table 3.1 shows that 1,264 hectares of irrigable land has been developed. One thousand and three hectares (1,003ha) flood recession schemes was also developed. Inland Valley Rice Development Project (IVRDP) and Small Scale Irrigation Development Project (SSIDP) schemes with combined potential irrigable area of 2,61.61 hectares have also been constructed.

Table 3. 3: Targets and Achievements of Small Scale Irrigation Development

	Target in Appraisal report, ha	**Midterm Revised Target, ha**	**Achieved, ha**	**Percent Achieved**
Development of irrigable land	4,500	1,852	1,264	68.3
Constructions of dugout wells	410	0	-	-
Development of flood recession schemes	400	1,000	1,003	100.3
Rehabilitation/completion of IVRDP Schemes	-	633	650	100.2
Rehabilitation/completion of SSIDP Schemes	-	-	2, 111.61	-

Source: NRGP Tamale, (2016)

3.6 Policies/Activities to Promote Livestock

A national launch for the Control and Eradication of Peste de Petits Ruminants (PPR) through mass vaccination of sheep and goats was undertaken. This is a global programme implemented by OIE, FAO and AU-IBAR to eradicate PPR in small ruminants worldwide. As a result of this effort, it is being anticipated that the incidence of PPR will be reduced to the barest minimum.

During the period, Ghana Livestock Development Policy and Strategy was officially launched. Stakeholders at the launch recommended that an action plan should be developed for implementation. National Livestock Policy Hub was established in 2013 under the AU-IBAR Project called Reinforcing Veterinary Governance in Africa Programme. The hub serves as a think tank of stakeholders in the livestock industry to draw policies for the development of the livestock industry for incomes. Working groups have been formed under various themes (pigs, small ruminant, cattle and poultry working groups). There is also an existing work plan for all the working groups to use in advising government on livestock development.

The Diseases of Animal Act, 1961 (Act 83) was enacted as far back as 1961 to address Animal Health Issues. As part of the regular appraisal of standards for Veterinary Services, every 4 years, the World Animal Health Organisation (OIE) undertook a Performance of Veterinary Services (PVS) in 2016. The assessment revealed that no provisions were made in the existing Diseases of Animal Act, 1961 (Act 83) in the areas of hatchery inspection, meat inspection, veterinary pharmacy and biologicals inspection and recommended a review of the act.

In 2016, the ministry in collaboration with the Ministry Justice and Attorney General's Department with financial support from the Food and Agriculture Export Alliance, USA, organized a multi-stakeholders workshop on the Veterinary Services and Animal Production Bill To get the bill aligned with ECOWAS Protocol on veterinary drugs and biologicals, however the protocol is yet to be ratified by the Parliament of Republic of Ghana.

CHAPTER FOUR

4.0 Marketing of Agricultural Products

Marketing of agricultural produce is one of the major challenges faced by producers in the sector. To facilitate the advancement of a policy to regulate the marketing system as well as address the emerging problems related to marketing, the ministry commissioned a study to assess the agricultural marketing practices, and institutions and regulatory frameworks to provide a comprehensive situational analysis of the agricultural marketing in the country.

4.1 Improvements in Post-Production Management

Improvements in post-production management aim at establishing functional commodity clusters for effective supply chain management. During the period under review, the ministry carried out programmes aimed at promoting quality locally processed and well packaged products and cottage agro-processing industries in all parts of the country. Research conducted by the University of Cape Coast revealed a high amount of carcinogenic substances in the exported smoked meat. In order to facilitate the acceptance of Ghana's guinea fowl meat in the international market, the hot wood smoking technology was introduced by the Animal Research Institute (ARI). The technology makes use of the ARI smoker. The main aim of the technology is to reduce carcinogenic compounds in the processed meat. The sooth is filtered so that it does not get in contact with the meat being smoked. Also, CSIR-ARI pledged to dispatch technical personnel from Accra to assist any processor interested in constructing the ARI smoker.

Picture 4. 1: The Obaasima Seal

To further enhance quality of products that are sold locally, the Association of Ghana Industries (AGI) and the Ghana Standard Authority (GSA) with support from the GIZ funded Affordable Nutritious Food for Women (ANF4W), the Obaasima Seal was successfully launched. The seal which will be placed on products that are fortified with 18 vitamins and minerals is to reduce malnutrition among women of reproductive ages and children. The seal which is being promoted by AGI has been adopted by 3 major food processing companies who have agreed to fortify their processed products

with all 18 vitamins and minerals in conformity with the standards of the seal. Awareness is being created all over the country to sensitize the public to facilitate adoption.

Additionally, with support from the Market Oriented Agriculture Programme (MOAP), capacities of 81 representatives of processing companies were built in ISO 22000, ISO 9001:2008 standards, Hazard Analysis Critical Control Point (HACCP) for pack houses, sanitation and hygiene for citrus & pineapples processors. On a small-scale level, some producers from Brong-Ahafo Region acquired skills to process mango into juice for domestic use as a way of improving nutrition, and reducing post-harvest losses.

Picture 4. 2: Ghana Green Label

The ministry in collaboration with GSA and Ghana Veg, received support from GIZ MOAP to develop a local standard certification scheme that guarantees the quality and safety of produce produced under good agricultural practices (GAPs) known as the Green Label. The label which was successfully launched in 2016 will enable farmers who adhere to Good Agriculture Practices (GAPs) sell their produce at selected sales points at enhanced prices. This will promote development of the local market, increase income of smallholders and ensure quality control and food safety.

Post-harvest losses are major challenges hindering the optimization of agricultural production in Ghana. Consistent high post-harvest losses are recorded among value chains year on year. To reduce its impact, GIZ introduced an improved solar drying technology in the country. The solar bubble dryer is an innovative drying solution that takes advantage of renewable energy (i.e. solar radiation) efficiently and safely dries commodities and protect them from sudden rain and foreign materials. Fourteen (14) dryers were introduced to pilot the technology. Capacity of local artisans were built to fabricate an improved version of the bubble dryer known as the solar hybrid balloon dryer using local materials. This improved dryer reduces drying time, increases quality of products and reduces cost of purchase by GH₵10,050.00 compared to the imported bubble dryer.

Picture 4. 3: Imported Bubble Dryer: Photo Credit

Picture 4. 4: Fully covered Work View (left) and locally Manufactured Solar Hybrid Balloon Dryer (right)

Table 4.1: Price Differences between Imported and Locally Fabricated Bubble Dryers

Type of Bubble Dryer	Selling Price (2016) GH¢
Imported Bubble dryer	17,049.52
Locally Fabricated Solar Hybrid Balloon Dryer	7,000
Price Difference	10,049.52

Source: MOAP, 2016

4.2 GlobalGAP Certification

GlobalGAP certification is one major standard that allows producers in horticultural value chains such as mango and pineapple to sell their products to niche markets, locally and internationally. However, high cost of certification processes limits adoption of certification schemes. This is due partly to high cost of importing experts to facilitate the certification process for farmers. Cost of man days, flights, accommodation and insurance of international experts factored into the cost of certification makes it unaffordable to the average producer in Ghana. To make the certification affordable to producers, GIZ/MOAP in collaboration with GSA have supported the establishment of a local certification body called SmartCert. SmartCert provides facilitation services for GlobalGAP certification to producers at a lower rate (10% less than before).

4.3 Ghana Commodities Exchange

Parliament has passed the amendment to the Securities Industry Act mandating the Securities and Exchange Commission (SEC) to license and regulate Commodity Exchanges in Ghana. The act also designates warehouse receipts as securities and mandates the SEC to regulate the warehouse receipt system. Regulations are being finalised to actualize aspects of the law.

The design phase for the project has been completed. This phase was implemented with a technical partner, Eleni LLC supported by a national Ghana Commodities Exchange (GCX)

project team who are all Ghanaian professionals recruited to work with the technical partner for the design of a workable and customized commodity exchange for Ghana. Among other things, this is to ensure knowledge transfer from the technical partners to the Ghanaian professionals and also to prepare the grounds for the Ghanaian professionals to take over the running of the exchange once established.

The design phase of the project included bi - monthly consultations with the GCX Market Council. The Council was made up of commodity value chain actors, from producers to traders/ wholesalers, aggregators, processors, financial institutions and others, with the intent of soliciting feedback on the various outputs of the project. This was to ensure that the design was relevant and feasible. Sensitization and preliminary capacity building were embarked upon to build a sense of joint ownership and engagement with the GCX Project.

4.3.1 Warehouse Receipt System

For an effective roll out of warehouse receipt system to support the operationalization of the GCX, adequate warehousing facilities are required. Provision shall be made in the 2017 budget under the ministry for the provision of warehouses in support of the GCX.

Areas earmarked for the first phase of the GCX designated warehouse facilities include Tumu, Tamale, Ejura, Techiman, Accra for Maize, and Tamale, Worawora and Asutsuare for Rice. Key and of strategic importance is a collaboration with the NAFCO to make use of its existing warehouse infrastructure in the selected areas. This will make warehouses available for use from the very beginning of operations of the GCX. However, most of these warehouses are below the required GCX standards and need to be refurbished to make them suitable for use. Discussions have been held with the management of NAFCO to outline and agree on resources needed to revamp the warehouses with the needed equipment to make them useful to the purpose of GCX.

It is worth noting that even before GCX takes off, GGC operates a self-regulated private sector Warehouse Receipt System (WRS). As at December 2016, eleven (11) warehouses had been certified with grain storage capacity of 54,600 metric tonnes and twenty-one (21) community based warehouses with a grain storage capacity of 2,280 metric tonnes. There has been a collaborative effort by the GSA, Food and Drugs Authority, MoFA, GIZ and the WFP in raising awareness on the use of standards, weights and measures, and good warehousing practices among grain value chain actors. A total of 46,942 metric tonnes of grains have been receipted and GH₵10,000,000 (US$2.5 million) credit leveraged using 12,555 metric tonnes graded grains receipted as collateral.

The ministry also completed three (3) warehouses and one (1) pack house in four (4) districts in Upper West Region. Various private warehouses are also under construction with support from

Ghana Commercial Agriculture Project (GCAP), and GGC. A total of 2,500 metric tonnes capacity warehouses are being constructed at Wa Municipal (2000mt) and Tumu District (500mt) with support from GCAP. In the Upper East Region, two pack houses with capacity of 1,600 metric tonnes were completed with support from NRGP. Additionally, with combine supports from GCAP and NRGP, construction of six warehouses with total capacity of 3,800 metric tonnes were completed in the same region. From table 4.2, the private sector through the support of GGC, stored 54,600 metric tonnes in the year 2016.

Table 4. 2: Quantity of Grains Stored by Private Certified Warehouses

Years	Number of Warehouses Certified	Qty. stored (Receipted Grains)	Mt	Specific regions	Comments
2014	5	N/A	24,600	Brong Ahafo & Northern	After receipting 29,500mt in 2013 the WRS was under review and upgrading
2015	11	17,441	54,600	Northern, Brong Ahafo, Gt. Accra, Central, Ashanti, Upper West.	
2016	11	N/A	50,500	Northern, Brong Ahafo, Upper West, Central, Ashanti.	WRS was under review and upgrading

Source: GGC

4.4 Dissemination of Market Information

The E-Agriculture and E-Extension Portals system of the ministry being pioneered by WAAPP has provided 2000 smart phones to extension officers to access and disseminate relevant agricultural information to farmers. This is to assist the ministry to collect information on farmers and also monitor/ track field issues to boost accurate and prompt response to field problems and early control system to safeguard food security. The e-extension application is being used to register farmers by AEAs in their various operational areas.

The e-extension application now provides a database of registered farmers in the 10 regions as well as of AEAs. This is used to monitor the progress of each extension agent and the effectiveness of the E-extension system. The system synchronizes registered farmers with the fertilizer subsidy portal and generates codes for these farmers to be able to access the on-going fertilizer subsidy program. As at December, 2016 a total of 488,234 farmers (Table 4.3) have been registered across the country through the E-agriculture system. Which means that averagely, 48,823 farmers have

been registered in each region.

Table 4. 3: E-Agriculture Registered Farmers per Region as at December, 2016

Region	Jan	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Total
Greater Accra	4	394	1,848	1,729	2,112	5,072	1,545	850	847	264	246	35	14,946
Brong-Ahafo	12	3,371	15,339	25,648	6,121	4,648	2,720	649	352	83	33	100	59,076
Western	1	2,312	12,555	13,210	4,258	2,718	1,587	397	109	425	513	2	38,087
Upper East	-	686	10,798	5,791	6,569	6,450	3,353	111	43	95	2,806	-	36,702
Upper West	126	492	5,715	7,304	6,069	2,624	293	3	25	1	1,235	1	23,888
Northern	3	2,978	16,247	27,430	14,444	13,231	2,880	312	317	36	215	-	78,093
Eastern	51	1,989	3,144	11,869	12,210	11,207	3,874	1,894	955	242	150	183	47,768
Central	6	1,496	5,747	4,683	4,024	7,539	3,313	2,553	635	29	66	3	30,094
Volta	-	3,659	16,936	12,942	10,978	7,701	1,866	1,263	1,128	114	300	263	57,150
Ashanti	57	1,953	42,663	24,439	14,773	11,791	3,789	1,610	1,030	231	79	15	102,430
Total	**260**	**19,330**	**130,992**	**135,045**	**81,558**	**72,981**	**25,220**	**9,642**	**5,441**	**1,520**	**5,643**	**602**	**488,234**

Source: WAAPP 2016 Annual Report

4.5 Grades and Standards of Agricultural Products

In 2016, a total of 28 agricultural standards were developed to streamline measures and standards to make locally produced products competitive, see table 4.4 for details. In addition, interpretation handbooks for rice, maize and soyabean standards have been developed. Rice and soyabean pectoral standards (GS 765: 2016, GS 1039:2013) have also been developed.

Table 4. 4: Agricultural Standards Developed In 2016

NO	STANDARD	TITLE
1. 1	GS 101: 2016 (2nd Edition)	Fresh Fruits and Vegetables – Specification for pineapple
2. 2	GS 533: 2016 (2nd Edition)	Fruits and Vegetables - Specification for Fresh Sweet Potato
3. 3	GS 545: 2016 (2nd Edition)	Fresh Fruits and Vegetables – Specification For Papaya (Pawpaw)
4. 4	GS 560: 2016 (2nd Edition)	Fresh Fruits and Vegetables – Specification For Sweet Cassava
5. 5	GS 734: 2016 (2nd Edition)	Cereals, Pulses and Legumes – Specification for Whole and Decorticated Pearl Millet Grains
6. 6	GS 765: 2016 (2nd Edition)	Cereals, Pulses and Legumes – Specification for Rice
7. 7	GS 1069: 2016 (2nd Edition)	Fruits and Vegetables – Specification for Baby Corn
8. 8	GS 150: 2016 (4TH Edition)	Roots And Tubers - Specification For Fresh Yams

9. 9	GS 905: 2016 (2ND Edition)	Fresh Fruits and Vegetables – Specification for Fresh Okra
10. 10	GS 926: 2016 (2ND Edition)	Fresh Fruits and Vegetables – Specification for Garlic
11. 11	GS 937: 2016 (2ND Edition)	Fresh Fruits and Vegetables – Specification for Carrots
12. 12	GS 938: 2016 (2ND Edition)	Fresh Fruits and Vegetables – Specification for Aubergines
13. 13	GS 976: 2016 (2ND Edition)	Fresh Fruits and Vegetables – Specification for Fresh Plantain
14. 14	GS 977: 2016 (2ND Edition)	Fresh Fruits and Vegetables – Specification for Fresh Banana
15. 15	GS 1122: 2016	Cereals, Pulses and Derived Products - Specification for Paddy (rough)rice
16. 16	GS 1123: 2016	Fresh Fruits and Vegetables – Specification for Fresh Carambola (Star fruit)
17. 17	GS 95: 2016 (3rd Edition)	Cereals, Pulses and Derived Products – Soft Wheat Flour
18. 18	GS 187: 2016 (3rd Edition)	Cereals and Pulses - Specification for Strong Wheat Flour
19. 19	GS 579: 2016 (2nd Edition)	Cereals, Pulses and Derived Products – Specification for Pasta Products
20. 20	GS 732: 2016 (2nd Edition)	Cereals, Pulses and Legumes - Specification for Sorghum Flour
21. 21	GS 809: 2016 (2nd Edition)	Cereals and Pulses - Specification for Fortificant Premix for Wheat Flour
22. 22	GS 811: 2016 (2nd Edition)	Cereals and Pulses - Specification for Fortified Hard Wheat Flour
23. 23	GS 812: 2016 (2nd Edition)	Cereals and Pulses - Specification for Fortified Soft Wheat Flour
24. 24	GS 883: 2016 (2nd Edition)	Cereals Pulses and Derived Products – Specification for Roasted Maize Flour
25. 25	GS 921: 2016 (2nd Edition)	Cereals, Pulses and derived Products – Specification for Instant Noodles
26. 26	GS 1125:2016	Fresh Fruits and Vegetables – Specification for Mango for processing
27. 27	GS 1126:2016	Fresh Fruits and Vegetables – Specification for Pineapple for processing

Source: GSA, 2016

In line with these policy measures, GIZ/MOAP piloted an intervention to sensitize traders and aggregators in the maize value chain in Brong Ahafo Region on the use of moisture meters. This was to help maintain the right moisture contents, enhance quality and reduce post-harvest losses. Scales were also introduced to selected beneficiaries to ensure standardization in the packaging and sale of maize. Although adoption is slow, poultry farmers are now able to buy maize in standard 50kg bags at assured moisture levels. This service is available to other buyers who request for and insist on right standards.

4.6 Export of Non-Traditional Agricultural Commodities

The development and export of non-traditional commodities in Ghana continues to gain favorable attention due to its contribution to foreign exchange. According to national export strategy, the non-traditional sector is expected to grow at 30% annually. The prevailing economic conditions characterized by currency depreciation and its attendant effects on the economy provide an opportunity to strengthen the non-traditional export sector. The quantity of oil seed & nuts, game & wildlife and coffee/tea/spices exports decreased in 2016 whereas increases in horticultural products exports, fish & sea food and cereals were recorded (Table 4.5).

Table 4. 5: Export of Non-Traditional Agricultural Commodities

Commodity	2014		2015		2016		Percent Change 2015/2016	
	Quantity (Mt.)	Value (GH¢)	Quantity (Mt.)	Value (GH¢)	Quantity (Mt.)	Value (GH¢)	% Change Quantity	% Change Value
Oil Seeds & Nuts	338,465.04	598,667,668.00	434,474.42	1,027,103,047	349,820	950,786,581	-19	-7.4
Horticulture products	192,933.57	192,465,156.00	215,124.13	286,560,948	216,836	311,857,428	1	8.8
Game & Wildlife	52.48	316,515.00	53.08	201,834	10.548	52,369	-80	-74.1
Fish & Sea foods	33,267.17	166,223,389.00	17,240.33	128,607,607	40,019	141,528,139	132	10.0
Coffee/ Tea/ Spices	1,411.92	4,099,760.00	1,336.90	8,265,921.00	1,263.78	11,216,737	-5	35.7
Cereals	869.38	930,993.00	570.57	1,302,967.00	2,257.15	4,186,368	296	221.3

Source: GEPA, 2016

Table 4. 6: Export of Non-Traditional Horticultural Commodities (Mt)

Years	Pineapple	Yam	Mango	Pawpaw	Banana	Fish and Sea Food
2011	45,057.15	27,392.74	868.84	919.70	63,761.40	13,399.95
2012	41,211.91	25,079.36	1,222.33	425.51	60,424.50	30,692.07
2013	40,095.39	5,229.67	1,788.65	1,118.50		13,836.32
Average (2011-2013)	42,121.48	19,233.92	1,293.27	821.24	62,092.95	19,309.45
2014	33,634	36,826.0	1,276.0	1,295.0	56,075.0	76,197.3
2015	43,460.83	28,295.79	2,218.54	664.22	95,179.52	17,240.33
2016	27,148.338	24,105.015	2,121.9	520.23	108,472.81	40,018.84
% change	-37.5	-14.8	-4.4	-21.7	14.0	132.1

Source: GEPA, 2016

The efforts at reducing and finally preventing the export ban placed on the export of agricultural commodities by the various bodies, especially the European Commission, phytosanitary inspectors were trained on the European Commission Council Directives 200/29/EC, risk-based inspection and certification, and field pests' recognitions. This is to equip the staff to render efficient plant quarantine service delivery to clients. Another training was carried out for 240 producers on Good Agricultural Practices (GAPs) in six (6) districts (Keta, Nsawam, Ga South, Gomoa East, Ga Central and Fanteakwa). This is to equip the producers to enhanced knowledge on the certification process.

The introduction of Standard Operating Procedures (SOPs) for export certification was also introduced and the technical knowhow of staff improved. In the same breadth, new inspection facilities were installed at the main point of exit. In addition, a new plant health diagnostic laboratory was established with support from EDAIF. The facility was equipped and guidelines for phytosanitary inspection of specific commodities for specific pests was developed with support from the TRAQUE project. Also the national pest's lists for pathogens and insects have been reviewed and updated.

4.6.1 Development of Non-Traditional Exports

Government is promoting non-traditional export to generate more foreign exchange. In line with this the GIZ MOAP, implemented the inclusive Business Models (iBMs) by liaising between out-growers and technical operators to consolidate the linkages. It provided technical inputs for production and processing including support to quality standards, certifications, facilitation of the establishment and strengthening of business relations among the value chain actors. As a result of this support, Vintage Farms has accessed a € 10,000 loan package to build its capacity in the processing of citrus and pineapple into juice.

In a related development, HPW Fresh & Dry Limited decided in 2016 to invest €3 million towards doubling its drying capacities to accommodate the increases in supply of pineapples, mango and citrus. This was as a result of the company's efforts to build vertical linkages with major groups of suppliers in Adeiso in the Eastern Region.

4.7 Promotion of Nucleus-Outgrower Concept

GCAP seeks to increase incomes as well as enhance market integration and competitiveness. The project is also to leverage private sector investment in agrcultural growth. Under the matching grant and facilitation of out-grower schemes, Pee Farms (in the Atebubu – Amantin District) was supported to develop 120 hectares for cultivation by out-growers. It engaged 51 small-holder farmers in 2016 in the cultivation of maize, an increase from the 37 engaged in the previous year.

End of MOAP assessment revealed that, 850 additional farmers (21% women) gained access to market with women mainly being represented in processing and trading whereas their representation in production remained low. This was an addition to a target of 3,000 which had been achieved. The project facilitated the relationship between farmers and off-takers by supporting negotiations on pricing, conflict management and contract farming with the result of processors investing along the value chains. In addition, capacity development of farmers related to the inclusive Business Models (iBMs), input supply and loan acquisition were facilitated.

The Technical Operators (TOs) on the other hand, applied the same model where they established outgrower schemes and developed embedded service centres for their farmers including pre-financing service provision, advisory and input support systems. The results showed that these services led to higher yields (estimated 2-5% in one season), better record keeping as well as selective and coordinated harvesting throughout the season.

Under the GCAP matching grants scheme, a number of farmers in the intervention areas are being helped to remove binding constraints affecting their businesses. Global Agri-Development Company (GADCO) is one of the matching grant recipients operating in the Accra Plains. The company is assisting out-growers in Fievie, a town in the South Tongu District of the Volta Region, to produce rice. They assisted 60 out-growers in their first year of production, and intend to increase the number. In the third quarter, the out-growers of GADCO were assisted to harvest their first produce under the current arrangement. GADCO provided harvesting services which enabled the out-growers reduce post harvest losses.

The beneficiaries who are mainly community members, obtained a yield of 3.24 mt/ha and gross margin of GH₵ 1,216.00 per hectare, which was great for a small and ninitially unemployed holder. GADCO provides ready output market by buying the paddy to process in its mills, hence relieving the out-growers of the added work of finding market for their produce.

4.8 Promotion of Poultry Production

The ministry in collaboration with USAID carried out a poultry survey to describe the structure and performance of Ghana's poultry industry and use the results to provoke economically viable policy alternatives that would contribute to enhancing and sustaining the competitiveness of the industry. The survey defines small broiler poultry farms as those with less than 2,000 birds output per year, for layer poultry farms, small farms were those with less than 5,000 birds.

Results of the survey revealed that;

1. About 87 percent of the about 1,500 commercial broiler farms were small and about 88 percent of the nearly 2,900 layer farms were small.
2. Four regions – Greater Accra, Eastern, Ashanti and Brong Ahafo – accounted for more than two thirds of all broiler farms. Ashanti and Brong Ahafo together account for about half of layer farms.
3. Average output on small broiler farms was about 530 birds per annum. Average output on small layer farms was about 6,100 crates per year.
4. Average revenue on small broiler farms was about GH₵ 18,500.00, compared with GH₵ 91,500.00 and GH₵ 408,000.00 for medium and large size broiler farms respectively. For eggs, the average revenue was GH₵ 81,354.00 for small farms, about GH₵ 443,000.00 for medium farms and more than GH₵ 2 million for large farms.
5. Average total variable cost was about GH₵ 24.91 per bird on broiler farms and about GH₵ 12.08 per crate of eggs on layer farms. Feed cost, accounted for approximately 75 percent of variable cost for broiler farms and 92 percent for layer farms.
6. Gross margin averaged GH₵ 4,872.00 for small broiler farms compared to GH₵ 28,194.00 and GH₵ 155,393.00 for medium and large broiler farms respectively. For layer farms, the average gross margin per farm was respectively GH₵ 9,941.00, GH₵ 66,422.00 and GH₵ 321,045.00 for small, medium and large farms. The gross margins produced at the different size levels, illustrate the potential professional commitment the farmers can make to the enterprises.
7. The majority of industry's output goes through direct-to-consumer and wholesale channels. The absence of a significant processor channel was obvious.

Policy options based on the preliminary findings were proposed as follows:

A feed subsidy program with stringent participant eligibility criteria; and a blue ocean strategy for exploring innovative solutions to enhance the poultry industry's global competitiveness.

It however stressed in the pursuit of either or both policies, a necessity to develop and nurture a processor channel to help address the industry's current marketing channel limitations, which probably influence production cycles and selling age of birds.

CHAPTER FIVE

5.0 Management of Land and Environment

Agricultural land and environmental management practices are necessary to meet the requirements of sustained food production for a growing population. Selected interventions have been undertaken by the ministry and other MDAs over the years to:

- Promote sustainable use of land and water resources for agricultural production
- Ensure household food security and
- Promote sustainable environment.

This is expected to increase production, rural incomes and ultimately improve socio-economic livelihoods of Ghanaians.

5.1 Development of a System that Promotes Agricultural Land Management

The focus of agricultural land management is to resolve land acquisition and security of title problems through the establishment of a system of land banks. It is also to promote the development of community land use plans and enforce their use, particularly in urban and peri-urban agricultural systems.

5.1.1 Development of Land Banks

As part of efforts to curb the problems in land acquisition, GCAP engaged a consultant to prepare a Land Bank Strategy document. The document serves as a repository of critical information on land for commercial agriculture and includes information on the ownership of lands, coordinates and soil profiles. The Land Bank Strategy Paper is anticipated to be finalized in 2017 for circulation to key stakeholders.

As part of the measures to attract private sector investors to develop Accra Plains Irrigation Project (APIP), the ministry worked with the Lands Commission to commence the establishment of a Land Bank to facilitate transactions for large scale lands for commercial agriculture. Lands Commission held numerous consultations with community leaders and land owners within the

command area of the APIP, and also commenced the demarcation of lands as a prerequisite for the establishment of the proposed land banks. However, following the restructuring of GCAP, activities towards development of the APIP and establishment of land banks were cancelled. Nonetheless, GCAP planned to document all their operations in the Accra Plains related to the establishment of the land banks.

The objective of the initiative was to ensure land title security, enhance access to agricultural lands and help attract and sustain private sector investments. In line with this objective, the Ministry of Lands and Natural Resources (MLNR), with technical assistance from the USAID/ Ghana APSP and the World Bank, has developed a new Land Bill which will be passed into law in 2017, to reduce land acquisition challenges.

5.1.2 Restructuring of Land Tenure Arrangements

There are various drafts of land lease and "indenture" agreements in the country that have presumably been seen to have worked well in the context of traditional transactions. However, these need to be refined to address unique issues and challenges posed by large-scale commercial land transactions which can have significant negative consequences for land owners and communities. Two initiatives were developed to address this challenge; firstly, GCAP produced a 'Model Lease Agreement' (MLA) that aims to facilitate socially responsible land investment practices in the project's operational areas, and secondly, the Lands Commission with support from USAID/Ghana APSP, finalised a new policy guidelines for acquisition of large tracts of land for implementation. The initiatives are expected to proactively address specific challenges that investors, landowners and communities often encounter in commercial agricultural land transactions. These initiatives are however, yet to be tested.

5.2 Sustainable Land Management

Sustainable Land Management integrate the best agricultural practices and technologies that aim to ensure efficient biodiversity management (land and water use) and other environmental resources to sustain livelihoods. To promote sound environmental practices, the ministry in 2016 carried out selected initiatives to create awareness on environmental issues since lack of stakeholders' interest constraints adoption. The awareness was geared towards ensuring increased land efficiency to sustain food production.

To promote Sustainable Land and Water Management (SLWM), soil conservation practices were implemented in forty–six (46) communities in ten (10) districts in the Northern, Upper East and Upper West Regions. This covered, two thousand three hundred and sixty-eight hectares (2,368 ha) of land and five thousand eight hundred and thirty five (5,835) land users, with 49% of them being women.

As part of measures to improve and sustain environmental resources, forty-six (46) community watershed management plans were implemented in ten (10) Sustainable Land and Water Management Programme (SLWMP) districts in Northern, Upper East& Upper West Regions. All the forty-six (46) communities were supported with agricultural inputs and extension services to implement less exploitative and non-degrading agricultural technologies.

As part of effort to mainstream Climate Smart Agriculture (CSA) and to create awareness, five (5) learning sites (Saviefe, Tainso, Kokoben, Sege and Abura-Dunkwa) were established in five (5) different districts (Ho West, Tain, Birim South, Ada West, and Abura-Asebu-Kwamankese) on cassava, cocoyam and sweet potato to educate farmers. The ministry further facilitated and supported a stakeholder workshop to develop climate change and natural resource management action plan for Ghana. A road map for mainstreaming the plan has also been developed. To strengthen and broaden the scope of awareness creation in the Eastern Region, a presentation on climate change was made by the Regional Department of Agriculture at its 2016 RELC planning session.

The national Climate-Smart Agriculture (CSA) and Food Security Action Plan were launched by the ministry in 2016. Copies of the documents have been made available to all Regional and District Departments of Agriculture. The document is to serve as a guide to ensure that sector programmes and projects are implemented to increase productivity with minimal environmental effects.

Twenty-five (25) extension staff and their supervisors have been sensitized and trained on the use of the soil testing kits as well as use of mini-rain gauge and thermometer. Thirty (30) soil testing kits procured, were used for training and then distributed to beneficiary districts (Ho West, Akatsi South, Ada West, Ga West, Birim South, Abura-Asebu-Kwamankese, Agona East, Bosome Freho, Juaboso, and Tain). Ten (10) of these kits were given out to support farmers in their respective districts as well as carryout soil analysis on demonstration sites. This is also to support the mainstreaming of Climate Change adaptation into sector activities.

One of the beneficiary districts, Ho West, where cocoyam field is being used as a model Farmer Field School (FFS), daily rainfall and temperature data have been collected in all sites. Soil moisture conservation practices were also included in management activities. This is expected to enable the farmers to know the rainfall pattern in their catchment area.

Picture 5. 1: Training Workshop on the Use of Soil Testing Kits

Relevant extension information on Climate Smart Agriculture (CSA) has been developed and packaged for the e-agriculture platform and WAAPP website to support e-extension dissemination activities (electronic and print). Information on the following subjects are available:

- the use of scientific and indigenous knowledge in predicting the weather
- the need for soil test and analysis to recommend the right fertilizer application
- the use of Participatory Scenario Planning (PSP) in Climate Smart Activities

5.3 Mainstreaming of Climate Change into Sectoral Plans

The ministry in the year 2016 organized Training of Trainers (ToT) workshop for ten (10) District Departments of Agriculture (Ho West, Akatsi South, Ada West, Ga West, Birim South, Abura-Asebu-Kwamankese, Agona East, Bosome Freho, Juaboso, and Tain) in Kumasi to integrate and mainstream climate change interventions. As part of the steps to enhance the process of mainstreaming climate change into district plans, the ministry facilitated PSP orientation workshop for other stakeholders including four (4) Regional Department of Agriculture (Brong Ahafo, Northern, Upper East, and Upper West Regions).

To support the promotion of joint planning and implementation of interventions to address environmental issues, training activities were organized for twenty (20) extension staff, from selected districts on CSA using the Participatory Scenario Planning (PSP) tool. This is to address current challenges in the extension service delivery for effective mainstreaming of Climate Change adaptation into programmed activities.

CHAPTER SIX

6.0 Science and Technology Applied in Food and Agricultural Development

Agricultural development and modernization is pivoted on the application of science and technology which play central role in solving production challenges to increase production, income and reduce poverty. The Council for Scientific and Industrial Research (CSIR) is one of the major research organizations within the National Agricultural Research Systems (NARS) and the main research wing of the Government of Ghana. The ministry in collaboration with the CSIR had strengthened the Research and Extension Linkage Committee (RELC) system through programmes and projects over the years. Competitive Agriculture Research Grant Scheme (CARGS) is a facility within the RELC system to support demand driven research. The CARGS provides a platform that finances the generation of technologies to solve farmers' constraints emanating from the regional planning sessions. In the year 2016, selected researchers were supported to investigate 13 identified constraints through the RELC system.

6.1 Science, Technology and Innovation Application

The use of science and technology continues to provide essential information for agricultural modernization in terms of production, processing, marketing and research.

6.1.1 Application of Appropriate Agricultural Research and Technology

A total of sixty-one (61) cassava processors were trained on processing of cassava into High Quality Cassava Flour (HQCF) in the Volta Region at Adzedukope, Adaklu and Ablornu in 2016. The trained cassava processors consisted of men (18), women (43) and youth (15). Furthermore, 10 bakery and pastry groups were trained in the Upper East Region. The ten groups had a membership of 401. Among the trained groups were women (374), men (27) of which 214 were youth. Additionally, eleven (11) bakery and pastry groups were formed and trained in the Upper West Region. A total of 500 members, consisting of women (468), men (32), young women (239), and young men (29) were also trained. Ten (10) matrons and their students from educational institutions in the Upper East Region were trained on the use of cereals and legumes in composite flour products. Wheat composite flour used for products were developed from yam, sweet potato, cocoyam, cassava, sorghum, millet, rice and maize. The flours were formulated into 5%, 10%,

15%, 20%, 30%, 40% and 50% composite and used for bread, chips, meat pies, biscuits, cakes and doughnuts. Four manuals, developed on processing of composite flours and their utilization in pastry products were distributed to 3,500 beneficiaries in the Ashanti, Brong Ahafo, Upper East, Upper West and Greater Accra Regions. Ten sets of bakery equipment consisting of a mixer, roller, oven and their accessories were distributed to 10 trained bakery and pastry groups in the Ashanti, Brong Ahafo and Eastern Regions. Local processing equipment for glucose syrup and ethanol have also been acquired and installed at Agribusiness Incubation Centre at Pokuase.

The E-Agriculture Programme is an innovative electronic information and knowledge management platform that employs Information and Communication Technologies (ICTs) to enhance agricultural productivity through resource-sharing and systematic delivery. MoFA in conjunction with the World Bank has refurbished MoFA's Information Resource (MOFAIR) Centre in Accra and two (2) other centres located at its Regional offices in Kumasi and Tamale. The centres will create multi-stakeholder, people-centred, and a cross-sectored platform that will bring relevant stakeholders in the agricultural sector together. This is expected to improve agriculture modernization and enhance agricultural production and productivity.

6.1.2 Improved Technologies Demonstrated

With a set target of establishing 400 acres of community field demonstrations, 172 acres was established to showcase improved technologies to farmers and other stakeholders in 97 districts. Based on the 172 acres 98 (Table 6.1) improved technologies were crop bias. On the other hand, 65 and 14 improved technologies were showcased to farmers and other stakeholders in the livestock and fisheries subsectors respectively. The number of beneficiary farmers reached through community field demonstrations and field days were 48,656 (Table 6.2). Women and youth represent 31.8% and 31.9% respectively of the beneficiaries.

Table 6. 1: Number of Improved Technologies Demonstrated

Regions	Commodities			
	Crops	Livestock	Fisheries	Total
Greater Accra	19	10	0	29
Eastern	10	5	6	21
Ashanti	11	12	6	29
Western	3	3	1	7
Brong Ahafo	7	3	0	10
Upper West	10	9	0	19
Upper East	8	2	0	10
Northern	10	15	1	26
Volta	8	2	0	10
Central	12	4	0	16
Total	98	65	14	177

Source: RAD, 2016

Table 6. 2: Beneficiaries of 2016 Community Field Demonstrations

Region	No. of Districts	No. of Demonstrations	Total Area Under Cultivation (acres)	Beneficiaries				Grand Total	Total No. of field days
				M	W	Youth			
						M	F		
Volta	10	19	19.5	1713	2688	656	574	5631	47
Western	10	15	15	1269	1192	1230	1065	4756	40
Central	9	11	11	461	390	632	425	1908	35
Northern	10	24	24	2352	1473	1191	861	5877	93
Upper West	11	22	22	465	426	225	205	1321	0
Upper East	9	74	72	4582	3558	1620	1201	10961	318
Greater Accra	8	18	34	1142	864	743	630	3379	0
BrongAhafo	9	18	18	3111	3325	1609	905	8950	0
Ashanti	10	17	17	2548	1561	1130	634	5873	41
* Eastern	10	0	0	0	0	0	0	0	0
Grand Total	**96**	**218**	**232.5**	**17,643**	**15,477**	**9,036**	**6,500**	**48,656**	**574**

Source: DAES, 2016

A total of nine thousand five hundred and seventy-three (9,573) farmers were reached by AEAs and their supervisors during the conduct of Farmer Field School of which 33.5% and 20.2% were women and youth respectively in their respective districts and regions, Table 6.3.

Table 6. 3: Summary Beneficiaries of Farmer Field School

FFS	MEN	WOMEN	YOUTH	TOTAL
FFS 1	276	242	10	528
FFS 2	519	437	55	1,011
FFS 3	469	282	160	911
FFS 4	572	394	214	1,135
FFS 5	285	258	366	909
FFS 6	488	264	490	1,242
FFS 7	1,875	1,527	635	4,037
Grand Total	**4,439**	**3,204**	**1,930**	**9,573**

Source : DAES, 2016

A total of 1,975,690 farmers benefited from technologies (pest/disease recognition, prevention and control, postharvest management of food grains/ legumes and storage, introduction of improved crop varieties etc.) demonstrated in 2016 farming seasons. This is expected to enhance the adoption of technologies to improved farmers productivity.

Adoption of new technologies are yielding intended results. Mr. Akwasi Poku, a cassava farmer at Bosome-Freho District was faced with low yields, marketing constraints, and post-harvest losses until he adopted technologies demonstrated through community field demonstrations mounted by MoFA, Box 6.1.

A farmer with a family of four, Akwesi, adopted technologies on correct planting distance, no till conservation agriculture, correct cutting of planting materials and fertilizer application. He started his own farm of 2 hectares a couple of years ago. 'With the help of AEAs, I increased my farm yields; raise a sustainable income, started building a 3 room house and expanded my farming capacity to over 15 hectares with abundant improved planting materials which I freely give to other farmers in the community and beyond'. He was awarded National Best Cassava farmer for 2016 where he was given a tricycle motor-bike with other items and a certificate of recognition.

Box 6. 1: Success story of Mr. Akwasi Poku
Source DAES, 2016

The ministry plans to maintain the role of agriculture award winners to serve as sources of extension in production and marketing to small scale farmers within their localities to help transform subsistence farming into commercial farming. This was piloted in 2016 where the ministry established one acre field demonstration to showcase GAPs on cassava varieties (Sikabankye, Bankyebotan, Bankyehemaa and Esambankye) to the selected national award winners during the 32nd National Farmers' Day Celebration in the Kintampo North District. The farmers acquired knowledge on the effect of non-burning of farm and stubble mulching to improve soil health.

A comprehensive video documentary on Farmer Field School Training of Trainers (ToT) which was recorded in 2015 and 2016 is in the advance stage of production. Thirteen thousand (13,000) copies of Information Education Communication (IEC) technical leaflets on 13 commodities (1,000 copies each) were printed and distributed to the 10 regions and the general public during the 32nd National Farmers Day Celebration in Kintampo. Table 6.4 has the details of the technical leaflets that was produced and distributed.

Table 6. 4: Details of Technical Leaflets Produced and Distributed

Commodity	Total Number of Copies
Groundnut seed production	1,000
Chilli production	1,000
Making a living through fish farming	1,000
Garden egg production	1,000
Goat production	1,000
Improved practices in rearing indigenous chickens	1,000
Okra production	1,000
Pigs production	1,000
Rabbit production	1,000
Rice production	1,000
Sheep production	1,000
Tomato farming	1,000
Vegetable nursery management	1,000
Total	**13,000**

Source: DAES, 2016

6.1.3 Release of Agricultural Technologies

During the period under review, the National Variety Release and Registration Catalogue/ document was launched. The document is consistent with the harmonized seed regulation based on DUS and VCU. The National Variety Release and Registration Catalogue will be updated regularly to include newly released varieties. Eighty participants from policy, research, extension, seed industry, Civil Society Organizations, Development Partners etc. were present at the launch. Nine hundred and fifty (950) copies of the National list/catalogue has been distributed to various stakeholders. A proposal has been submitted to AGRA to support the digitization of the catalogue and release system.

The National Seed Council (NSC) has approved and released the following crops as indicated in table 6.5. On the other hand, first inspection of the genotypes of the crops in table 6.6 has been carried-out and the second inspection of these genotypes for a possible release is scheduled for first quarter 2017.

Table 6. 5: Approved Varieties Released and Genotypes Awaiting 2nd Inspection

No.	Varieties Approved for Release		Genotypes Awaiting 2nd Inspection	
	Type of Crop	No. Approved for Release	Type of Crop	No. Approved for Release
1	Cowpea	5	Yam	4
2	Beans	4	Sweet Potato	3
3	Soy	2	Cassava	3
4	Maize	1	Groundnut	3
5	n/a	n/a	Tomato	5
6	n/a	n/a	Pepper	5

Source: CSIR 2016 Annual Report

Proposal on review of the release and registration process has been presented to the NSC. Following this proposal, two windows for variety evaluations and inspections have been accepted (April and August) and all applications for variety evaluations are to be received by the National Varietal Release and Regulation Committee (NVRRC) secretariat not later than February each year. NVRRC is to set up fees and charges for variety evaluations (DUS/VCU) for NSC consideration. New crop varieties were also released in the year 2015 and 2016 including cowpea, millet and maize. Tables 6.7, 6.8 and 6.9have the details of varieties and key attributes.

Table 6. 6: Cowpea Varieties Released in 2016

Name	Key Attributes
Zaayure Pali (New Zaayura)	· Large creamy white seeds, · vigorous growth, · High resistant to aphids · medium maturity, · Short cooking time. · Yield potential is 2.5 t/ha.
Soo-Sima (Sweet cowpea)	· Medium creamy white seeds, · Medium maturity · Vigorous growth, · High resistance to aphids, · Resistance to diseases, · Drought tolerance · Short cooking time. · Yield potential is 2.0 t/ha

Diffeele (Good Soup – as leafy vegetable)	· Large White seeds, · Medium maturity, · Vigorous growth, · High resistance to Aphid, · drought tolerance · Short cooking time. · Yield potential is 2.2 t/ha
Wang Kae (No Striga)	· Large white seeds, · Back helium colour, · Early maturity, · Resistance to aphids and Striga, · Short cooking time · Yield potential is 2.4 t/ha
Kirkhouse Benga	· Large white seeds, · Brown helum colour, · Early maturity, · Resistance to aphids and Striga, · Short cooking time · Yield potential is 2.4 t/ha

Source: CSIR, 2016 Annual Report

Table 6. 7: Millet Varieties Released in 2015

Released Name	Special Attributes
Akad-kom	· Open Pollinated Variety (OPV) Recurrent selection · Pot. Yield: 1.2 t/ha · Physiological maturity – 70 days · Drought tolerant · Short, compact head
Kaanati	· OPV Recurrent selection · Pot. Yield: 1.2 t/ha · Physiological maturity – 70 days · Drought tolerant · Grain colour: Yellow
Naad-kohblug	· OPV Recurrent selection · Pot. Yield: 1.3 t/ha · Physiological maturity – 75 days · Drought tolerant · Presence of bristles on head · Resistant to bird damage

Afribeh-Naara	· OPV Recurrent selection · Pot. Yield: 1.2 t/ha · Physiological maturity – 70 days · Drought tolerant · Grain colour: Yellow
WAAPP-Naara	· OPV Recurrent selection · Pot. Yield: 1.1 t/ha · Physiological maturity – 80 days · Drought tolerant · Resistant to Downy mildew · Dual purpose (grain, fodder & fuel wood)

Source: CSIR, 2016 Annual Report

Table 6. 8: Stress Tolerant Maize Varieties Released in 2015

Name	Grain Colour	Maturity (Days)	Potential Yield (t/ha)	Special Attributes
Kunjor-wari	Yellow	90	5.7	Drought and Striga tolerant
Suhudoo	White	90	5.8	Drought and Striga tolerant
Wari-kamana	White	110	6.9	Drought and Striga tolerant
Kpari-faako	White	110	6.7	Drought and Striga tolerant
Sika Aburo	White	115	6.8	Drought and Striga tolerant, High industrial uses (Low fat, high crude protein)

Source: CSIR, 2016 Annual Report

The ministry develop a seed paper, on Seed Sector Development Framework in support of CAADP implementation within the framework of Africa Seed and Biotechnology programme, which have since been submitted to the technical committee. The ministry through the West Africa Seed Program facilitated the laying of the ECOWAS-UEMOA-CILSS Seed Regulation and the ECOWAS Regulation on Fertilizer Quality Control in Parliament of Ghana. The two Community Regulations have to meet 21 days sitting in Parliament before enforceable in Ghana.

Capacities of the researchers need to be build ready for modern developmental research challenges. A total of one hundred and twenty-five (125) officials including breeders, researchers, policy makers, Private Sector and students were sensitized on the crop variety release and registration procedures. Emphasis was placed on the importance of Distinctiveness, Uniformity and Stability (DUS) and value for cultivation and use (VCU) coupled with the way forward with Ghana becoming a member of International Union for the Protection of New Varieties of Plants (UPOV).

6.1.4 Research-Extension-Farmer Linkage Committee

As part of the measures to improve Research-Extension-Farmer Linkage Committee (RELC) system, stakeholders were drawn from Research Institutions, Universities, MoFA Technical Directorates, Regional and District staff from decentralized Departments of Agriculture (DOA), Department of Co-operatives, FBOs, NGOs, agribusinesses (processors and input dealers) to participate in regional RELC planning sessions. A total of four hundred and eight (408) participants (387 Men; 93 Women) participated in the ten (10) regional RELC planning sessions in 2016. Based on the outcome of the sessions, a total of nine (9) researchable farmer constraints (Table 6.10), and 11 policy issues (Table 6.11) were prioritized for consideration by the Competitive Agricultural Research Grant Scheme (CARGS) from and 18 policy issues (Table 6.12) were prioritized for consideration by government.

Table 6. 9: Prioritized Farmer Constraints

Research	Extension/Training	Policy
1. High incidence of tuber rot and worm attack on leaves and vines of sweet potato 2. High incidence of termite infestation in farms 3. High incidence of sudden wilt (yellowing of leaves) and death of pawpaw plants 4. High incidence of snail attack (damage) on vegetables 5. Lack of high quality vegetable seeds for cultivation 6. Cassava stem and root damage caused by millipede attack. 7. Field competition with rice by unidentified stubborn weed that looked like rice plant. 8. Plant wilt in tomato, garden egg and pepper caused by diseases and pests. 9. Stunted growth in pepper due to leaf curl	1. High incidence of black rot and leaf wilt in cabbage 2. Lack of non-conventional feed sources for dry season feeding of livestock 3. Negative impact of climate change on farming activities 4. High incidence of Black Sigatoka in plantain 5. High incidence of stem borer attack in maize 6. High incidence of nematode infestation/attack in vegetables 7. High incidence of leaf curl in pepper 8. High incidence of blossom-end rot in tomato 9. High incidence of basal rot in onions 10. High incidence of snail attack in vegetables 11. High mortality in rabbits and grass-cutter bunnies 12. High incidence of mange in livestock 13. Newcastle disease in poultry 14. High post-harvest losses in root and tubers 15. High incidence of insect attack in cowpea 16. incidence of lodging in plantain 17. Low soil fertility associated with plantain cultivation 18. Stone weevil infestation in mango 19. High incidence of fruit cracking and premature fruit drop in mango 20. Sooty mould in mango 21. Inadequate certified mango planting materials for farmers 22. Excessive fruit drop and fruit cracking in citrus 23. High incidence of fruit rot and flower abortion in oil palm 24. Rhinoceros beetle damage in oil palm	1. Damage to farms by nomadic cattle 2. High cost of farm inputs 3. Widespread degradation of arable land, forests and water bodies by illegal mining (galamsey) activities. 4. Proliferation of unapproved agro-chemicals on the market. 5. Lack of well-established irrigation schemes for continuous cropping 6. Unavailability of subsidized tractor services and non-functional mechanization service centres 7. Lack of low single dose vaccines for poultry and livestock 8. Insufficient vet facilities and personnel 9. Insufficient hatchery sources 10. High incidence of dog bites/ poor patronage of anti-rabies immunization campaigns. 11. Contamination and pollution of the environment (soil, land, water bodies etc,) around palm oil and cassava processing sites.

Source: CSIR 2016 Annual Report

Four (4) research problems were prioritized for consideration by the Competitive Agricultural Research Grant Scheme (CARGS).

Table 6. 10: Researchable Problems Prioritized for CARGS from Western Region, RELC

Problem	Way forward
1. Cassava stem and root damage caused by millipede attack.	Conduct investigation into safe use of chemical/ biological agent for millipede management.
2. Field competition with rice by unidentified stubborn weed that looked like rice plant.	Develop effective control strategy for the stubborn weed.
3. Plant wilt in tomato, garden egg and pepper caused by diseases and pests.	Screen tomato, garden egg and pepper varieties for tolerance to plant wilt in the Western Region.
4. Stunted growth in pepper due to leaf curl.	Screen pepper varieties for leaf curl tolerance in the Western Region.

Source; CSIR, 2016

The eighteen (18) key issues that needed to be address by policy in the ten regions were collated and summarized in table 6.12. The response from farmers in six (6) regions namely Ashanti, Brong Ahafo, Central, Eastern, Volta and Western indicated that the high cost of agricultural inputs was the key constraint affecting crop production in their respective regions. Galamsey activities by illegal miners and sand winning in five (5) regions namely Ashanti, Central, Eastern, Greater Accra and Upper West were hampering agricultural production as crops had been destroyed through activities by these perpetrators.

High cost of poultry feed and others inputs (Ashanti, Central, Eastern and Volta regions) together with inadequate veterinary officers in 3 regions (Ashanti, Eastern, Upper West and Volta) as well as unstable market prices in 4 regions (Ashanti, Brong Ahafo, Northern and Western) were identified as other constraints that affected agricultural production and poverty reduction in the rural areas. High cost of poultry feed and other input affect cost of poultry products, thus making them non-competitive as against imports from other countries.

Table 6. 11: Policy Issues from RELC Sessions

No.	Policy Issues	No of Regions reporting	Regions
1.	High cost of Agro-inputs	6	Ashanti, BA, Central, Eastern, Volta and Western
2.	Galamsey activities and sand winning in destroying farmlands	5	Ashanti, Central, Eastern , GA, UW
3.	High cost of poultry feed and other inputs	4	Ashanti, Central, Eastern and Volta
4.	Inadequate Veterinary staff	4	Ashanti, , Eastern UW and Volta
5.	Unstable market prices	4	Ashanti, BA, Northern and Western
6.	Inadequate Logistics of for Veterinary activities	3	Ashanti, Volta and Western
7.	Destruction of farms by Fulani herdsmen	3	Ashanti, Eastern and UW
8.	Low extension – farmer ratio	3	Ashanti, UW and Volta
9.	High cost of transporting goods to market centres	3	BA, UE and UW
10.	Poor feeder roads	3	BA, Northern and UW
11.	Inadequate certified planting material	3	Eastern, Volta and Western
12.	Cumbersome loan processing procedures from banks	3	Northern, UW and UE
13.	Inadequate Vaccines and drugs	2	Ashanti and Eastern
14.	Lack of Veterinary clinic	2	Ashanti and Eastern
15.	Land tenure system	2	Ashanti and BA
16.	Lack of irrigation systems	2	Ashanti and Eastern
17.	Annual bushfires	2	Northern and UW
18.	Inadequate land for pasture and watering – dry season	2	GA and Volta

Source: DAES

The researchable constraints were forwarded to the CSIR RELC desk for further consideration and possible award for contract research under the CARGS scheme. The policy related constraints were also referred to the CSIR for further submission to the relevant authorities for consideration.

6.1.5 Agricultural Research Funding

Funding agricultural research in extension service delivery remains a major challenge in Ghana. The ministry through WAAPP has been funding research and transfer of technologies generated under the CARGS from 2012 to 2016. Through the programme, there are 10 ongoing researchable farmers' constraints being worked on by research scientist. To ensure sustainable funding mechanism for agricultural research and extension, CSIR has been mandated by the ministry to lead the process towards its establishment in Ghana. To this end, a sustainable funding mechanism committee has been established to carry this through. Stakeholder consultations have been organised based on which a draft report has been finalised. A survey of some potential partners, stakeholders and beneficiaries have been undertaken and the second targeted at the National Agricultural Research Systems (NARS) in 2017.

Using Council for Scientific and Industrial Research (CSIR) as a case, on the status of agricultural research funding, the indication was that most of the funds that go to CSIR for agricultural research are from programs and projects being implemented by the ministry. During the year under review for example, the Council received a total of eight million eight hundred and sixty three thousand one hundred and eleven cedis (GHC 8,863,111.00) from three different sources; Government of Ghana (GoG), Internally Generated Fund (IGF) and Donors. This amount represents 66.67% of total budget, 98.13% of which was actually spent, Table 6.13. About 75 percent, 21.44% and 3.88% of the total expenditure is from GoG, IGF and donor sources.

Table 6. 12: CSIR, Budget Information from 2012-2016

YEAR	GOG	IGF	DONOR	TOTAL
2012				
Budgeted				
Actual Receipt	6,532,420	754,249	-	7,286,669
Actual Expense	6,532,420	764,098		7,296,518
2013				
Budgeted	2,575,498	7,807		2,583,305
Actual Receipt	10,688,593	1,023,095	40,000	11,751,688
Actual Expense	9,682,749	916,502	34,410	10,633,660
2014				
Budgeted	-	205,143		205,143
Actual Receipt	7,337,830	1,077,280	50,953	8,466,063
Actual Expense	7,337,830	2,255,450	49,796	9,643,076
2015	-	-		-
Budgeted	6,198,481	830,684		7,029,165
Actual Receipt	6,193,363	1,497,476	105,819	7,796,658
Actual Expense	6,193,363	1,666,851	99,188	7,959,401
2016	-	-		-
Budgeted	11,943,620	1,101,435		13,045,056
Actual Receipt	6,494,455	2,009,929	358,727	8,863,111
Actual Expense	6,494,455	1,865,055	337,622	8,697,133

Source: CSIR 2016 Annual Report

6.1.6 Development of Innovative Platforms for Extension Delivery

Under the Plantwise Programme, forty (40) Plant Doctors made up of 38 men and 2 women were trained in pests and disease diagnosis, management recommendations and data management. The breakdown by region is shown in table 6.14.

Table 6. 13: Number of Plant Doctors per Region

No	Region	Number
1	Ashanti	9
2	Brong Ahafo	10
3	Eastern	8
4	Volta	9
5	Northern	1
6	PPRSD	3
	Total	**40**

Source: PPRSD 2016 Annual Report

According to the data obtained from Ashanti Region, a total of 5,621 queries were received on crops such as vegetables, fruits and roots and tubers. The major plant pests that were diagnosed included: aphids, caterpillars, diamond-back moth, fruit borer, fruit flies, mealy bugs, mirids, nematodes, stem borers, stink bugs, termites and whiteflies. Some plant diseases that were diagnosed are angular leaf spots, anthracnose, black sigatoka, black pod of cocoa, bacteria blight, damping off, wilts and viral diseases. Drought, nutrient deficiency and chemical damage were some of the recorded abiotic factors affecting crop yield.

In Brong Ahafo Region, a total of 3,158 queries were received by the plant doctors for the year 2016. There was a significant increase in the performance from the districts compared to 2015. This could be because the clinics were increased from 18 to 26 and also there was an introduction of the electronic clinics by using tablets to transmit data.

The Ministry developed 87 Pest Management Decision Guides (PMDG) for key pests and diseases (fruit fly, nematode infestation in plantain, maize weevil, cassava bacteria blight, cassava mosaic virus, mango anthracnose, etc. under the Plantwise Programme supported by Centre for Agriculture and Biosciences International (CABI). The concept of Integrated Agricultural Research for development has been viewed as the new paradigm for Research for Development in terms of its ability to ensure effective technology dissemination through complex social interaction.

To ensure that more actors of the agricultural value chain benefit from WAAPP, five new community Innovation Platforms (IPs) were formed based on actor engagement to identify constraints and opportunities within a crop value chain. After analysis, entry points were identified and basic governance structures put in place to ensure functionality.

Picture 6.1: Sweet Potato Infested with Maggots

Table 6. 14: Newly Formed Innovation Platforms

Community	District	Region	Focus Crop/System
Achina and Abura	Nkawie	Ashanti	Rice
Akrofrom and Boamang	Afigya-Kwabre	Ashanti	Cassava
Dromakuma	Ejura Sekyeredumasi	Ashanti	Maize
Hiowowu	Ejura Sekyeredumasi	Ashanti	Maize
Komenda	KEEA	Central Region	Sweetpotato

Source: WAAPP, 2016

Improved planting materials are critical for creating innovations. To this end, planting materials were supplied to various IPs across the country. This was based on request from IP members and availability of planting materials and funds. The IAR4D component under National Centre of Specialization (NCoS) financed the supply of cassava and sweet potato planting materials as indicated in table 6.15.

Table 6. 15: Supply of Planting Materials

Region	IP Members	IP Name	Crop variety	Planting Materials Supplied	Acreages Cultivated
Volta	30	Adziedukope	Sika Bankye	160,000	111
	10	Sofa			23
		Nincongo	Sweet potato(CRI Ligri & CRI–Apomuden)	66,660 Vines	20

Source: CSIR

To support the efforts of IAR4D team, the project provided 14 IPs with planting materials. The specific crops were; maize, soybean, groundnut and cassava. Materials supplied by the project could cover 612 acres. This support meant that for 2016, improved planting materials supplied under IAR4D could cover 766 acres.

Furthermore the effects of pests and diseases on sweet potato production for IPs in Upper East Region were obvious, resulting in huge post-harvest losses. Couple with this, was poor marketing of the produce. As a response, 3 districts (Pusiga, Garu-Tempane and Bawku Municipal) benefited from a 3-day training programme on Integrated Pest Management (IPM) and marketing. A total of 99 IP members (M=79, F=20) benefited. This training was possible due to collaboration with CSIR-SARI and an entomologist.

The CSIR-Crops Research Institute as the National Centre of Specialization (NCoS) has the mandate to generate (through the design and implementation of research activities) technologies directed at improving root and tuber crops production and productivity with a focus on high yielding, tolerance to pests and diseases, and high quality traits acceptable to consumers. These include post-harvest technologies that add value by increasing shelf life and development of other food forms. In addition, the NCoS in scaling up the dissemination of improved technologies, seeks to produce, distribute and promote clean and healthy planting material as breeder seeds for primary and secondary seed growers and develop a sub-regional root and tuber research network, which will ensure the integration of regional priorities in technology development.

The NCoS in Ghana, CSIR-Crops Research Institute organized a regional conference to create a platform to strengthen National and Regional multidisciplinary networks and for identification, planning and implementation of common research problems and solutions on root and tuber value chain development in the different countries in the sub region. The 5-day conference had the theme: *"Research in root and tuber crops value chain: The hope for food security in the ECOWAS sub region"*.

In relation to that, a 4-member committee was formed to identify gaps and training needs from various Innovation Platforms and Implementation Agencies. A number of training modules were developed but no plan of implementation yet. Training module on Good Agricultural Practices in root and tuber crops value chain were developed and Innovative Platform members and MoFA staffs benefited from such training under the sponsorship of COTVET.

The innovation is extended to the agricultural education syllabi which tend to be theoretical with little emphasis on practical work and had little to do with agribusinesses. The curriculum in the country's agriculture colleges need to be reviewed and new subjects introduced along the agricultural value chain. The ministry through HRDMD has set up

a15-member review committee to review the curricula for the Diploma, Certificate and Vocational Programmes. In addition, the ministry developed a 5-year strategic plan for six (6) Agricultural Institutions (Asuansi Farm Institute, Adidome Farm Institute, Wenchi Farm Institute, Kumasi Institute for Tropical Agriculture, Kpando Technical Institute and Comboni Technical Institute) supported by the Agricultural Technical and Vocational Education Training (ATVET) Project. The strategic plan is yet to be implemented. Farm Institutes are also fully accredited to run Competency Based Training.

CHAPTER SEVEN

7.0 Management and Administration

The Management and Administration Programme provides all the cross-cutting services required to support effective implementation of the other five programmes of METASIP II. The organizational units responsible for delivering this programme are the Line Directorates as well as the Office of the Chief Director.

This programme consists of two sub programmes:

- General management and
- Institutional coordination and collaboration for agricultural development

7.1 General Management

The Ministry harmonises programmes and projects within the agricultural sector, with the aim of reducing duplication of efforts as well as promoting synchronisation. The ministry guides interventions in the sector through dialogue platforms such as; the Agriculture Sector Working Group and the Business Meetings. It also serves as a focal point for coordination of development partners within the sector.

During the year, efforts were geared toward finalization Modernization of Agriculture in Ghana (MAG) programme. MAG is a five-year CAD 135 million initiative. Up to CAD 125 million may be provided to the Government of Ghana for the programming activities. Through the MAG Program, conditional budget support and technical assistance will be provided to Ghana to respond to the objectives of Food and Agriculture Sector Development Policy (FASDEP), Medium Term Agriculture Sector Investment Program (METASIP II) and the Ghana Shared Growth and Development Agenda (GSGDA II).

Strongly aligned with Ghana's decentralized governance structures, the MAG Programme will be delivered by Ghana through four components:

Component 1: Support to increase the efficiency of local farmers through value chain development ($58M/5years): *Will provide direct support to District Departments of Agriculture to provide general agricultural extension services to farmers at the local level.*

Component 2: Support to specialized agricultural services to build national market linkages and promote efficiencies in commodity development along value chains ($22M/5 years): *Will provide direct support to Regional Departments of Agriculture to maintain pools of highly-trained development officers who provide expertise that is more specialized than the general extension services provided at the district level.*

Component 3: Support to agricultural research to strengthen agricultural extension services and improve agricultural productivity ($30M/5years): *To help identify production needs and demands of smallholder farmers and define appropriate agricultural research and innovations that can be efficiently rolled-out. Specific beneficiaries of this components include;*

- *CSIR through MESTI .*
- *Human Resource Development and Management Directorate and Agricultural Extension Services Directorate for improved logistics capacity, extension material development and dissemination, capacity development for private sector and Farmer-Based Organization extension delivery, and curriculum revision for agricultural extension workers.*
- *Monitoring and Evaluation Directorate within MoFA for overall program monitoring.*

Component 4: Developing the enabling environment to improve agricultural productivity and competitiveness ($15M/5years): *Beneficiaries include all technical and line Directorates at MoFA that are not included in Component 3. This component will be used to enable the Directorates to fulfil their mandates as defined by MoFA.*

Component 5: Canada-managed Monitoring, Evaluation, Audit and Technical Advisory Services ($10M/5 years): *These funds will be managed by Canada and used to fulfil: i) retaining a Head Monitor to be embedded within MoFA to facilitate the overall delivery and operations of the program and manage a pool of funds to respond to technical assistance needs; ii) retaining monitors to assess the overall progress of the program, troubleshoot and address issues and identify technical assistance needs; iii) financing a pool of funds to finance identified technical assistance needs; iv) financing a mid-term evaluation and operational review and a final summative evaluation; and v) financing annual audits of the funding provided to the Government of Ghana for Components 1 to 4.*

7.1.1 Provision of Financial Resources and Logistics

This section looks at the ministry's approved budgets, releases and expenditures for the year 2016. The Government of Ghana (GoG), in the 2016 financial year, allocated a total budget of GH¢501.502 million to the ministry to achieve its mandate. Out of the total budget, the Government's contribution was GH¢59.776 million representing 11.9%, whilst Development Partners' (Donors) contribution was GH¢175.342 million representing 34.9%. In addition to the above stated contributions was GH¢4.066 million, (ie 0.81%) from Internal Generated Funds (IGF) and GH¢262.318 million (i.e 52.3%) of the budget from the Annual Budget Funding Amount (ABFA).

Compared to the approved budget of GH¢501.502 million, the total amount released amounted to GH¢377.294 million representing 75.2%, whereas the actual expenditure amounted to GH¢357.907 million representing 94.9% of the total amount released. The Ministry received from the Ghana Infrastructure Fund, an amount of GH¢34.172 million. At the same period, an amount of GH¢3.002 million was also realized from refunds, interests earned on bank balances and foreign exchange gain / loss on Projects' Accounts, Both receipts had not been factored in the 2016 budget. The ministry, therefore, received a total of GH¢414.468 million made up of budgeted amount of GH¢357.907 million and an unbudgeted amount of GH¢37.174 million.

7.1.2 Total Inflows by Funding Sources

The total amount received out of the approved budget of GH¢501.502 million amounted to GH¢377.294 million representing 75.2%. GoG component of inflows is made up of Compensation of Employees, Goods & Services and Assets.

Table 7. 1: Approved 2016 Budget against Actual Releases in Million Cedis

Budgeted Revenue	Approved Budget (GH¢ million)	Actual Annual Releases (GH¢ million)	% Released
GoG Funds	59.776	56.982	95.2
ABFA	262.318	138.132	52.6
Internally Generated Funds	4.066	2.456	60.4
Donor Funded Projects	175.342	179.724	102.5
Sub-Total	501.502	377.294	75.2
Non-Budgeted Revenue			
Ghana Infrastructure Fund	-	34.172	-
Others	-	3.002	-
Sub-Total		37.174	
Total	501.502	414.468	82.6

Source: Annual Financial Report, 2016

7.2 Availability of Credit to the Agricultural Sector

Credit remains a major input for driving production and productivity of the agricultural value chain. Farmers, input dealers, aggregators and mechanization service providers all require adequate and timely credit to finance their businesses. Credit provision to the agricultural sector will boost production and may improve the declining contribution of the sector to national GDP. For the 2016 fiscal year, data is available from Bank of Ghana, Agricultural Development Bank (ADB) and EXIM Bank. Data is also available from Outgrower and Value Chain Fund (OVCF), the Ghana Commercial Agricultural Project (GCAP) and Northern Rural Growth Programme (NRGP) on facilitation roles in linking stakeholders to the financial market.

7.2.1 Distribution of Outstanding Credit to Agricultural Sector

Outstanding credit to the agricultural sector, including cocoa, as a percentage of outstanding credits to all sectors, as reported by Bank of Ghana decreased consistently from 5.8% in 2012 to 3.7% in 2015. However, in 2016 it increased marginally by about 0.4% to 4.09%. As outstanding credits to the agricultural sector grew by 82.95% from 2012 to 2016, that to other sectors grew by 161.13% over the same period. Growth of 2016 over 2015, outstanding credits to the agricultural sector is 16.66% and that to other sectors is 15.60%.

Table 7. 2: Trends of Outstanding Credit

Items	Periods (GHC 'million)				
	2012	2013	2014	2015	2016*
Agric., Forestry and Fisheries	7,312.27	7,078.79	9,467.42	11,650.85	13,403.10
Cocoa Marketing	599.54	600.60	744.02	756.82	1,071.17
Total Agriculture	7,911.81	7,679.39	10,211.44	12,407.67	14,474.27
All Sectors	137,791.78	180,359.30	260,572.91	305,795.13	353,632.8
Agriculture as percentage of total (percent)	5.77	4.26	3.92	3.69	4.09

Source: BoG, 2016 ****Provisional***

Table 7.2 indicates that, the outstanding credit to agriculture, forestry and fisheries for the year 2016 by the commercial banks stood at GH₵13,403.10 as against GH₵11,650.85 in 2015. This may be attributed to increasing average annual interest rates. The average annual interest rate increase from 28.62% in 2015 to 31.02% in 2016. It is worthy of note that the average annual interest rate for the agricultural sector is about 0.24 percentage points lower than the average annual interest rate to other sectors (31.26%) in 2016. This difference though small, is a good effort towards stimulating the growth of credit in the agricultural sector.

7.2.2 Loan by Agricultural Development Bank (ADB)

The Agricultural Development Bank, since its inception in 1965, has been the main commercial bank that supports the development of agriculture and its allied industries. Over the years, the bank has advanced loans to various actors along the agricultural value chain. Table 7.3 shows the volume of credit advanced to the sub-sectors between 2011 and 2016.

Table 7. 3: Loan Approval to the Agricultural Sector by ADB (GH₵ Million)

Subsector/Year	2011	2012	2013	2014	2015	2016*
Agricultural Production	33.4	88.4	42.1	47.4	57.8	64.4
Agro-Processing	84.5	35.1	18.8	46.7	15.5	15.1
Agro-Marketing	12.9	0.6	5.4	7.2	4.4	31.0
Agro-Export	1.3	2.4	-	-	13.5	-
Total	132.1	126.6	66.3	101.2	91.1	110.5

Source: ADB, 2016 ****Provisional***

From table 7.3, agro-processing had the highest share of loan (GH₵ 84.5 million) in 2011 whilst agro-export had the least (GH₵1.3 million). Agricultural production took over with GH₵ 88.4 million in 2012 and continued through to 2016 with GH₵64.4 million. The total loan approved to the sector has however been inconsistent. From as high as GH₵132.1 million in 2011, it decreased by about 50% to GH₵66.3 million in 2013. It however increased by 21.3% from GH₵91.1 million in 2015 to GH₵110.5 million in 2016 (Figure 7.1).

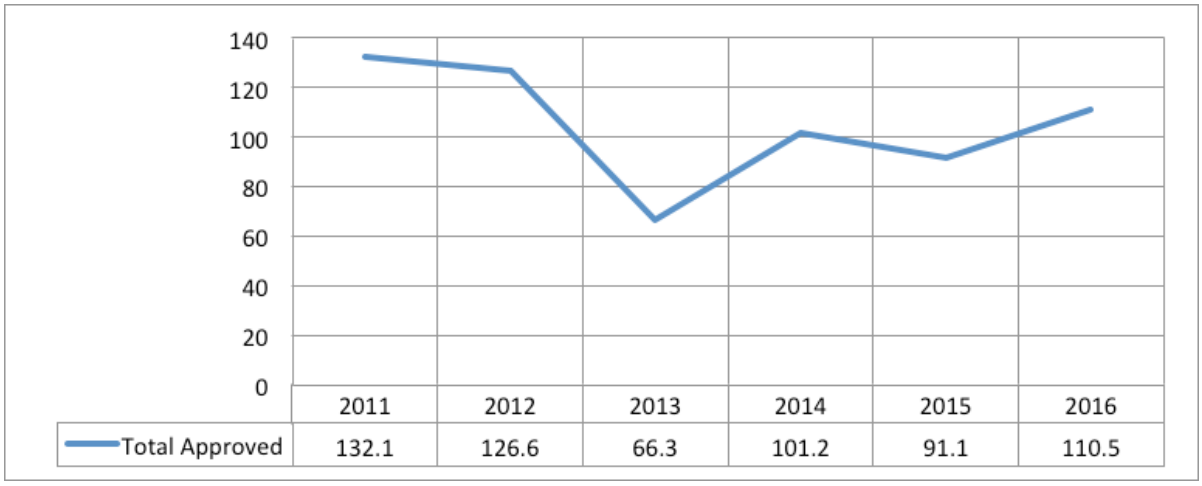

Figure 7. 1: Total Loan Approved to the Agriculture Sector to the ADB (GH₵ Million)

During the period 2011 - 2016, agricultural production constituted the highest proportion (53 percent) of the entire loan approved to the agricultural sector by ADB. Agro-export on the other hand, received the least of 3 per cent.

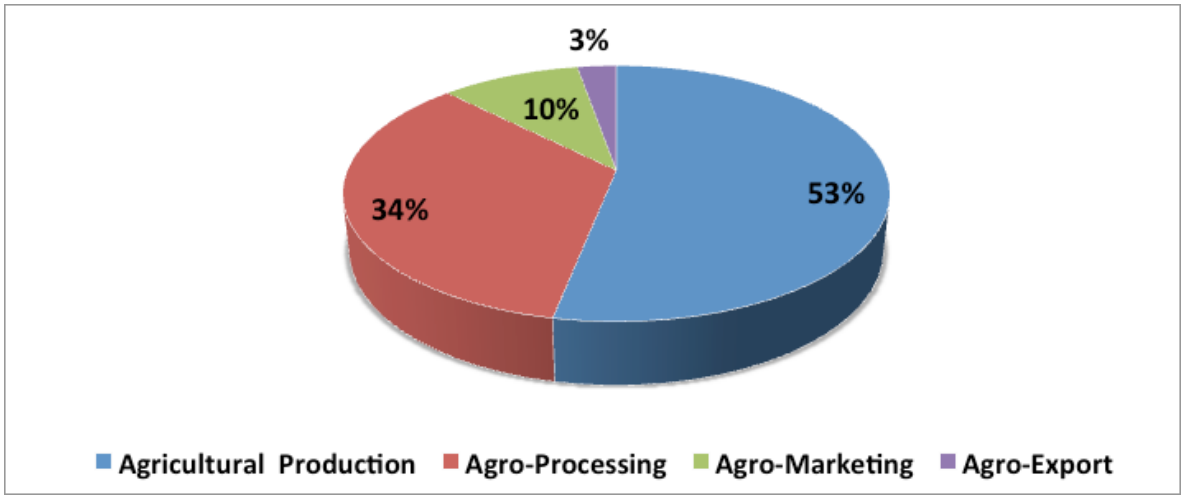

Figure 7. 2: Total Loan to Agricultural Sector by ADB (2011-2016)

7.2.3 Loan Disbursement by Export and Import Bank

Ghana's Parliament in June, 2016 passed the Ghana Export - Import (EXIM) Bank Act, 2016 (Act 911) into law and the Export Trade, Agricultural and Industrial Development Fund (EDAIF) Act, 2013 (Act 872) was repealed (www.ghana.gov.gh).

In effect, the EXIM Bank came into being to facilitate the flow of credit to Small and Medium Enterprises (SMEs) by providing credit guarantees and general financial risk management solutions. By the close of 2016, EXIM Bank disbursed a total of GH¢52,832,857.04 to cover grant for agro-processing and export, credit for agro-processing and export and poultry production (110.27%). Indications are that grants for agro-processing and export in the 2016 financial year decreased by about 84% while credit for the same purpose increased by about 57%. Disbursement for poultry production on the other hand, received over twice that of 2015. During the period, allocation was not made for rice, mango and GIDA, (Table 7.4).

Table 7. 4: Loan Disbursement by EXIMBank

No	Sector	Amount Disbursed (GH₵)			%Change (2015 & 2016)
		2015 (EDAIF)	2016 (EX-IMBank)	Total	
1	Agro-Processing and Exporters (Grant)	12,355,841	2,004,395	14,360,236	-83.78
2	Agro-Processors and Exporters (Credit)	25,567,554	40,123,962	65,691,516	56.93
3	Project Account (Poultry)	5,090,849	10,704,500	15,795,349	110.27
4	Project Account (Rice)	2,309,316	0	2,309,316	0
5	Project Account (Mango)	0	0	-	-
6	Ghana Irrigation Development Authority	0	0	-	-
Total		**45,323,560**	**52,832,857**	**98,156,417**	**16.57**

Source: EXIMBank, 2016

7.2.4 Performance of the Outgrower and Value Chain Fund (OVCF)

The Outgrower and Value Chain Fund (OVCF) project became operational in 2011. It has been providing medium to long term financing to some value chains, some of which are rubber, oil palm, rice, pineapple, maize, sorghum, soya bean and cassava industries. To date, it has cumulatively provided an amount of GH¢14.411 million to these value chains including Technical Operators (TOs) and Outgrowers. Out of this, GH¢ 646,565 went to TOs for oil palm, maize, soya bean and sorghum whereas GH¢3.049 million was given to outgrowers for rubber and oil palm, Table 7.5. The number of outgrowers supported by the end of 2016 stood at 2,982. Out of this, 336 was covered in 2016 and for only rubber production representing 11.27%. The project, after about six years of operation, is yet to record any outcome level results. According to the project management, the project is currently in the process of recruiting short Term Expert to Support to undertake baseline studies and help with the M&E system of the project.

Table 7. 5: Performance of Out-grower and Value Chain Fund (OVCF)

Scheme #	Commodity	Number of Outgrowers per Scheme			Volume of Credit Disbursed to TOs and Outgrowers (GH₵)				
					2011- 2015		2016		
		2011-2015	2016	Cumulative	(TO)	Outgrowers	(TO)	Outgrow-ers	cumulative
1	Rubber	881	336	1217	-	5,743,749	-	2,947,204	8,690,953
2	Oil Palm	100	0	100	787,935	404,883	146,565	101,566	1,440,949
3	Rice	136	0	136	9,599,500	546,534	-	-	10,146,034
4	Pineapple	94	0	94	601,140	393,130	-	-	994,270
5	Maize-soya-Sor-ghum	1,655	0	1655	-	2,000,000	500,000	-	2,500,000
6	Cassava	125	0	125	811,540	-	-	-	811,540
Total		**2,989**	**336**	**2,982**	**10,715,540**	**90,882,96**	**646,565**	**3,048,770**	**14,410,875**

Source: OVCF, 2016 Annual Report

7.2.5 Facilitation of Credit Disbursement by NRGP

The Northern Rural Growth Programme (NRGP) as part of its mandate to improve rural financing, continued to strengthen linkages with financial institutions towards improving access to financial services by smallholder farmers especially women, micro entrepreneurs and agribusinesses in the programme area. Consequently, target Participating Financial Institutions (PFIs) underwent capacity building in the under listed areas to enhance credit disbursement:

- Technical assistance i.e. training of PFIs in Rural and Agricultural Finance
- Development of Innovative Products and Services
- Logistical Support (provision of motor bikes) and
- Operational Support for PFIs (top up allowance for credit staff of PFIs dedicated to NRGP agricultural loans and maintenance cost)

7.2.6 Credit Applications, Approvals and Disbursement for 2016, NRGP

Discussions and engagement by District Value Chain Committees (DVCCs) with PFIs on loan applications, collation, vetting and submission of FBO loan requests, made some positive strides as indicated in table 7.6. An amount of GH₵ 2.15 million was disbursed to 331 FBOs in the crop production window. These were used for the cultivation of 3,873.40 hectares of maize and 100 hectares of Soya.

Table 7. 6: 2016 Credit Disbursements

Region	No. of Districts	No. of FBOs	No. of Farmers			Amount Disbursed (GH₵)	Area of Crops cultivated (Ha)		
			M	F	Total		Maize	Soya	Sorghum
UER	8	222	1,329	1,598	2,927	1,070,688	1,720	0	0
UWR	6	16	174	80	254	214,390	684	0	0
NR	7	69	518	604	1122	434,905	1,095	100	0
BAR	5	24	220	260	480	427,302	374	0	0
Total	**26**	**331**	**2,241**	**2,542**	**4,783**	**2,147,285**	**3,873**	**100**	**0**

Source: NRGP, 2016 Report

7.2.7 Loan Recovery by NRGP

In 2015, NRGP facilitated the disbursement of an amount of GH₵1,569 million to 294 FBOs. The programme made every effort to recover all outstanding loans to improve the credit worthiness of the beneficiaries and enhance the agribusiness financing confidence of the PFIs. The programme worked closely with the Facilitating Agency, the Association of Church Development Projects (ACDEP) together with the District Departments of Agriculture (DDA), DVCCs and bank officials to recover the loans in the 30 districts where it was accessed. The stakeholders held series of meetings and embarked on joint recovery visits to defaulting FBOs at the community level to redeem their indebtedness. This was critical towards the facilitation of credit approval and disbursement for the 2016 cropping season. Results from credit recovery are indicated in table 7.7.

Table 7. 7: Loan Recovery for 2015/2016 Farming Season

Region	No. of FBOs and Farmers (Loan Beneficiaries)				Loan Disbursed + Interest (GH¢)	Amount Repaid	% Repayment
	No. of FBOs	M	F	Total			
UER	199	1,209	1,397	2,606	1,124,872.78	1,034,816.91	92
UWR	8	59	68	127	90,536.97	80,034.68	88
NR	64	435	575	1,010	408,840.47	370.719.8	92
BAR	23	186	21	207	260,631	250,784.00	96
Totals	**294**	**1,889**	**2,061**	**3,950**	**1,884,881.22**	**1,736,355.39**	**92**

Source: NRGP, 2016 Report

Generally, efforts made by the programme to recover loans advanced to the target groups paid off. Consequently, out of a total amount of GH¢1.9 million credit disbursed (including interest), an amount of GH¢1.7 million representing an average of 92 percent of the disbursed amount was repaid. As a result, modest gains were achieved in terms of FBOs access to credit and it is anticipated that subsequently, the volume of credit to the FBOs might increase.

7.3 Human Resources Development and Management

The ministry through the Human Resource Development and Management Directorate (HRDMD) develops sector-wide policy on human resource, succession planning, training and development and performance management. It also ensures that, there is an effective and stable management framework consistent with the overall human resource needs of the sector. This concept is expressed mainly through staff development in this report.

7.3.1 Foreign Trainings

Acquisition of international experience, global approach to solving problems and knowledge sharing with international expertise has been some of the major benefits of undertaken foreign courses. Over the years, the ministry has benefited from some bilateral relationships with a number of countries such as the Republic of China, Japan, South Korea, Egypt and Israel, in the form of training courses to enhance the capacities of staff in food security and related areas.

During the year under review, a total of 72 staff benefited from such trainings, out of which 16 were females and 56 were males as indicated in appendix 9.

7.3.2 Local Training

A total of twenty two (22) staff participated in a number of academic training courses organized locally as indicated in table 7.8. A number of staff at the regional and district levels also benefited from some local training during the reporting year.

Table 7. 8: Local Training

COURSE (TOPIC)	DURATION	No. OF PARTICIPANTS		
		M	F	TOTAL
BSc. Agricultural Education	4years	1		1
BSc. Agricultural Extension	2 years	2		2
MA Economic Policy Management	1 year		1	1
MSc Environmental Technology for Sustainable Development	2 years	1		1
HND Secretaryship and Management Studies	3 years		1	1
Masters' in Rural Development and Food Security	1year		1	1
MSc. In Biotechnology with Specialization in Agric.	2yrs	1		1
MSc. In Environmental Science	2 years	2		2
MSc. In Veterinary Science (Veterinary Diagnostic Pathology)	18 months	1		1
8Master of Agriculture Degree in Crop Science	1 year	1		1
Masters' in Integrated Crop Management	1 year	1		1
Masters' in Business Administration			1	1
Bachelor of Technology in Agric. Engineering	2 years	1		1
Masters' in Agricultural Marketing and Processing	16 months	2		2
MSc. In Development and Rural Innovation	2 years		1	1
MSc. Environmental Technology for Sustainable Development	2 years	1		1
MSc. Food Security and Agricultural Development	16 months	1		1
MSc. In Agricultural Development (Production Chain Management)	1 year	1		1
PhD in Information, Communication and Technology	3 years	1		1
TOTAL		**17**	**5**	**22**

Source: HRDMD, 2016

7.4 Policy Formulation, Review and Implementation

The ministry in 2003 adopted the CAADP processes for developing National Agricultural Investment Plans (NAIP). This contributed to the development of the Food and Agricultural Sector Development Policy (FASDEP II) and the Medium Term Agricultural Sector Investment Plans (METASIP I & II).

The FASDEP II (2008) still remains the overarching policy document for the agricultural sector in Ghana. However, there are a number of sub-sector and commodity specific policies, plans and

strategy documents that complement FASDEP II implementation. These include: (a) Tree Crops Sub-Sector Policy; (b) Livestock Development Policy and Strategy; (c) National Seed Policy; (d) National Fertilizer Policy; (f) Oil Palm Master Plan (2012-2025); (g) National Rice Development Strategy (2015-2020); (h) Crop Protection Policy (2001); (i) National Plant Protection Policy (2004); etc.

In the year under review, the ministry developed and reviewed a number of policies, bills, plans, strategies and programmes for various subsectors and commodities within the sector. For a example, the ministry developed position papers and submitted to Technical Committee of National Development and Planning Commission (NDPC) to inform the 40-year development framework. It has also initiated an Agriculture Public Expenditure Review (2012-2016) with the support of the World Bank.

In addition, the ministry with support from the Canadian government, has finalized the development of a five year Modernizing Agriculture in Ghana (MAG) programme. This programme will make available CAD 135 million to the agricultural sector over the period, 2017-2021. The MAG evolved from Food and Agricultural Budgetary Support (FABS) and Support to Food and Agriculture Sector Development Policy (SFASDEP) to respond to the decentralisation of the sectors implementation responsibilities to Departments of Agriculture of the Local Government Service.

In the Livestock sub-sector, MoFA in 2016 supported the development of the Regional Livestock Development Programme for West Africa. It also developed a draft Veterinary and Livestock Improvement Bill which has been submitted to parliament for approval. The Livestock Development Policy and Strategy was also developed. The purpose is to facilitate and ensure the rapid development of the livestock industry and for locally produced livestock and its products to comply with international standards. For the crops sub-sector, the seed sector development framework in support of CAADP implementation within the framework of Africa Seed and Biotechnology Programme was developed with support from New Partnership for Africa Development (NEPAD).

Under the Micro Reforms for African Agribusiness Project supported by AGRA, the ministry facilitated consultation with the Parliamentary Select Committee on Agriculture Food and Cocoa Affairs for the approval and ratification of the ECOWAS harmonised seed and fertilizer regulation. In order to effectively coordinate and harmonize the agricultural policy environment, MoFA through the support of the USAID's Feed the Future - Agricultural Policy Support Project (APSP) developed an Agricultural Policy Matrix. Its objective is to capture, bring into focus key policy issues, increase the level of commitment and monitor all key actors in ensuring that collective actions are successfully implemented and on schedule.

The Ministry in collaboration with the Monitoring, Evaluation and Technical Support Services (METSS) continued to update the existing database on interventions in the sector. This involves the use of ArcGIS software which represents the data points (investment location) on map of Ghana. This helped in analysing the location of interventions, which will guide the design of future interventions to avoid duplications. The Unit reviewed the database and identified data gaps, based on that engaged enumerators to collect information from projects to fill in the data gaps.

7.5 Institutional Coordination and Collaboration for Agricultural Development

The agricultural sector stakeholders include state and non-state actors along the agricultural value chain. There is therefore the need for effective collaboration and coordination to achieve sector objectives. To this end, the ministry has dialogue platforms for engaging other Ministries, Departments and Agencies (MDAs), Development Partners, Civil Society Organisations (CSOs) and the private sector to deliberate on strategic policy issues, share information to improve planning and implementation. These platforms are; The Medium Term Sector Investment Programme Steering Committee (METASIPSC), Strategic Analysis and Knowledge Support Systems (SAKSS), Joint Sector Review (JSR), Agricultural Sector Working Group (ASWG) and Business meetings. These platforms harness the available human and other resources for effective support and implementation of sector plans.

7.5.1 METASIP Steering Committee (METASIPSC)

Membership of the METASIPSC is drawn from various institutions and the primary function is to see to the overall implementation of the sector plan i.e. METASIP II. It comprises thirteen (13) members and is supported by a Strategic Analysis and Knowledge Support System (SAKSS) and a Secretariat. The Steering Committee met each quarter of the year to review performances of critical segments of the sector. Key decisions taken include review of the following documents;

- Review of membership for efficiency and effectiveness
- Review of Gender and Agriculture Development Strategy (GADS II)
- Review of 40 year national development plan
- Review of guidelines on large Scale Land Transaction

7.5.2 Strategic Analysis and Knowledge Support System (SAKSS)

SAKSS is one of the mechanisms under the METASIP Steering Committee for coordination, participation and governance for effective implementation of METASIP II. The objective of SAKSS is to improve the quality of design and implementation of policies and strategies in Ghana's agricultural sector. SAKSS membership constitutes the public sector, academia, research,

private sector (entrepreneurs and Farmer Based Organizations) and CSOs. The main functions of SAKSS are; (i) Coordinate a collaborative network to mobilize available expertise to generate the required knowledge to support the implementation of agriculture and rural development programme and (ii) Ensure accessible storage and dissemination of such products.

Key achievements of the SAKSS during the year include;

1. The SAKSS Steering Committee its five Nodes were fully composed with the full complements of its membership to enable it function effectively;
2. Two of the SAKSS Nodes developed and submitted to USAID/APSP, TORs on research issues identified. Studies have been commissioned and will be ready by the end of the first quarter of 2017. Two of the remaining three (3) groups have submitted their TORs for the research issues identified. It is currently going through procurement processes to be awarded to research consultants;
3. SAKSS has also supported the institutionalization of Agriculture Public Expenditure Reporting. Currently, consultants contracted by World Bank are still working on the final report on the Agriculture Public Expenditure Review from 2008-2015. This would help track progress towards the 10% budgetary allocation as stipulated in the CAADP;
4. Six (6) Grant Awards have been given to researchers to conduct research on relevant researchable issues. The outcome of this studies would impact on the implementation of the Medium Term Agricultural Sector Investment Plan (METASIP) and on future policy decisions.

7.5.3 Agricultural Sector Working Group (ASWG)

The ASWG provides a platform for dialogue among stakeholders on strategic planning, performance monitoring and harmonization of agreements in the sector. This is aimed at enhancing the agricultural sector performance and the smooth implementation of projects and programmes. ASWG membership is represented by Development Partners, MoFA and other MDAs in the sector. The Agricultural Sector Working Group has been operational since 2004 and currently has two sub-working groups – (i) Policy Harmonization & M&E sub-group and (ii) Operations Sub-group.

During the year under review, two (2) Agricultural Sector Working Group (ASWG) meetings were organised during which key issues were discussed decisions taken. These issues included;

- Review of input subsidy programs for their sustainability, relevance and impact
- Planning and undertaking agricultural census
- Study on impact of decentralization on agricultural performance
- NAFCO study finalization

7.5.4 Development of Framework for Coordinating

As part of efforts to ensure effective coordination and synergy among all agricultural sector projects and programmes, MoFA established the PCU to undertake this task to ensure effective collaboration among projects. In the three regions of the north, the Northern Sector Agricultural Investment Coordination Unit (NSAICU) is mandated to effectively harmonize projects operation in the zone. The table 7.9 indicates some existing synergies among projects.

Table 7. 9: Projects and their Areas of Collaboration

Project	Areas of Collaboration
NRGP	▪ Development and usage of irrigation schemes for rice production - GCAP, RSSP, GASIP etc. ▪ Financial inclusion - RAFIP, OVCF ▪ Development and strengthening of FBOs and DVCCs – GASIP and other Projects ▪ Conservation Agriculture - GASIP, WAAPP
GCAP	▪ Collaborate with other projects/ programmes on warehouse management and supply of tools and equipment to ensure proper use of these infrastructure ▪ MoFA to collaborate with the Min. of Roads & Highways to select and improve feeder roads in GCAP project areas ▪ Collaborate with the RSSP to enhance implementation Nasia Nabogo Inland Valley Improved Rice Production Scheme. ▪ Encourage supported farmers to leverage support from OVCF
GASIP	▪ Collaborate to learn from other projects such as cashless credit and matching grant provided to FBOs under NRGP, WUA Law and land use right from GCAP, OVCF for business plan development
WAAPP	▪ Collaborate with CSIR, existing MoFA Projects, Agric Stations, Commercial Seed Growers to promote newly released crop varieties for dissemination and adoption. ▪ Collaborate with MoFA/DCS, Research to Operationalize and sustain the Technology Transfer Centres/Innovation Platforms. ▪ Collaborate with other MoFA projects and Donor Agencies to promote the e-Agricultural Initiative.
RSSP	▪ Collaborate with other projects to promote on-farm conservation agriculture demonstrations in project regions ▪ Multiplication of identified cover crop seeds for improved soil fertility management.
OVCF	▪ Collaborate with other projects to develop value chain commodities that can significantly curtail imports (import substitution e.g. rice) for financing and other non-traditional export commodities such as pineapple, cashew, sheanut/sheabutter, etc should be developed to make them attractive for financing.

7.5.5 Joint Sector Review (JSR)

The JSR provides a forum for key stakeholders such as MoFA, DPs, MDAs, Private Sector and CSOs for engagement. It is expected that the findings and recommendations of the JSR would inform and shape future plans and budgets. Recommendations at the JSR, informs the ensuing year's planning and budgeting for MoFA and sector-related MDAs and helps to synchronize support from Development Partners (DP) and areas of private sector participation.

In the year under review, an AgSWG meeting (with a wider stakeholder representation) served as a platform for the annual JSR. The key issues and recommendations from the review are as follows:

1. An accountability platform should be established at the departments of agriculture at all MMDAs;
2. Advocate for agriculture performance indicators to be included in the MMDA assessment criteria to attract funding to agriculture;
3. Intensify education on the use of appropriate technology instead of use of machinery and equipment;
4. Strengthen the linkage between industry and primary production; and
5. Improve collaboration among implementing partners to maximize impact and avoid duplication of efforts.

7.5.6 Business Meeting

This provides a forum for constructive dialogue between MoFA senior management, the private sector and civil society, parliament and the development partners to discuss high-level issues affecting sector performance and resolving sector development challenges and concerns. The Business Meeting, was initiated during the 2013 JSR as a result of the fact that, critical decisions cannot be taken during the large technical meeting of the JSR. The purpose of the meeting was to build consensus and prioritize key issues and action emerging from the JSR that will inform priority actions and budgeting for the subsequent year.

The first Business Meeting was held in 2014. The platform is one of the governance structures which is to help management and other stakeholders discuss and make concrete decisions on issues emanating from the JSR. It was scheduled to meet quarterly, however, in 2016, this meeting has been organized just ones. Key decision taken include:

- As part of accountability process, request was made to DPs to make their expenditure data available to MoFA;
- On the issue of GIRSAL, it was mentioned that proposals have been sent to Bank of Ghana for Board Room Approval;
- There was an appeal to DPs to support the agriculture census.

7.6 Strengthening Capacities for Planning, Monitoring and Evaluation

Planning, monitoring and evaluation plays an important role in effective and efficient running of every institution. It helps identify trends and patterns, adapt strategies and inform decisions while tracking progress made in implementing projects and programmes. The results of the M&E process helps to appropriately shape national development planning whiles redirecting its implementation based on the lessons learnt. It provides evidence which helps in making right decisions whiles ensuring transparency and accountability in the management of national resources.

A good data collection system forms the basis for an evidence based decision. However, data collection has been confronted with a number of challenges such as, inadequate funding and data collection equipment as well as untimely data collection. During the year under review, the ministry with the support of the Agricultural Policy Support Project (APSP) of the USAID Feed the Future programme, introduced the use of the Computer Assisted Personal Interview (CAPI) approach in data collection as a pilot in the Eastern Region. This is expected to reduce errors and provide timely data.

A number of staff participated in training and workshops related to monitoring and evaluation. The participants were made up of Agricultural Extension Agents (AEAs), District Management and Information Officers (DMISO), District Agricultural Officers (DAOs), District Directors of Agriculture (DDAs), Regional Agricultural Officers (RAOs), Regional Directors of Agriculture (RDAs), Non-Governmental Organizations (NGOs) and other stakeholders in Agriculture.

The M&E system has been used in undertaking a number of actions at all three administrative levels (National, Regional and District) over the years.

These include:

a. Preparation and dissemination of annual progress reports;
b. Conducting and reporting of annual Joint Sector Performance Reviews;
c. Supporting programmes and project implementation and policy formulation; and
d. Generating inputs into the reporting process of the national development frameworks.

APPENDICES

Appendix 1: *Key Indicators of Rainfall Distribution by Regions*

Region	Indicators
Western	The first quarter recorded moderate to high temperatures accompanied with low relative humidity and hazy atmospheric conditions that affected visibility for flight landings at the Takoradi Airport. Land clearing and post-harvest activities were however positively affected. There was bush fire outbreak due to the dry spell in Juaboso, Jomorro, Bodi and Bia West districts that mainly destroyed food crops. The Sui Forest Reserves, Krokosue Forest Reserves and some cocoa farms were also destroyed as a result of the bush fires.
Central	The first quarter of the year was dry, sunny, humid and associated with some gusty winds which adversely affected most existing plantain plants. A good heavy rainfall for the second and third quarters, almost a once a week, especially during the third interspersed with intense sunshine in the afternoons with a cool weather at night. Farming activity was at its climax. The last quarter had an erratic rainfall ushering in the harmattan period.
Greater Accra	Dry and dusty conditions were recorded especially in the first and second quarters of the year leading to drying of vegetation, withered crops and resulted in stunted growth. This gave way to a wet and humid weather with interspersed sunshine conditions were later recorded in the second and third quarters. Green vegetation was abundant between third and fourth quarters of the year.
Eastern	Generally rainfall intensity, frequency and distribution was good throughout the year especially in the savannah areas. However rainfall duration in the major season was shorter when compared to the 30 year average. This is because the onset of rains delayed and that affected early planting.
Brong Ahafo	The number of rainy days and the amount of rainfall for 2016 far exceeded that of 2015, but more dry spell period were longer than that of 2015. The torrential rains stopped abruptly, which affected late cultivated crops during the minor season. Although rainfall volume was high initially, soil moisture became low due to the intensity of the long dry spell. Some of the crops encountered pests and diseases, and this affected the 2016 food production.
Volta	Vegetative cover for 2016 was better as compared with that of 2015. This was as a result of favourable rainfall pattern in 2016. There were pockets of floods in Ho-Municipal, Agortime Ziope and Adaklu Districts which affected rice, tomato and maize fields. The year experienced shorter drought spells as compared to 2015. This was as a result of the even distribution of rainfall in 2016. Small streams and big rivers increased in volume as compared with 2015. This reduced the incidence of cattle travelling long distances in search of water. The reporting year recorded higher production figures for the major crops as compared with 2015.

Upper East	Early onset of rains (mid-March). Short dry spells around April – May in almost all districts. Favourable amount of rainfall and distribution. Flooding in some parts of the region (9 out of the 13 districts).
Upper West	Normal rainfall situation during the first quarter. Dry spell in April and June. The rainfall distribution was poor. It had been erratic, with some dry spells during the second quarter in some districts.
Ashanti	Sunny, dry and dusty in January and February but grasses were green and succulent in March. The rainfall distribution was sparse and below normal. Occasional flooding of the lowlands in some communities. Grasses and other leguminous crops were succulent and available to feed livestock. The weather pattern for the year was comparatively rainy.
Northern	The total amount of rainfall for 2016 was higher than 2015 and was evenly distributed over the districts. This had a positive effect on most crop yields. The weather report indicated that there was adequate rainfall during the period under review (2016) as against same period in 2015 especially with the second and third quarters as well as the fourth quarter respectively. This enabled farmers to plant their arable crops on time. The wet days experienced were also normal and was uniformly distributed. The overall effect is that crops performance is satisfactory throughout the region for the season.

*Appendix 2: Food Self-sufficiency Levels (Food Balance Sheet)**

CROP	Total Domestic Production (MT)						Production Available For Human Consumption (MT)						Estimated National Consumption (MT)						Deficit/Surplus (MT)					
	2011	2012	2013	2014	2015	2016	2011	2012	2013	2014	2015	2016	2011	2012	2013	2014	2015	2016	2011	2012	2013	2014	2015	2016
MAIZE	1,684	1,950	1,764	1,769	1,692	1,722	1,263	1,462	1,323	1,326	1,269	1,291	1,105	1,131	1,157	1,184	1,211	1,239	158	332	166	142	57	52
RICE (Milled)	302	313	393	417	443	474	262	272	342	363	385	413	605	620	634	649	664	679	343	-348	-292	-286	-279	-266
MILLET	184	180	155	155	157	159	160	156	135	135	137	138	126	129	132	135	138	141	34	27	3	0	-1	-3
SORGHUM	287	279,983	257	259	263	230	250	244	223	225	229	200	126	129	132	135	138	141	124	115	91	90	90	58
CASSAVA	14,241	14,547	15,990	16,524	17,213	17,798	8,981	10,183	11,193	11,567	12,049	12,459	3,857	3,947	4,039	4,133	4,229	4,326	6,112	6,236	7,154	7,434	7,820	8,132
YAM	5,855	6,639	7,075	7,119	7,296	7,440	4,684	5,311	5,660	5,695	5,837	5,952	3,153	3,227	3,302	3,379	3,457	3,537	1,531	2,084	2,358	2,316	2,380	2,415
COCOYAM	1,300	1,270	1,261	1,299	1,301	1,344	1,235	1,207	1,198	1,234	1,236	1,277	1,009	1,033	1,057	1,081	1,106	1,132	226	174	142	153	130	145
PLANTAIN	3,620	3,557	3,675	3,828	3,952	4,000	3,077	3,023	3,124	3,254	3,360	3,400	2,139	2,189	2,240	2,292	2,345	2,399	938	834	884	962	1,014	1,001
G'NUTS	465	475	409	427	417	426	419	428	368	384	375	383	303	310	317	324	332	340	116	118	51	60	44	44
COWPEA	237	223	200	201	203	206	20	190	170	171	173	175	126	129	132	135	138	141	75	61	38	36	35	34
SOYABEAN	165	151.71	139	141	142	143	14	129	118	120	121	122	50	52	53	54	55	57	89	77	65	66	66	65

Source: SRID,MOFA

*Notes: Estimated Population for 2016, based on 2010 provisional census figure = 28.31 m. **

70% of Domestic production for maize and cassava; 87% for rice, millet and sorghum; 80% for yam

95% for cocoyam; 90% for groundnuts; 85% for plantain and cowpea. Livestock feed, wastage and seed account for the discount

*** Milled rice is 69% of the paddy*

· Provisional

Appendix 3: Outbreaks of Scheduled Diseases and Estimated Losses

Disease	Species	No. of Outbreaks	No. of Animals Affected	Total Loss of Animals	Money Lost to Death from Disease (GHc)
African Swine Fever	Pigs	10	4,481	2752	3,096,000
Anthrax	Sheep/ Pigs	2	22 11	22 11	11,000 12,375
Bovine TB	Cattle	97	183	88	176,000
Brucellosis	Dog	1	1	1	500
CBPP	Cattle	83	345	207	414,000
Contagi-ous Ecthyma	Goats	5	16	0	0
Dermato- philosis	Cattle	4	7	2	4,000
Foot & mouth disease	Cattle	8	102	14	28,000
Fowl pox	Birds	19	1,202	455	9,100
Fowl Typhoid	Birds	1	2	2	40
Gumboro Disease	Birds	146	20,097	9,627	192,540
Heartwater	Sheep	1	3	1	600
HPAI	Birds	29	20,215	54312	1,900,920
Lumpy Skin Disease	Cattle	7	552	9	18,000
Mange	Sheep/ goats	34	580	109	32,700
Newcastle Disease	Birds	187	13,362	5,352	107,040
PPR	Sheep/Goats	30	469	174	52,200
Rabies	Cattle Dogs cat	1 16 1	1 19 2	1 19 2	2,000 950 70
Sheep pox	Sheep	4	4	3	1,500
Bovis Trypanoso-miasis	Cattle	8	25	1	2,000
TOTAL					**6,061,535**

Source: Veterinary Services / DAD, MoFA

Appendix 4: Interventions to Ensure Household Food Availability

Area of Training	Number Beneficiaries					
	2015			2016		
	M	F	Total	M	F	Total
Establishment of backyard/home gardens	2,379	2,491	4,870	2,475	2,507	4,982
Raising of small animals and poultry	2,153	1,957	4,110	2,311	2,092	4,403
Planting of fruit trees; mango, pear etc.	1,376	1,128	2,504	1,420	1,350	2,770
Establishing of woodlots.	435	365	800	546	391	937
Dry season gardening	1,152	1,756	2,908	1,312	1,790	3,102
Raising of school gardens	710	508	1,218	815	400	1,215
Registration of farmers to produce orange flesh sweet potato	28	102	130	45	215	260
Storing of cowpea using the Pergion Improved Cowpea Store (PICS) bag methods	30	56	86	47	53	100
Farmer training on Onion storage	-	25	25		27	27
OTHERS (Soap making, Head Porters, Fetching of water for sale, Weeding, Burning of charcoal, Fish processing, Fuel wood sale, Forage sale, Use of improved cassava variety (bankye ohemaa), Safe and effective use of agro-chemicals in the home, Fertilizer Application, Vegetable production, Mushroom production)	546	2,046	2,592	712	2,294	3,006

Appendix 5: Status of Implementation of METSIP II by GID

Adopted Strategies	Key Activities	Status of Implementation
2.3.1 Develop and promote appropriate and cost effective irrigation schemes including dams, boreholes, and other water harvesting techniques for different categories of farmers and agro ecological zones.	Explore the potential and implement ground and surface water irrigation and agriculture water management including water harvesting.	Groundwater: With funding from the Spanish Government, GIDA implemented Irrigation and Groundwater Resource Development Project. As part of the project, sprinkler accessories were delivered to Weija scheme. Main canal and three sumps were rehabilitated and a warehouse (100m2) was constructed at Mankessim. Four agro-meteorological stations were established for real time climatic data collection at Bongo, Mankessim, Weija and Wenchi. Additionally, 5 tube-wells have been constructed in Shime in the Volta Region. Surface water irrigation: GIDA is also constructing 10 schemes to promote export trade in Ghana. For Mprumem and Tamne ongoing construction is at 30% completion each Kiape and Mandari construction is completed and handed over to farmers. Pre-feasibility studies is completed at Kpli, Ho-Keta Plains and Sabare and on-going studies at Kamba. Studies and draft designs completed at Amate while review of designs completed at Nasia-Libga. Funding from Export Trade and Agriculture Investment Fund (EXIM Bank). On the other hand, provision of irrigation infrastructure for selected communities in Upper East, Eastern and Volta Regions under Livelihood Support Improvement Project is in progress. As part of the project, work is completed at Atidzife-Ayiterkofe and Aka Basin. Work at 95%, 20% completion at Kornorkle, Uasi respectively. GIDA also provided technical support in the construction of irrigation infrastructure in conflict zones (Yendi, Bawku and Wa) in collaboration with FAO. The Project is completed with a total of 20ha to be put under irrigation.

Adopted Strategies	Key Activities	Status of Implementation
2.3.2 Rehabilitate viable existing irrigation infrastructure and promote their efficient utilisation.	Prepare designs for the rehabilitation, sensitize farmers and undertake rehabilitation with active involvement of farmers and opinion leaders.	Northern Rural Growth Programme (NRGP): Reorganize and sensitize Water Users Associations on 9 Small Scale Irrigation Development Projects in collaboration with NRGP. A total of 285 prospective farmers trained; 40 in Dordoekope, 23 in Tordzinu, 39 in Tokpo, 33 in Volo, and 30 each in Afaode, Agorveme, Sogo, Dipali and Dinga. Farmers trained on formation of Water Users Associations (WUAs), land allocation issues, determination, collection and use of Irrigation Service Charge (ISC), farm business sustenance management and marketing, water management, record keeping, agricultural finance and credit, and maintenance of irrigation infrastructure. Provide technical support for rehabilitation of dams and dugouts in the 3 northern regions in collaboration with the Ghana Social Opportunities Project (GSOP). A total of 44 dams/dugouts completed, work on-going at 20 sites in Upper East Region. For Upper West Region, 51 dams/dugouts is completed, while work is on-going at 12 sites. In the Northern Region, 22 dams/dugouts is completed while work ongoing at 30 sites. A total of 320ha developed for irrigated crop production
2.3.3 Promote private sector participation in irrigation development, management and utilisation.	Develop PPP concept for irrigation based on research and good practices elsewhere.	GIDA is currently implementing Restructuring and Modernization of the irrigation sub-sector. As part of the restructuring and modernization, National Irrigation Policy is being reviewed. The policy which is PPP-friendly is expected to improve the investment climate for Public-Private Partnerships (PPPs) and external funding which are urgently needed to maintain and expand the irrigated agricultural sub-sector.
2.3.4 Promote land reforms targeting equal access to irrigated land by men, women and persons with disabilities.	Organize four stakeholder sensitisation workshops on irrigated land reforms.	Sensitization workshops were organized for farmers on Weija and Okyereko Irrigation Schemes on issues such as time constraints of women and need for women participation in leadership and decision making of Water Users Associations.
2.3.5 Develop policy and legal regime and appropriate tenure arrangement for use of irrigation facilities.	Organize stakeholder workshop to collect views. Advocate for the development of the policy and legal frameworks.	The National Irrigation Policy which is being reviewed will empower GIDA just like Volta River Authority (VRA), the Forestry Commission and Minerals Commission to enable the Authority exercise absolute control in terms of ownership and use of public irrigation lands.
3.2.3 Provide improved rural infrastructure to enhance private sector investments.	Facilitate the provision of infrastructure to support private sector investment in agriculture.	As part of restructuring and modernization of GIDA and the irrigation sub-sector, Kpong, Torgorme, Tono and Vea irrigation schemes are being rehabilitated to facilitate private sector investment into agriculture

Appendix 6: Land Use Efficiency

	Area of Irrigated Land (ha)				Land Use Efficiency				Production (ton/ha)		
	2014	2015	2016	% Change	2014	2015	2016	% Change	2014	2015	2016
National											
Total irrigated areas developed (formal and informal)	29,507.71	-			-	-	-				
Total formal irrigated area developed	10,687.50	10,687.50	11,000.00	2.92	-	-	-		_	_	_
Total formal irrigated area cropped	9,367.90	9,367.90	17,291.51	84.58	0.88	0.88	1.57	79.34	Veg: 22,541.6	Veg: 9,745	Veg: 42,898.10
									Cereal:31,977.6	Cer:34,698.4	Cer: 79,403.13
Total informal irrigated area cropped	26,470.67	30,935.68	49,687.75	60.62	0.6	n.a	n.a	n.a	Veg: 57,957.0	Veg:92188.6	Veg:144,100.46
									Cer: 67,079.9	Cer:82,788.5	Cer:91,426.40
										Fruit: 682	
Total formal area irrigated first cycle	3543	5,231	4,941.52	-5.54	0.48	0.49	0.45	- 8.22	Veg: 8,0905	Veg:6,233.94	Veg: 14,044
									Cer:11,046.77	Cer:13,200.18	Cer: 19,083.54
									Leg:65.88	Leg:148.5	Leg: 764.18
Total informal area irrigated during first cycle	10,431.30	10,212.94	18885.89	84.92	0.37	n.a	n.a	n.a	Veg: 19,219.98	Veg:28,711.37	Veg: 12,105.26
									Cer: 24702.4	Cer:27,031.35	Cer:6,052.63
									Fruit	Fruit: 682	
Total formal area irrigated during second cycle	5,824.90	5,231.24	12,349.99	136.08	0.45	0.49	1.12	129.37	Veg:14,451.06	Veg:3,342.4	Veg: 28,854.10
									Cer: 20,930.87	Cer:21,496.6	Cer: 60,319.59
									Leg: 61.09		Leg: 1,767.07
Total informal area irrigated during second cycle	8,156.10	10,238.70	21,432.63	109.33	0.13	n.a		n.a	Veg:21927.74	Veg:33,434.00	Veg:13021.09
									Cer: 20,3888.8	Cer:27,955.56	Cer:6,510.54
Total informal area irrigated with three annual crops	7,883.30	10,484.00	9,369.23	-10.63	0.09	n.a		n.a	Veg:16,809.28	Veg:30,043.00	Veg:6,346.15
									Cer:21988.69	Cer:27,801.50	Cer:3,173.08

Source: GIDA (2017)

Appendix 7: Regional Performance of Irrigation in 2016

	Areas developed (hectares)	Area Cropped (hectares)				Average land intensification ratio	Production of irrigated crops	
		First Cycle	Second Cycle	Third Cycle	Sub-total		Crop	Mt
UPPER EAST								
Formal	3,942.00	1,834.90	4,985.42	-	6,820.32	1.73	Vegetable	16,862.6
		-	-	-	-		Cereal	31,435.9
		-	-	-	-	-	Legume	939.9
					-		Sub-total	49,238.4
Informal	1,178.60	698.60	256.80	223.60	1,179.00	1.00	Vegetable	4,906.7
		-	-	-	-	-	Cereal	4,979.1
		-	-	-	-	-	Legume	0.0
Sub-Total	5,120.60	2,533.5	5,242.2	223.6	7,999.32	1.56	Sub-total	9,885.8
					-	Regional Total		59,124.2
UPPER WEST								
Formal	194.5	0	0	-	0.00	-	Vegetable	-
							Cereal	0
							Legume	0
							Sub-total	-
Informal		187.6	75	0			Vegetable	155.9
							Cereals	37.5
Sub-Total	194.5	187.6	75	0		1.35	Sub-total	193.4
						Regional Total		193.4
NORTHERN								
Formal	782.3	440.7	1,148.5		1589.13	2.03	Vegetable	3,935.6
						-	Cereal	7,311.1
							Legume	225.7
							Sub-total	11,472.5
							Vegetable	1,500.0

	Areas developed (hectares)	Area Cropped (hectares)				Average land intensification ratio	Production of irrigated crops	
		First Cycle	Second Cycle	Third Cycle	Sub-total		Crop	Mt
Informal	1,147.00	401	750	50	1201.00		Legume	90.0
					0.00		Cereal	1,203.0
Sub-Total	1,929.30	841.7	1898.5	50.0	2790.13	-	Sub-total	2,793.0
						Regional Total		14,265.5
BRONG-AHAFO								
Formal	311	0.0	55.80	-	55.80	0.18	Vegetable	381.8
		-		-			Cereals	798.1
		-	-	-		-	legume	0.0
							Sub-total	1,179.8
Informal	2,941.00	26.0	20.0				Vegetable	84.0
		-	-	-		-	Cereals	78.0
Sub-Total	3,252.00	26.0	75.8	0.0	101.80	0.03	Sub-total	162.0
						Regional Total		1,341.8
ASHANTI								
Formal	335	241.0	125.9		366.90	1.10	Vegetable	920.9
			-			-	Cereals	1,663.3
							Legume	64.5
							Sub-total	2,648.7
Informal	2,063	728.0	1751.0		2479.00	1.20	Vegetable	0.0
		-	-			-	Cereals	0.0
Sub-Total	2,398.00	969.0	1876.9	0.0	2845.90	1.19	Sub-total	0.0
						Regional Total		2,648.7
WESTERN								
Formal	108	0.0	0.0	-		-	Vegetable	0.0
		-	-	-		-	Cereals	0.0
							Legume	0.0

	Areas developed (hectares)	Area Cropped (hectares)				Average land intensification ratio	Production of irrigated crops	
		First Cycle	Second Cycle	Third Cycle	Sub-total		Crop	Mt
							Sub-total	0.0
Informal							Vegetable	0.0
		-	-	-		-	Cereals	0.0
Sub-Total	108.00	0.00	0.00	0.00		-	Sub-total	0.0
						Regional Total		0.0
EASTERN								
Formal	2932			-		-	Vegetable	0
							Cereal	0.0
							Legume	0.0
							Sub-total	0.0
Informal	3,685	7639.2	9022.0	6073	22734.2	4.52	Vegetable	64,954.1
						-	Cereal	13,214.1
						-	Legume	0.0
Sub-Total	6,617	7639.2	9022.0	6073.0		2.52	Sub-total	78,168.2
						Regional Total		78,168.2
CENTRAL								
Formal	134.10	119.00	83.50	-	202.50	1.51	Vegetable	515.3
						-	Cereals	903.7
							Legume	42.8
							Sub-total	1,461.8
Informal	426.00	380.00	386.00	392.00	1158.00	1.80	Vegetable	2,156.0
						-	Cereals	240.0
						-	Fruits	0.0
Sub-total	560.10	499.00	469.50	392.00	1360.50	1.73	Sub-total	2,396.0
						Regional Total		3,857.8
VOLTA								

	Areas developed (hectares)	Area Cropped (hectares)				Average land intensification ratio	Production of irrigated crops	
		First Cycle	Second Cycle	Third Cycle	Sub-total		Crop	Mt
Formal	1,399.00	1840.7	340.7	-	2181.48	1.56	Vegetable	5,269.0
							Cereals	10,306.4
							Legume	174.5
							Sub-total	15,750.0
Informal	21,597.54	8501.3	7000.0		15,501.26	0.72	Vegetable	63,620.0
			-			-	Cereals	51,217.0
Sub-Total	22,996.54	10342.0	7340.7	0.0	17682.74	0.77	Sub-total	114,837.0
						Regional Total		130,587.0
GT. ACCRA								
Formal	2380.00	2,115.83	3,851.95		5,967.78	2.51	Vegetable	15,012.8
							Cereals	26,984.7
							legume	1,083.8
							Sub-total	43,081.4
Informal	4,175.30	324.23	2,171.83	2,630.63	484.06		Vegetable	6,723.8
						-	Cereal	20,457.7
							Legume	0.0
Sub-Total	4,725.30	2,440.06	6,023.78	2,630.63	11,094.47	2.35	Sub-total	27,181.5
						Regional Total		70,262.8
Total Formal Area	10,687.90	6,592.1	10,591.8	-	17,183.91	1.61	Vegetables	42,898.1
							Cereals	79,403.1
Total Informal Area	37,213.44	18,885.89	21,432.6	9,369.2	49,687.8		Legumes	2,531.3
							Vegetable	144,100.46
		18,885.9	21,432.6	9,369.2	49,687.8		Cereals	91,426.40
							Fruits	0.00
TOTAL	47,901.34	25,478.0	32,024.4	9,369.2		1.40	Total	360,359.34
							Vegetable	186,998.56
							Cereal	170,829.53

	Areas developed (hectares)	Area Cropped (hectares)				Average land intensification ratio	Production of irrigated crops	
		First Cycle	Second Cycle	Third Cycle	Sub-total		Crop	Mt
		66,871.66					Legumes	2,531.25

Source: GIDA (2016)

Appendix 8: Agricultural Mechanization Centres

REGION	2014				2015				2016			
	New Centres Established	Total Existing	Total Operational	Total Area ploughed (Ha)	New Centres Established	Total Existing	Total Operational	Total Area ploughed (Ha)	New Centres Established	Total Existing	Total Operational	Total Area ploughed (Ha)
Ashanti	0	5	6	1,882	0	3	2	3,745	N/a	7	7	473
Brong Ahafo	0	13	12	4,376	0	4	4	2,924	N/a	4	3	1,300
Central	0	4	5	450	0	1	1	30	N/a	1	1	232
Eastern	0	10	4	830	0	5	1	0	N/a	5	3	728
Greater Accra	0	3	4	314	0	9	8	4,015	N/a	9	8	105
Northern	0	28	27	30,150	0	11	9	2,990	N/a	11	9	4,910
Upper East	0	7	7	7,450	0	7	6	5,866	N/a	7	6	2,787
Upper West	0	9	9	8,550	0	9	9	4,248	N/a	9	9	2,579
Volta	0	9	7	985	0	9	7	898	N/a	9	7	564
Western	0	1	1	170	0	1	1	46	N/a	1	1	102
Total	**0**	**89**	**82**	**55,157**	**0**	**59**	**48**	**24,762**	**79**	**63**	**54**	**13,780**

Source: AESD (2014-2016)

Appendix 9: Staff Participation in Foreign Training

COUNTRY	COURSE TITLE	MALE	FEMALE	TOTAL
CHINA	Applied Cultivation Technology of Economic Crops for Developing Countries	2		2
	Hybrid Rice Comprehensive Technology for Developing Countries	2		2
	Grain and Oil Crops and Irrigation System Comprehensive Utilization Technology for Developing Countries		2	2
	Agricultural Mechanization Standardization for Developing Countries	1	1	2
	International Seminar on Integrated Technology of Beef/ Cattle Production for Developing Countries	3		3
	Agricultural Mechanization for Developing Countries	2		2
	Hybrid Rice for Developing Countries	2		2
	Hybrid Maize for Developing Countries	2		2
	Oil Crops Comprehensive Technology for Developing Countries		2	2
	Agricultural Biotechnology Application for Developing Countries	2		2
	Ecological Agriculture and Planting Models and Demonstrations of Special Economic Crops for Developing Countries	2		2
	Crop Seed Production and Management for Developing Countries	2		2
	New Technology Popularizing of Agriculture Modernization for Developing Countries	2		2
	Prevention and Treatment of Animal Epidemics for Developing Countries	2		2
	Super Green Hybrid Rice Variety Breeding Seed Production and Cultivation for Developing Countries	2		2
	Developing and Planning of Tropical Agro-Tourism for Developing Countries	2		2
	Bee Keeping and Honey Processing Technology for Developing Countries	2	1	3
	Grain Security for officials from Developing Countries	1	1	2
	Information Technology, Applications in Agriculture for Developing Countries	2		2
	Modern Agricultural Technology and Food Security for Developing Countries	1	1	2
	Training Course on Environmentally Friendly Fertilizer Production Application and Demonstration for Developing Countries		2	2

JAPAN	Promotion of African Rice Development for Sub-Sahara African Countries	2		2
	Post–Harvest Rice Processing for African Countries	1		1
	Strengthening Safety Management System of Agricultural Products	1		1
	Local Industry Development in Agricultural Regions by Strengthening Capacity Management and Marketing (A)		1	1
	Development of Core Agriculture Researcher for Promotion of Rice Production in Sub-Saharan Africa	1		1
	Market-oriented Agriculture Promotion for Africa (Planning and Management)	1	1	2
	Policy and Administration of the Land for Responsible Agricultural Investments and Inclusive Development	1	1	2
	Irrigation Scheme Management & Participatory Water Management	3		3
	Promotion of Mechanization in Rice Sector for CARD Member Countries	4	2	6
	Improvement of Rice Cultivation Techniques	1		1
	ICT For Agricultural Information Use	1		1
	Local Industry Development through Hygiene & Quality Management for Animal-Sourced Foods	1		1
	Research on Veterinary Technology		1	1
South Korea	Production and Distribution System of Animal Products	1		1
	Agricultural Marketing and Processing	2		2
EGYPT	Rice Cultivation for Africa	2		2
TOTAL		56	16	72

Source: HRDMD, 2016

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