

An Assessment of Uganda's Agricultural Production, Climate Change, Agricultural Trade and Food Security

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**THE KENYA INSTITUTE FOR PUBLIC POLICY RESEARCH AND
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**UNITED NATIONS ECONOMIC COMMISSION FOR AFRICA
(UNECA)**

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Economic Policy Research Centre, Uganda

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Foreword

Climate change and climate change variability is a threat to food production patterns, thus exacerbating food and nutrition insecurity across Africa. Therefore, tackling poverty, hunger and food security is a priority for the Africa Union Agenda 2063 which underscores the right of Africans to live healthy and productive lives. Further, the African Union has set a target to eliminate hunger and food insecurity by 2025 towards achieving the Sustainable Development Goal (SDG) 2 on ending hunger, achieving food security and improving nutrition. Unfortunately, Africa is not on track in meeting these targets mainly because the region is not producing enough food due to climate change and low adoption of technology. However, climate change has variable impacts on food production, with both production losses and gains across the region. As a result, regional trade is critical for facilitating the distribution of agricultural products to enhance food security in the region.

The East Africa Community (EAC) region is particularly vulnerable to climate change. The region is already experiencing increased climate change impacts, including extreme weather conditions, persistent drought, floods, and landslides and rising sea level which threaten food security and efforts to eradicate poverty. Despite the huge potential to produce enough food, the agricultural production system in the region is mainly rainfed, which consequently leads to high food and nutrition insecurity.

Finding solutions to perennial food security challenges in the EAC is crucial and urgent as climate change impacts intensify in frequency and severity. Looking beyond just agricultural production systems is thus critical in tackling this peril. Thus, there is need to apply other approaches such as the nexus approach which allows for evaluating integrative systems where, for instance, trade facilitates food security in a changing climate environment. Although agriculture production is vulnerable to climate change, food security is not necessary a result of low production but a combination of other factors such as poor food distribution caused by perverse subsidies and other trade barriers. The EAC has been able to attain a common market status, which could facilitate trade in the region and thus mitigate food shortages.

Despite the various measures and programmes adopted in EAC, some parts of the region continue to face food deficits due to restrictive trade policies and barriers to trade. Opportunities exist for adopting existing policy frameworks by member countries to address food security needs.

Preface

The project on Regional Assessment of Climate Change, Agricultural Production, Trade in Agricultural Production and Food Security in East African Community (EAC) was carried with support from the ACPC-CLIMDEV Work Programme. The ClimDev-Africa Programme is an initiative of the African Union Commission (AUC), the United Nations Economic Commission for Africa (UNECA) and the African Development Bank (AfDB). It is mandated at the highest level by African leaders (AU Summit of Heads of State and Government). The Programme was established to create a solid foundation for Africa's response to climate change and works closely with other African and non-African institutions and partners specialized in climate and development.

Over the last few years, our understanding and certainty about how climate is changing and the possible impacts this could have has grown immensely. This notwithstanding, agricultural production systems in the EAC region are highly vulnerable to climate change, consequently affecting food and nutrition security. The region is the most developed regional economic community (REC) in Africa, and cross border trade plays a critical role in facilitating food security. In response, the United Nations Economic Commission for Africa–African Climate Policy Centre (ACPC) is increasing its efforts to improve the capacity of EAC member states for mainstreaming climate change impacts in development policies, frameworks and plans.

The three-year project was launched in May 2014 covering Burundi, Kenya, Rwanda, Tanzania and Uganda. The activities carried in this study were linked to the ClimDev-Africa Programme work stream II, which focuses on solid policy analysis for decision support, and was spearheaded by the Kenya Institute for Public Policy Research Analysis (KIPPRA). The overall objective of the project was to assess whether or not agricultural production systems and trade policies in EAC can be adjusted to alleviate the impact of climate change on food security, and promote sustainable development. The project outputs include pre-project report, country scoping studies, indepth EAC studies on climate change, crop production model, economic policy and trade and finally a comprehensive regional report.

Acknowledgements

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The study was conducted as a part of the activities of the Climate Change and Development in Africa (ClimDev-Africa) Programme supported by the UK Department for International Development (DfID), European Union Commission, Norway, Sweden, France, Nordic Development Fund, and the United States Agency for International Development (USAID).

The Executive Director of KIPPRA and the Executive Secretary of UNECA would like to acknowledge the KIPPRA technical team comprising Nancy Laibuni (Project Coordinator), Dr August Muluvi, Dr Christopher Onyango, Mr John Nyangena, Mr Simon Githuku, and Mr Nixon Murathi; and the project consultants Dr Richard Mulwa, Dr Miriam Omolo, Dr Wilfred Nyangena, Prof. Caleb Mireri, and Dr Wellington Mulinge. In addition, we appreciate the Eastern and Southern Africa Region Office of the World Meteorological Organization, led by Dr Elijah Mukhala and the consultants, Mr Nicholas Maingi and Dr Joshua Ngaina for their contributions to the project.

The regional Partner Institutions included Economic Policy Research Centre (EPRC)–Uganda team lead by Dr Isaac Shinyekwa, Sokoine University–Tanzania team led by Prof. Siza Tumbo, University of Burundi team led by Dr Alex Ndayiragije, and Kigali Independent University team led by Mr Paul Muzungu. The participation of the stakeholders in various stages of the preparation of the report was highly valuable in enriching the report.

The Economic Commission for Africa and KIPPRA would like to express their appreciation to all the government Ministries, State Departments and Agencies in Burundi, Kenya, Rwanda, Tanzania and Uganda for their active participation and providing the data and information used in preparing the report.

Executive Summary

Recent research has demonstrated that climate change has potential impact on ecosystems globally, with enormous resultant effects on habitants. Evidence exists from observation over half a century demonstrating extreme change in climate with disasters leading to major losses. Changes in climate have led to changes in precipitation, length of growing seasons, water availability, carbon uptake, incidences of extreme weather events, flood risks, desertification, distribution and prevalence of human diseases and plant pests. These in turn have greatly impacted on agriculture and thus significantly altered the conditions for agricultural production especially in Africa. Uganda, like other countries, is likely to continue to experience increasing climate variability, which will lead to further decline in food production and hunger and thus limit the country's ability to attain food security. Currently, there are inadequate policies developed to mitigate climate change impacts.

Increasing agricultural production is crucial to securing food and more foreign exchange through trade. Therefore, it is important to put in place policies and strategies that promote good agricultural practices such as use of improved technologies, soil and water conservation techniques among farmers to shield them against impacts of extreme events and climate change. The study aims at scoping the agricultural production, climate change, agricultural trade and food security status in Uganda. Specifically, the study seeks to: document the agricultural production and agricultural systems in Uganda; analyze policies governing agricultural production in Uganda; establish the existing linkage between food production and food security in Uganda; assess the relevance of trade policies to trade in agricultural produce; and assess climate change, its implications on agricultural food production and how it impacts trade and food security.

The study reviewed and analyzed secondary materials and information, especially reports. This was the core source of secondary data supplemented by databases from the Uganda Bureau of Statistics and other relevant government agencies. The study used a distillation approach to obtain information from the various reports collected. Using the generated information, linkages and policy implications were crafted.

Agriculture is the backbone of Uganda's economy. It is the major source of employment, food and export earnings to the country and significantly contributes to the Gross Domestic Product (GDP). However, the sector has experienced slower growth compared to the other sectors over the recent years. Among the factors affecting agriculture productivity is land scarcity that has resulted into land fragmentation, less adoption of better farming technologies such as high

yielding seed varieties, fertilizers application and irrigation, pests and diseases, and weather shocks. Uganda's agricultural output is heavily reliant on natural climatic conditions. Agriculture is rain fed, which makes it susceptible to weather shocks such as prolonged droughts that lead to crop losses and hence threatening food security. Farmers heavily depend on poor and rudimentary production technologies and still practice extensive farming systems. The sector is faced with poor market access by most farmers especially those in remote areas due to inadequate infrastructure and information asymmetry.

Uganda's overriding objective for the agricultural sector is to modernize the sector by strengthening productivity, export competitiveness and food security. The government has formulated a number of policies aimed at enhancing agricultural production and productivity, including the Plan for Modernization of Agriculture (PMA), National Agriculture Advisory Services (NAADS) the Agricultural Sector Development Strategy Investment Plan (ASDSIP) and the National Development Plan (NDP). They include developing controllable water system for agricultural production, road, rail and other transport infrastructure and access to affordable agricultural finance, inputs and mechanization. These measures are necessary to address the issue of output instability and production efficiency as means of enhancing competitiveness in agricultural trade and food security in the country. However, Uganda has no climate change policy and no framework to address such challenges, making it difficult to target efforts geared towards reducing adverse impacts of climate change. Little has been done to combat climate change and to insure farmers against weather vagaries. Furthermore, the available policies remain fragmented and not clearly linked, thus are unable to address the climate change concerns such as floods and long droughts.

Uganda's agricultural sector comprises food crop, cash crop, livestock, fisheries and forestry sub-sectors. Looking at the level of agricultural output produced and traded, the sector significantly contributes to Uganda's exports (greater than 48%). Maize is one of the crops that has been identified as having significant potential for regional trade as it is consumed widely in the East Africa Community (EAC) and Common Market for Eastern and Southern Africa (COMESA) regions. There is trade potential regionally of other food crops such as rice, beans, simsim, groundnuts, millet, bananas, peas, soya beans and cassava. The crops have a strong bearing on food security. However, less than 50 per cent of the maize, irish potatoes, food bananas, simsim and others produced are traded. This implies that although food insecurity can be mitigated by food trade, there is a limit of the extent to which this avenue can work. Apart from the output enhancement, trade is likely to be constrained and food insecurity likely to become a bigger issue. The

other non-output related constraints include: poor infrastructure, information asymmetry, poor legal framework, low standards development and certification of products in Uganda, making the country's products uncompetitive regionally and globally.

The linkage between climate change, trade and food security is important in analyzing the likely impacts of the latter. Uganda pursues a liberal trade agenda to the extent that during difficult times of scarcity as a result of climate change, the country depends on trade to mitigate the impact. Although higher food prices means higher incomes for those involved in export agriculture which is good for net food producers, it can also lead to shortages during times of higher prices. Therefore, a more open trade regime has a higher potential to expose domestic food markets to the vagaries of international market and exacerbate the food insecurity problem.

Uganda's trade policy focuses on enhancing the competitiveness of Uganda's products and services; strengthening trade institutions; trade facilitation; improving market access; providing trade/market information to the business community; developing capacity for both domestic and foreign trade; and ensuring that the gains from growth in trade are equitably shared. Whereas the domestic policy actions target strengthening of selected commercial and/or trade laws, setting up a market information system to facilitate the collection and dissemination of trade information, launching public-private sector partnership programmes, among other things, the external trade policy actions focus on ensuring effective integration of the economy into the regional economy and the multilateral trading system, enhancing national capacity to take advantage of the above, while minimizing the negative effects of globalization. Although an efficient trade system will alleviate food insecurity challenges since food will be moved from areas of surpluses to deficit, it equally has the potential to increase food insecurity when households sell all produce and remain with less or nothing to depend on.

The implication of climate change on agriculture production will differ depending on the type of agriculture being practiced, i.e. crop, livestock or fisheries. Warmer temperatures are likely to have negative effects on fisheries. On the contrary, results could be different for livestock production. Furthermore, effects are likely to be different amongst crops. Therefore, the rising temperatures and climate extreme events present challenges for management of agricultural production, and trade activities for further economic development.

It is therefore recommended that Uganda:

- promotes water saving technologies such as irrigation so as to ensure steady food supply throughout the year;

- Promotes use of fertilizers, mechanization and intensification to curb the threat of food insecurity;
- improves infrastructure (road, rail and other transport) to improve access to markets by farmers;
- promotes the use of post-harvesting technologies (such as safe and better storage facilities);
- provides adequate market information as an incentive to investment in agricultural infrastructure;
- revisits the complex land tenure system in the country with the intention to improve the functioning of land markets and to ensure investments in the land;
- promotes exports of agricultural products through value addition; development of standards and certification of products; strengthening of commercial laws and trade laws domestically; and ensuring integration of the economy into the regional economy and the multilateral trading system; and
- formulates climate change policies and puts in place a framework to address and mitigate the adverse impacts that come with this phenomenon. The framework should be integrated and inclusive to take care of existing policies that affect climate change, trade, agricultural production and food security.

Abbreviations and Acronyms

ATAAS	Agricultural Technology and Agribusiness Advisory Services
ACB	Agricultural Chemicals Board
ACPC	African Climate Policy Centre
AEP	Agricultural Extension Project
ARIPO	African Regional Intellectual Property Organization
CAADP	Comprehensive Africa Agriculture Development Programme
CAIIP	Community Agricultural Infrastructure Improvement Project
CMB	Coffee Marketing Board
COMESA	Common Market for Eastern and Southern Africa
DLGs	District Local Governments
EAC	East Africa Community
EACCMA	East African Community Customs Management Act
ERP	Economic Recovery Programme
FAO	Food Agriculture Organization
GDP	Growth Domestic Product
GHGs	Green House Gases
IMF	International Monetary Fund
IPRs	Intellectual Property Rights
KIPPRA	Kenya Institute for Public Policy Research and Analysis
LMB	Lint Marketing Board
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
MAFAP	Monitoring African Food and Agriculture Policies
MAPS	Marketing Agro-Processing Strategy
MATIP	Markets and Agriculture Trade Improvement Project
MoFPED	Ministry of Finance, Planning and Economic Development
NAADS	National Agriculture Advisory Services
NAP	National Agriculture Policy
NARO	National Agriculture Research Organization
NDA	National Drug Authority

NDP	National Development Plan
NFP	National Fertilizer Policy
NTSDP	National Trade Sector Development Plan
PASIC	Policy for Sustainable Intensification of Ugandan Cropping System
PEAP	Poverty Eradication Action Plan
PMA	Plan for Modernization of Agriculture
PMB	Produce Marketing Board
PRSP	Poverty Reduction Strategy Paper
ROSCAS	Rotating Savings and Credit Associations
SACCOs	Savings and Credit Cooperatives
SAD	Single Administrative Document
SADC	South African Development Corporation
SDG	Sustainable Development Goal
SPS	Sanitary and Phyto-Sanitary
T&V	Training and Visit
TBT	Technical Barriers to Trade
TIN	Tax Identification Number
TOT	Transfer of Technology
UBOS	Uganda Bureau of Statistics
UEP	Unified Extension Approach
UEPB	Uganda Export Promotion Board
UIA	Uganda Investment Authority
UNBS	Uganda National Bureau of Standards
UNFCCC	United Nations Framework Convention on Climate Change
UNHS	Uganda National Household Survey
URSB	Uganda Registration Services Bureau
WB	World Bank
WFP	World Food Program
WHO	World Health Organization
WIPO	World Intellectual Property Organization

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1. Introduction

1.1 Linking the Key Concepts

Research in the recent past has demonstrated that climate change has potential impact on the climate and ecosystems globally, whose resultant effects are enormous on habitants (IPCC, 2007). Accordingly to IPCC (2012), evidence exists from observations gathered since 1950 of some extreme changes in climate. Some of the extremes have changed as a result of anthropogenic influences, including increases in atmospheric concentrations of greenhouse gases. Economic losses from weather and climate-related disasters have increased, although with large spatial and inter-annual variability. Estimates of annual losses have increased from a few US\$ billion in 1980 to above US\$ 200 billion in 2010, with the highest value for 2005 (the year of Hurricane Katrina). Therefore, future changes in exposure, vulnerability, and climate extremes resulting from natural climate variability, anthropogenic climate change, and socioeconomic development has potential to alter the impact of climate extremes on natural and human systems.

It is now a fact that changes in precipitation, length of growing seasons, water availability, carbon uptake, incidences of extreme weather events, changes in flood risks, desertification, distribution and prevalence of human diseases and plant pests has greatly impacted on food security/agriculture and thus significantly altering conditions for agricultural production especially in Africa. Barrios et al. (2008) and Lotsch (2007), among others, have modeled the impact of climate change on agricultural production in Africa, which illustrates that there will be negative effects on crop yields and livestock management over the next century by up to 50 per cent in 2020. These impacts are likely to be severe on food security especially in Africa ,and the EAC region is not an exception. Uganda like other EAC countries will continue to experience increasing climate variability, declining food production and hunger and thus limit the country's ability to attain food security due to the unfavorable positioning in regional trade.

Although climate change effects do not disaggregate among populations, it is also true that impacts on the livelihoods of human population vary and are largely determined by the location of settlement, and levels of income, education and awareness as argued by Hunter et al. (1998). This implies that policy responses must be targeted to the different groups and effects. The socio-political and institutional factors that influence climate change and the response thereof are crucial. Eriksen et al. (2008) and Mannke (2011) argue that the most vulnerable are often the poor, politically disenfranchised and marginalized communities, who are among the first to experience the impacts and are least equipped to diversify

their livelihoods. In Uganda, most of the households belong to the low income groups, dependent on subsistence farming which exacerbates the hardships with limited cushioning. Policies developed to mitigate climate change impacts will play a significant role in developing coping mechanisms for such households to these challenges. Uganda's agricultural policies have been largely market-led with less emphasis on interventions to help such households. Uganda like the rest of the EAC countries has no climate change policy and framework to address such challenges, thus it is difficult to target efforts geared towards reducing adverse impacts of climate change.

The linkage between climate change, trade and food security is important in analyzing the likely impacts of the latter. During difficult times of scarcity as a result of climate change impacts, countries may invoke restrictive trade policies such as quantitative restriction of exports, safeguard or anti-dumping measures and tariff peaks that ensure food security of a nation. Although Uganda pursues a liberal trade agenda, Tanzania, one of the EAC partner states, in such times has restricted movement of grains into the other partner states on several occasions.

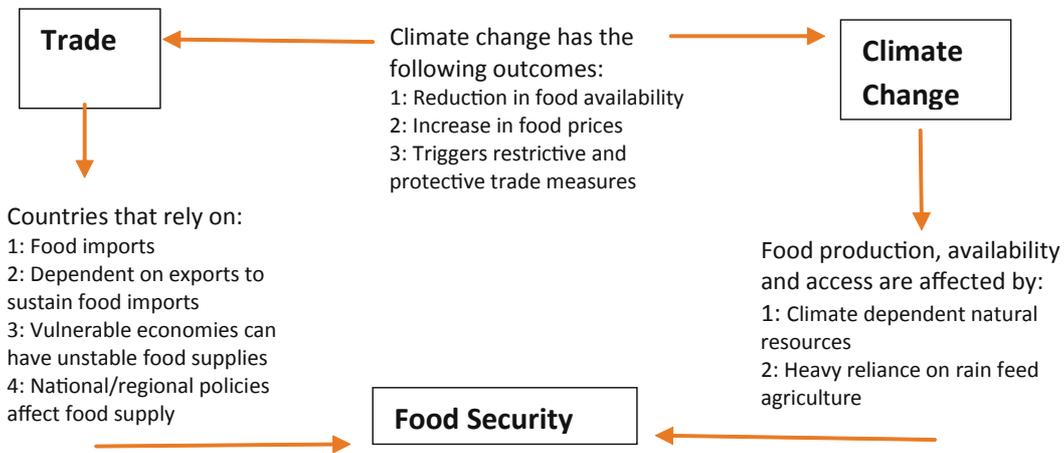
Higher food prices also mean higher incomes for those involved in export agriculture, which is good for net food producers. However, caution ought to be exercised in trade of foods such as maize/cereals in general where the country still relies on imports to meet nutritional adequacy. In such cases, food stability may be subject to the variability of world prices. A more open trade regime could further expose domestic food markets to the vagaries of international market and exacerbate the food insecurity problem. Attaining food security is already a challenge to Uganda since climate change poses even greater risk to food security. Trade may offer a means of mitigating the various shocks caused by climate change.

Increasing agricultural production is crucial to securing food security and more foreign exchange through trade. However, the rising temperatures and climate extreme events present challenges for managing agricultural production and trade activities for further economic development. The risks from climate change come at a time when Uganda is experiencing degradation, making it imperative to take on sustainable adaptation. Strategies that promote good agricultural practices, in particular the use of improved technologies, soil and water conservation techniques among farmers are needed to shield against impacts of extreme events and climate change.

Therefore, climate change has direct impact on agricultural trade, as evidenced during situations where there is a food crisis due to change in weather patterns. Trade measures and policies such as safeguard mechanisms tend to be used to protect a country against the imminent threat of food insecurity. The relationship

between climate change, trade and food security discussed above is summarized in Figure 1.1 below.

Figure 1.1: Climate change, trade and food Security



Source: KIPPRA (2014), *Project Concept Notes: A regional assessment of agricultural production, climate change, agricultural trade and food security*

1.2 Objectives of the Study

The study aims at scoping the agricultural production, climate change, agricultural trade and food security status in Uganda. Specifically, the study seeks to:

1. Document the agricultural production and agricultural systems in Uganda;
2. Analyze policies governing agricultural production in Uganda;
3. Establish the existing linkage between food production and food security in Uganda;
4. Assess the relevance of trade policies to trade in agricultural produce; and
5. Assess climate change and its implications on agricultural food production and how it impacts trade and food security.

1.3 Research Approaches

The study largely used documentary review and information from secondary sources for its findings. This was the core source of secondary data for the study and was supplemented by reliance on relevant databases from the Uganda Bureau of Statistics and other government agencies. The study used a distillation approach to obtain relevant information for the study from the various reports collected. The data collected was analyzed thematically to generate the desired

trend results. From the generated information, linkages and policy implications were generated.

1.4 Organization of the Study

The rest of the study is organized as follows: Section two examines the details of the agricultural production systems in Uganda, highlighting the area cultivated, production, prices of commodities, agro-ecological zones, food security status, and government policies governing agricultural production and food security. Section three presents an overview of trade policies and how they affect trade in agricultural produce. Section four examines climate change and its implications on agricultural food production linking climate change trade and food security. Section five concludes the study and makes policy recommendations.

2. Literature Review

2.1 Agriculture Production in Uganda

Agriculture is the backbone of Uganda's economy. It is the major source of employment, food and export earnings to the country and considerably contributes to the GDP. The agriculture sector employs 66 per cent of the working population and contributes about 40 per cent of the total goods export earnings and about 23.5 per cent of GDP (UBOS, 2016). While the sector still remains crucial in employment, food security and export earnings, the share of agriculture in the structure of Ugandan economy has significantly declined over time. For instance, the share of agriculture in GDP was 51.1 per cent in 1988 and 33.1 per cent in 1997, declining further to 22.7-24.1 per cent in 2007-2011. The sharp decline in the share of agriculture on GDP represents a significant structural transformation within the economy, demonstrating a shift towards the services and industry sectors.

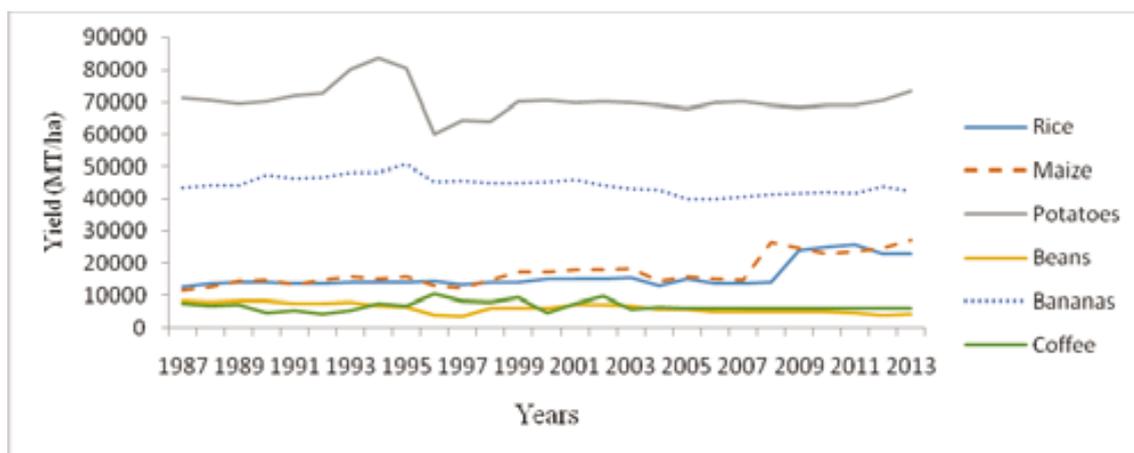
In addition to the structural changes, the agriculture sector has experienced slower growth compared to the other sectors over recent years. Between 1998 and 2002, agriculture grew at an average rate of 5.4 per cent. However, from 2004 to 2008, the growth of the sector slowed markedly to an average 1.1 per cent. The real growth in agricultural output declined steadily from 7.9 per cent in 2000/01 to 1.3 per cent in 2007/08 after which it recovered, albeit at a slow rate, in 2008/09, with a 2.9 per cent growth rate as indicated in Table 2.1. The sector's growth rate was estimated at 2.8 per cent in 2013 which is lower than 3.2 population growth rate and below the target rate of 6 per cent per annum under the Comprehensive Africa Agriculture Development Programme (CAADP).

Table 2.1: The growth rate of agriculture sector, industry and services between 2003 and 2013

Sector	2006/ 2007	2007/ 2008	2008/ 2009	2009/ 2010	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016
Agriculture	0.1	1.3	2.9	2.4	1.2	0.8	1.4	1.5	2.3	3.2
Cash crops	5.4	9	1.7	-1.1	-1.5	8.2	3.9	3.3	4.9	2.8
Food crops	-0.9	2.4	2.6	2.7	0.7	-1.7	0.2	1.9	2.0	2.2
Livestock	3	3	3	3	3	2.8	2.8	3.3	2.9	2.8
Fisheries	-3	-11.8	-0.1	2.6	1.8	1.9	1.9	2.2	1.3	4.2
Forestry	2	2.8	6.3	2.9	2.8	3.3	2.8	-5.1	1.5	4.8
Industry	9.6	9.1	5.8	6.5	7.9	2.5	6.8	5.6	7.8	4.0
Services	8	10.2	8.8	8.2	8.2	3.6	4.8	5.6	4.8	6.5

Source: MoFPED (2004), MAAIF (2010), MoFPED (2013), UBOS (2016)

Figure 2.1: Trends in productivity of the major crops in Uganda



Source: Authors computation using FAOstat data

The poor performance has mainly been with cereals such as maize, beans and coffee which are a major foreign exchange earner to the country (Figure 2.1). The livestock production and livestock products have maintained a positive growth rate due to the steady market, and favourable government policies which have attracted investors in the sub-sector, and the fact that livestock is relatively less affected by climate change compared to crops (Mbowa, et al., 2012).

Among the factors affecting agriculture productivity is land scarcity that has resulted into land fragmentation, less adoption of better farming technologies such as high yielding seed varieties, fertilizers application and irrigation, pests and diseases, and weather shocks. Others include over-exploitation of fish stocks; uncertain land rights leading to under-investment in agricultural land; and the struggle to comply with increasingly demanding international quality standards for traded food and agricultural products (MAAIF, 2010).

There is thus need to come up with interventions aimed at enhancing agricultural production and productivity. These may be in form of extension service provision aimed at improving farming practices. According to the Uganda Census of Agriculture 2008/09, only 19 per cent of agricultural households reported to have received extension visits, indicating that extension service delivery is still low in Uganda. There is also a need to promote crop intensification especially for smallholder farmers by supporting them to access and apply better farming technologies such as use of improved seeds and application of fertilizer. This can be achieved by urging farmers to form Savings and Credit Cooperatives (SACCOs) through which they accumulate savings that can be used to offer credit to those who want to purchase inputs. This would help in reducing financial constraints facing smallholder farmers.

2.1.1 Crops grown and livestock

Agriculture in Uganda is practiced largely for subsistence and to a smaller extent, for commercial purposes. Uganda's agriculture sector thus consists of five main sub-sectors, namely food crops, cash crops, fishing, livestock and forestry. The food crops sub-sector basically dominates the agricultural sector contributing 14.6 per cent to the national GDP in 2009/10 (MAAIF, 2010). Total cultivable land amounts to 16.7 million hectares, of which 32 per cent is actually cultivated, one-third of it under perennial crops and the rest under annuals (Aggrey, 2009). Among the perennials, bananas dominate, followed by coffee, sugar cane and tea. Food crops (cereals, root crops, pulses and oil seed) also dominate the annuals, followed by cotton and tobacco. Agricultural output comes almost exclusively from smallholders, most (80%) with less than 2 hectares of land (FAO, 2013). Generally, crop production has declined and the traditional cash and food crops are steadily losing their contribution to food security and revenue generation. For instance, banana, a traditional food crop in most parts of Uganda, has been attacked by wilt. Likewise, coffee and cotton which have for long contributed greatly to the national revenues as major forex earners have weakened. Climate change mainly characterized by prolonged dry spells and erratic rains and floods are largely blamed for the poor agricultural sector performance.

Food Crops

Uganda produces around 16 food crops which include cereals (maize, millet, sorghum, rice); root crops (cassava, sweet potatoes, Irish potatoes); pulses (beans, cow peas, field peas, pigeon peas); and oil crops (groundnuts, soya beans, simsim) and plantains (UBOS, 2014). The Uganda census of agriculture of 2008/09 found that maize, beans, banana, cassava and sweet potatoes were the crops grown by most of agriculture households in the country and of these crops, maize was the most grown crop. On the basis of acreage, cereals occupy 17 per cent of the total area of food crops of which maize is the dominant crop occupying 63 per cent of the cereals area followed by sorghum (Table 2.2). In 2011, the area under maize constituted 19.0 per cent of the total area under selected food crops (FAO, 2013).

Root crops, dominated by cassava, cover 13 per cent of the acreage under food crops. In terms of the individual commodities, maize area was followed by banana with 979,000 ha (17.5%) and cassava with 822,000 ha (14.7%). Over time, acreage of most food crops is relatively stable with area under some few crops (sorghum, rice and sweet potatoes) expanding over the period 2008-2011. Production of food crops tends to follow the same trends of crop acreage over the period of 2008- 2011. In 2011, the tonnage for the different food crops increased from 2010 except for beans, cassava and sweet potatoes, which registered reductions of 3.6 per cent, 10.1 per cent and 9.5 per cent, respectively, compared to the previous season.

With smallholder farming dominating agriculture in Uganda, most of the food produced is consumed at home, with the surplus marketed in local and district markets. The three most common types of disposition for cereal crops include sale, consumption and storage. The biggest percentage of maize production (40.5%) and rice production (54.5%) was sold while most of the finger millet (37.7%) and sorghum (46.9%) were consumed by the households.

Table 2.2: Production of food crops in Uganda 2008-2011 ('000 tons)

Crop	2008	2009	2010	2011	2012	2013
Plantain bananas (all types)	919	942	978	979	979	972
Cereals						
Millet	196	192	167	172	175	175
Maize	1,052	942	1,032	1,063	1,094	1,101
Sorghum	285	340	355	364	373	373
Rice	68	86	87	90	92	93
Wheat	11	12	12	13	14	14
Root crops						
Sweet potatoes	427	463	442	450	452	453
Irish potatoes	1	35	36	37	39	39
Cassava	846	777	794	822	851	851
Pulses						
Beans	651	616	633	654	669	672
Field peas	30	42	28	28	29	29
Cow peas	17	28	24	25	25	25
Pigeon peas	26	31	32	33	33	33
Oil seeds and others						
Ground nuts	383	369	394	409	421	422
Soya beans	31	45	45	45	46	46
Sesame	165	192	198	203	207	207
Sunflower	183	195	207	221	230	238

Source: UBOS/MAAIF (2010)

Cash Crops

Some of the traditional cash crops include coffee, tea, cotton and tobacco which are classified as the traditional exports of Uganda. Coffee is by far the most important cash crop in terms of production and export earnings. Uganda produces two kinds of coffee: Robusta coffee and arabica coffee, also known as mountain coffee. Over the years, robusta coffee has been produced in much more quantities compared to

arabica coffee (UBOS, 2014). Wheat is also increasingly becoming a major crop in Uganda as it has been in the rest of East Africa.

Over the period 2008-2011, the quantity of coffee produced declined considerably. Tea also performed poorly with a marked decline (28.4%) in 2011. Tobacco continued to register high procurement increments from 2009 although there was minimal increase (4.8%) in 2011. Tea production in Uganda has fluctuated considerably over time. In the early 1970s, Uganda produced about 23,400 tonnes of tea with productivity (yield) exceeding 1.2 ton/ha. Since then, production began to decline rapidly to as low as 1,533 ton by 1980 and 3,500 ton in 1988 when the government began the implementation of the Smallholder Tea Rehabilitation Project (STRP). Since then, the tea sector appears to slowly recover in terms of production resulting primarily from increasingly rising productivity as area under tea production is relatively stable.

The area under cotton cultivation has been fluctuating. Cotton area decreased from 100,000 hectares in 2008 to 67,000 hectares in 2009 and then increased to 80,000 hectares in 2010 (MAAIF, 2011). The decline in acreage is attributed to decline in the cotton prices in 2008/9 season which affected farmers' incentives; severe drought during the June-August 2009, the ideal cotton planting window in Uganda; and a shift to the production of food crops due to high prices paid during that period (MAAIF, 2011).

For the four cash commodities, domestic consumption represents only a small fraction of production. Domestic consumption of coffee in Uganda is relatively small, ranging from 4-10 per cent of production. As such, coffee is primarily an export crop. On the other hand, tea is consumed by the majority of the Ugandan population as hot beverage alone or with milk. However, domestic consumption is only a small fraction of total production. On average, Ugandans consumed about 3,000 tons of tea annually between 2000 and 2010 which represents 7.5 per cent of the average production. Domestic utilization of cotton refers to the amount of cotton lint used by the domestic textile industry and seed processed into oils and animal feed. Over the years 2005 to 2010, over 80 per cent of the lint produced was exported, while only about 8 per cent of the seed produced was exported over the same period of time. While the textile industry in Uganda consists mainly of small to medium sized industries with modest technology and low capacity, the seed processing companies appear to have a higher capacity (FAO, 2013). This partly explains the low domestic utilization of lint compared to the domestic utilization of seed.

Livestock

Livestock production constitutes an important sub-sector of Uganda's agriculture, contributing about 9 per cent of GDP and 17 per cent of Agricultural GDP. The

livestock sub-sector comprises mainly cattle, sheep, goats, pigs and poultry production as illustrated in Table 2.3. Between 2012 and 2013, cattle, sheep and goat numbers increased by about 1.4, 2.5 and 4.3 per cent, respectively, while pigs and poultry numbers increased by 2.5 per cent and 3.0 per cent, respectively, in the same period. The indigenous breeds continue to be dominant over the exotic ones for both cattle and poultry. Livestock production is a source of livelihood to about 4.5 million people in the country (UIA, 2009).

Table 2.3: Livestock numbers ('000)

Animal	2004	2005	2006	2007	2008	2009	2010	2011
Cattle	6,567	6,770	6,973	7,182	11,408	11,751	12,104	12,467
Sheep	1,552	1,600	1,648	1,697	3,413	3,516	3,621	3,730
Goats	7,566	7,800	8,034	8,275	12,450	12,823	13,208	13,604
Pigs	1,940	2,000	2,060	2,122	3,184	3,280	3,378	3,496
Poultry	31,622	32,600	26,049	26,950	37,404	39,270	43,201	47,520

Source: MAAIF and UBOS (2012)

Livestock and livestock products play a key role in raising incomes of households and providing a source of protein to many families. According to analysis of poverty trends using the Uganda National Household Survey (UNHS) time series data, households that include livestock in their enterprise mix tend to be less poor (UBOS, 2007). Livestock is predominantly used for supporting rural households (80% owned by smallholders) with herd size of 5-100. The livestock production system is an integral part of the agricultural system in many parts of the country. The greatest concentration of livestock is found in the "cattle corridor," extending from South-Western to North-Eastern Uganda. The Livestock census estimates the national herd to be 11.4 million cattle, 12.5 million goats, 3.4 million sheep, 3.2 million pigs and 37.5 million chickens (UBOS, 2009). The data following the census showed a marked increase in the herd size of all species in Uganda.

The main factor that has contributed to livestock growth is the favourable investment climate that has attracted investors in the sub-sector. Uganda has more than 40 milk processing plants which have enhanced value addition and the competitiveness of the dairy sub-sector in the region. Also, due to rapid population growth in Uganda and increased market access in the East African sub-region, the demand for milk and milk products has increased. This has resulted in high prices to farmers which have in turn provided an incentive to invest in high yielding cattle breeds and water reservoirs such as dams. However, the jump-starting in 2008 is explained by the methodology used to arrive at numbers. Before 2008, livestock numbers were estimated using predetermined growth rates. However, after that, a census was conducted that revealed the exact livestock numbers.

In terms of economic value, cattle and specifically dairy farming is regarded as the most profitable livestock (Mbowa et al., 2012). Also, other animals such as goats, sheep, pigs and poultry are equally important. Total cattle ownership is estimated to have increased by 54 per cent since 2005. Nonetheless, current production levels in the sub-sector can only meet half the domestic and regional demand.

The potential for the export market is high and opportunities exist for the expansion of dairy and meat, hides, skins, and leather. Export of livestock products in Uganda is limited to raw and semi-processed hides and skins. Inadequate disease control and the absence of the relevant quality and processing infrastructure are some of the factors which limit the expansion of beef and dairy products exports. Perhaps the major opportunity for the future is that per capita domestic consumption of animal products is still well below the World Health Organization and FAO recommendation. This suggests that, as economic growth continues in the country, consumption will rise and current investment in the industry will be justified (FAO, 2013).

However, livestock growth in Uganda is characterized with increased deforestation, which has had negative implications on the climate. The cattle corridor is the driest area following the forests' depletion. In addition, the methane produced by the animals has resulted in temperature rises and weather variability in western Uganda, the most cattle producing region (Nuwagaba and Namateefu, 2013).

Fisheries

Fisheries activities are mainly carried out in open water sources and provide an important source of livelihood for many people in Uganda. Open water covers 15.1 per cent of Uganda's total surface area and this comprises five major lakes (Victoria, Albert, Kyoga, Edward and George), which are the main sources of fish in the country (UBOS, 2014). Lake Victoria continues to be the most important water body in Uganda, both in size and contribution to the fish catch. Its share of catch was 41.4 per cent in 2011 rising to 45.7 per cent in 2012 and 45.9 per cent in 2013. This was followed by Lake Albert and then Lake Kyoga. There was an increase in the fish catch from Lake Victoria in the year 2013 to 193,000 tonnes from 185,500 tonnes in 2012. Lake Albert and Edward also recorded an increase during the period under review. However, Lake Kyoga, Lake George as well as the Kazinga channel recorded a decrease in the fish catch during the period under review. It is worth noting that over 90 per cent of the fish catch is harvested from Lakes Victoria, Albert and Kyoga (UBOS, 2014).

Of all the fish species, Nile perch, tilapia and silver fish are the major fish species of commercial importance in Uganda. The fisheries sector contributes 6 per cent of the national economy although only 2.4-2.6 per cent is captured in the national accounts. On average, Uganda's fishery industry employs over 700,000 people

involved in various activities, e.g. fishermen, fishmongers, fish transporters and boat builders.

2.1.2 Farm acreage and input use

Due to population explosion in Uganda and the resulting land scarcity, agriculture is practiced on very smallholdings. According to Uganda census of agriculture (2008/09), agriculture households have increased tremendously in all regions of Uganda (Table 2.4) and, given that land is a fixed production factor, the national average holding size has significantly reduced to about 1.1 hectares. The northern region had the largest holding size among all regions of 1.6 hectares, while the western had the lowest holding of 0.8 hectares. Due to land scarcity, farmers are encroaching on forests and swamps so as to expand their land holdings and to increase or maintain production. Indeed, the Uganda Census of agriculture (2008/09) found that 18 per cent of the parcels operated by the agriculture households had been cleared less than one year ago, indicating that there is still opening of new fields for agricultural production.

The rampant land scarcity suggests a great need for agriculture intensification through adopting improved technology such as improved crop and animal breeds, and application of better farming practices. However, Uganda's agriculture is characterized by low and declining yields even when the inverse relationship theory suggests that productivity increases with a decline in land size. This is partly a function of low application of modern technology. Fertilizer use, for instance, at an average of 2.1 kg/ha of nutrients in 2006 is among the lowest in the region and the world, compared to Kenya's 29 kg/ha, Rwanda's 6.8 kg/ha and Tanzania's 5.0 kg/ha (MAFAP, 2013). The proportion of farmers using fertilizer is also low amounting to only 1 per cent. The use of other improved inputs is also minimal. For instance, only 6.3 per cent of farmers use improved seeds, while only 3.4 per cent use agrochemicals (FAO, 2013). International experience shows that agricultural productivity has grown rapidly where modern varieties and fertilizers have been widely adopted and National Agriculture Research Organization (NARO) is working on this type of improved technology. Since 2003, NARO has

developed up to 218 improved varieties, breeds and prototypes for increased yields as a contribution to improve food security.

Table 2.4: Growth of Uganda’s agriculture households over the years

Region	UNHS 1995/6	UNHS 1999/2000	PHC 2002	UNHS 2005/06	UCA 2008/09
Central	768	790	835	1,014	807
Eastern	896	922	1,041	1,103	1,109
Northern	544	718	871	866	905
Western	992	874	1,086	1,169	1,125
Uganda	3,200	3,300	3,833	4,151	3,946

Source: UBOS and MAAIF (2010)

Agriculture production and climate change

Different crops in Uganda grow well in different regions depending on the climate conditions. Climatic changes thus alter the classification of production zones and farming systems. The following sub-sections describe the existing farming systems in Uganda.

2.1.3 Agriculture production zones

The government of Uganda, exploiting the existing agro-ecological zones which determine the across region farming systems, has initiated zonal agriculture production, agro-processing and marketing. An ‘agricultural zone’ is a broad area with similar socio-economic background and in which ecological conditions, farming systems and practices are fairly homogeneous. In a zone, more or less the same crops can be grown and same livestock can be reared. Zones may cut across districts and may be sub-divided into sub-zones to cater for specific development requirements (Nahamya and Mitala, 2004). See details in Table 2.5.

Figure 2.2: Map of Uganda districts by agricultural production zones



Source: Nahmya and Mitala (2004)

The factors considered when zoning include: agro-ecological factors such as rainfall, land forms (topology), soil types, water bodies, vegetation cover and temperature regimes; farming systems/management systems such as cropping and livestock systems; socio-economic factors such as attitudes, resource endowments, demographic patterns and literacy levels; geo-politics such as civil strife and political boundaries; infrastructure such as transport, communication, production facilities, processing facilities and marketing facilities; land e.g. tenure availability and land holdings; and on-going agriculture-based programmes/projects/initiatives (Nahmya and Mitala, 2004). For instance, successes of the ongoing programmes form a base for capacity and infrastructure while identification of gaps allows for strategically complementing the programmes. Based on these factors, the country is divided into ten production zones including: north eastern dry lands, north eastern savannah grasslands, north western savannah grasslands, para savannahs, Kyoga plains, Lake Victoria crescent, western savannah grasslands, pastoral rangelands, south western farmlands and highland ranges (Table 2.5 for districts under different production zones).

Table 2.5: Districts by production zones

Zone No.	Zone Name	Districts
I	North Eastern Dry lands	1. Moroto 2. Northern Kotido 3. Eastern Kitgum
II	North Eastern Savannah Grasslands	1. Pader 2. Kitgum 3. Eastern Lira 4. Katakwi 5. Northern Sironko 6. Northern Kapchorwa 7. Nakapiripirit 8. Southern Kotido
III	North Western Savannah Grasslands	1. Adjumani 2. Western Nebbi 3. Arua 4. Moyo 5. Yumbe 6. Northern Gulu 7. Northern Apac 8. Western Lira
IV	Para Savannahs	1. Eastern Nebbi 2. South-western Gulu 3. Western Masindi
V	Kyoga Plains	1. Kayunga 2. Kamuli 3. Iganga 4. Northern Bugiri 5. Tororo 6. Northern Busia 7. Southern Mbale 8. Pallisa 9. Kumi 10. Soroti 11. Kaberamaido 12. Southern Lira 13. Southern Apac
VI	Lake Victoria Crescent	1. Kampala 2. Mukono 3. Wakiso 4. Eastern Mpigi 5. Eastern Masaka 6. Eastern Rakai 7. Kalangala 8. Jinja 9. Mayuge 10. Southern Bugiri 11. Southern Busia
VII	Western Savannah Grasslands	1. Hoima 2. Kiboga 3. Southern Luwero 4. Mubende 5. Kibaale 6. Kyenjojo 7. Kabarole 8. Kamwenge 9. Southern Kasese
VIII	Pastoral Rangelands	1. Eastern Masindi 2. Nakasongola 3. Northern Luwero 4. Central Kiboga 5. Southern Mubende 6. Western Mpigi 7. Western Masaka 8. Western Rakai 9. Sembabule 10. Eastern Mbarara 11. Southern Ntungamo 12. Northern Bundibugyo
IX	South Western Farmlands	1. Western Mbarara 2. Bushenyi 3. Northern Ntungamo 4. Rukungiri 5. Northern Kanungu
X	Highland Ranges	1. Northern Mbale 2. Southern Sironko 3. Southern Kapchorwa 4. Southern Kanungu 5. Kabale 6. Kisoro 7. Northern Kasese 8. Southern Bundibugyo

Source: Nahamya and Mitala (2004)

2.1.4 The climate and farming systems in Uganda

Uganda's temperatures show little variation throughout the year, ranging between 25°-31°C for most areas. Rainfall distribution is generally categorized as high (over 1,750 mm per annum) covering 4 per cent of the land area, moderate (1000-1,750 mm per annum) covering 70 per cent of the land area and low (under 1,000 mm per annum) covering 26 per cent of the land area (Mwebaze, 2006).

Rainfall seasons range from one to two seasons depending on the region. Rainfall distribution in southern and central Uganda is bimodal, allowing for two cropping seasons annually, and adequate grazing for livestock throughout the year. Around Lake Victoria, the annual rainfall averages 1200-1500 mm and is well distributed. To the north, the two rainy seasons gradually merge into one. Dry periods at the end of the year become longer, with annual rainfall ranging between 900-1300 mm. This restricts the range of crops that can be grown. These conditions in northern Uganda are not suitable for bananas but favour extensive livestock production. The influence of soils, topography and climate on the farming systems in Uganda has led to the dividing of the country into seven broad agro-ecological zones.

However, the sharp classifications of the farming systems have been blurred by recent climatic changes. The cattle corridor is extending because of prolonged drought, and crop choices are changing in different regions. The different farming systems include:

The banana-coffee system

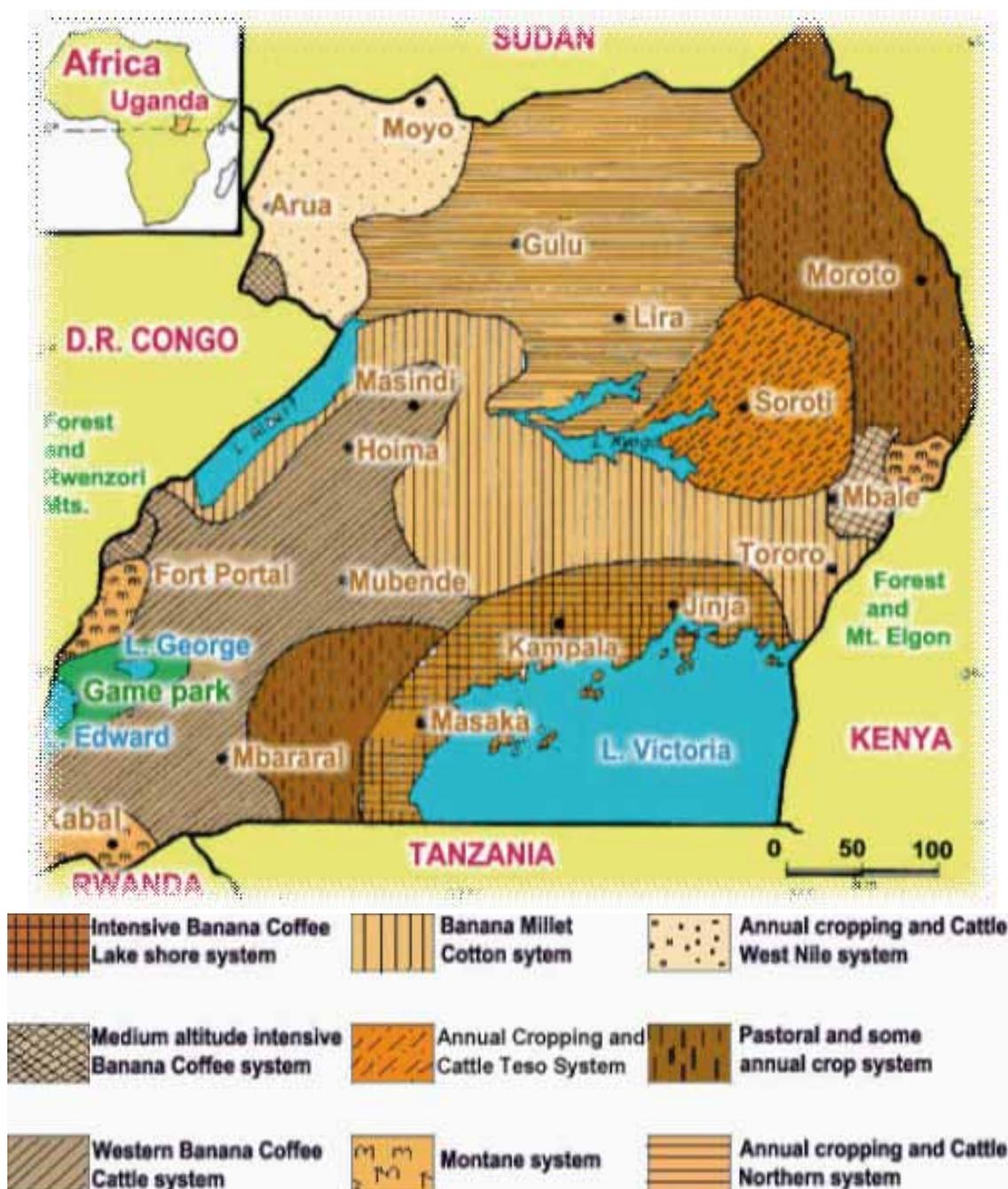
In this system, rainfall is evenly distributed (1000-1500 mm) and soils are of medium to high productivity. The per capita area cultivated is small. Banana and coffee are the main cash crops; root crops and several annual or biennial food crops are on the increase. Maize is a secondary cash crop and sweet potatoes a secondary food to bananas. Livestock is generally not integrated into the system, but dairy cattle are gaining prominence. The typical land holding is 2-4 hectares in this agro-ecological system (Mwebaze, 2006). The vegetation is mainly forest-savanna mosaic with pastures suitable for intensive livestock production. The change in cropping patterns from twice to once a year is an indication of changes in climatic conditions and so is the integration of livestock production which used to be mainly in the cattle corridor.

The banana-millet-cotton system

Rainfall for this system is less stable than for the banana-coffee system, so there is greater reliance on annual food crops (millet, sorghum and maize). In the drier areas, livestock is a main activity. The vegetation is moist savanna with moderate

biomass production.

Figure 2.3: Uganda's farming systems



Source: Mwebaze (2006)

The montane system

This system is found at higher elevations between 1500-1750 metres above sea level. The area receives high and effective rainfall and cloud cover. Banana is a major staple as well as sweet potatoes, cassava and Irish potatoes. Arabica coffee is prevalent at above 1600 metres. Some temperate crops such as wheat and barley are grown. Feeding crop residues to livestock is a common practice.

Montane systems are densely populated and are hence characterized by smaller holdings. Landslides are experienced in some parts because the populations have encroached on and destroyed the forest cover leaving soils exposed to direct heavy downpour.

The Teso system

The area receives bimodal rainfall on sandy-loams of medium to low fertility. The dry season is longer from December to March (Mwebaze, 2006). The vegetation is moist with grass savannas; and short grassland which is ideal for grazing. The staple foods are millet, maize and sorghum; other crops are oil seed crops (groundnuts, simsim and sunflower) with cotton as the major cash crop. Mixed agriculture (crops and livestock) is practiced and cultivation by oxen is the main agricultural technology. Livestock are kept extensively in those areas which are tsetse fly free.

The northern system

The rainfall in areas of this system is less pronouncedly bimodal with about 800 mm annually. Rainfall in the far north and north-east of the country (Kotido and Moroto) is unimodal and too low (under 800 mm) and erratic for satisfactory crop production. The dry season is so severe that drought tolerant annuals are cultivated; these include finger millet, simsim, cassava and sorghum. Tobacco and cotton are the major cash crops. The grassland is short and communal grazing abounds. This area is well-known for its pastoral system with semi-nomadic cattle herding.

The West Nile system

The rainfall pattern resembles that of the northern system, with more rain at higher altitudes. Mixed cropping is common with a wide variety of crops. The system is in the sub-humid zone where the vegetation community is moist with grassland. Livestock activities are limited by the presence of tsetse fly. As in the northern system, tobacco and cotton are the major cash crops.

The pastoral system

This system covers some districts in the north-east and parts of western and central districts. Annual rainfall is low (less than 1000 mm). The system is characterized by short grassland where pastoralism prevails with nomadic extensive grazing. Mixed herds are common but with small ruminant ratios for optimum grassland use.

2.1.5 Factors constraining Uganda's agricultural production and productivity

Uganda's agricultural sector faces a number of constraints that range from institutional, climatic and economic factors (MAAIF, 2010):

- Uganda's agricultural output is heavily reliant on natural climatic conditions. Agriculture is rain-fed which makes it susceptible to weather shocks such as prolonged droughts that lead to crop losses and hence threatening food security. There is thus need to promote water saving technologies such as irrigation so as to ensure steady food supply throughout the year;
- Farmers are still using poor and rudimentary production technologies which are characterized by low output and productivity. The use of fertilizers, kg/ha/year, is one of the lowest in East Africa. Also, according to Uganda Census of Agriculture, only 31 per cent of agriculture households use improved seed. This suggests that farmers in Uganda are still practicing extensive systems that involve opening unused land which is unsustainable because of the rapid population growth which is among the highest in the world;
- There is also poor market access by most farmers especially those in remote areas. Poor infrastructure and information asymmetry hinder accessibility to markets in different parts of the country. This acts as a disincentive to farmers who opt not to invest heavily in agriculture because they are not certain of the markets;
- There is land tenure insecurity in many parts of Uganda which discourages investment in land such as the use of more efficient and productive technologies. Tenure insecurity manifests in the increasing incidence of land conflicts and land grabbing in the country. Also, in places where land is communally owned, land markets are not functioning which affects efficient use of resources since unproductive farmers cannot rent out or sell their land to the productive farmers;
- There is poor post-harvest handling which leads to wastage and loss to farmers. This is because of poor storage and cooling facilities;
- Low agricultural education and skills add to low labour productivity and poor technologies to impede productivity growth in the sector; and
- Other factors include over-exploitation of fish stocks and the struggle to comply with increasingly demanding international quality standards for traded food and agricultural products.

2.2 Policies Governing Agricultural Food Production and Food Security

Owing to the critical importance of the agricultural sector, the government of Uganda has undertaken a number of policy reforms and measures at the national level and sectoral levels since 1987 to promote agricultural production

and productivity. This section discusses the existing and past agriculture related policies, strategies and programmes.

2.2.1 Overarching national policies

The Economic Recovery Programme (ERP)

The policy reforms at the national level started in 1987 with the liberalization of the economy under the IMF/World Bank supported Economic Recovery Programme (MoFPED, 2000; MAFAP, 2013). This was part of the World Bank/IMF's structural adjustment programmes that were rolled out in many parts of Africa. The ERP that ended in 1992 underwent two major phases: (i) liberalization policy that came with exchange rate deregulation and liberalization of trade including agricultural inputs and output, and (ii) Public Enterprise Reform and Divestiture Act of 1993 (privatization policy) that concentrated on public sector reforms and privatization of state-owned enterprises such as the Coffee Marketing Board (CMB), Lint Marketing Board (LMB), and Produce Marketing Board (PMB) which used to purchase and export agriculture produce and provided extension and credit services to farmers. These institutional reforms also led to the merging of the then Ministry of Agriculture and Forestry with the Ministry of Animal Industry and Fisheries to form present-day Ministry of Agriculture, Animal Industry and Fisheries (MAAIF).

The ERP, however, did not address climate change issues. This is because the programs remained macro in nature and the sectoral interventions only focused on changing ownership and governance from the government to private sector. The concern though remains that private individuals, without government regulation, have less incentive to adopt climate smart farming practices.

The Poverty Eradication Action Plan (PEAP)

In 1997, the government developed the PEAP as a 10 year planning framework for accelerating growth, reducing poverty and promoting sustainable development. The PEAP 1997 was organized under four pillars or goals: (i) macroeconomic policy, (ii) institutional framework for poverty eradication, (iii) policy framework to increase incomes of the poor, and (iv) measures to improve the quality of life of the poor (MAFAP, 2013). The PEAP 1997 was later revised to PEAP 2001 following the introduction of the Poverty Reduction Strategy Paper (PRSP) initiative by the World Bank in 2000 and was established on four pillars: (i) creating a framework for economic growth and transformation, (ii) ensuring good governance and security, (iii) directly increasing the ability of the poor to raise their incomes, and (iv) directly increasing the quality of life of the poor (MoFPED, 2000). The PEAP 2001 was later revised to PEAP 2004, which had five pillars: (i) improving

economic management, (ii) enhancing production, competitiveness and incomes, (iii) improving security, conflict resolution and disaster management, (iv) promoting good governance, and (v) realizing human development. As a poverty reduction framework, the PEAP focused mainly on areas that would enhance rural incomes, such as agriculture, rural roads, education and health (MAFAP, 2013). In 2010, the PEAP was replaced with the 5-year National Development Plan (NDP) as a medium-term planning framework.

2.2.2 Agriculture sector policies

The Plan for Modernization of Agriculture (PMA)

The overarching goal of the PMA was poverty eradication. The PMA was developed in 2000 as a framework and strategy to implement the second pillar of the PEAP 1997. The PMA had four main objectives, all of which were focused on improving the livelihood of agricultural households. The PMA had seven implementation areas: (i) research and technology development, (ii) National Agricultural Advisory Services, (iii) agricultural education, (iv) rural financial services, (v) marketing and agro-processing, (vi) sustainable use and management of natural resources, and (vii) physical infrastructure. To implement the PMA strategy, a secretariat was established to coordinate the various stakeholders in the agricultural sector and to implement all the areas highlighted in the PMA. For all the years that the PMA framework has been in operation, however, only the first two areas out of the seven were implemented through the National Agricultural Research Organization (NARO) and the National Agricultural Advisory Services (NAADS) secretariat.

Attempts to increase farmer access to financial services have not been successful. The Marketing and Agro-processing Strategy (MAPS) was drafted and not implemented. Recently, the ministry started implementing donor-funded projects such as the Community Agricultural Infrastructure Improvement Project (CAIIP) and the Markets and Agriculture Trade Improvement Projects (MATIP), which were geared towards improving rural roads and market infrastructure. Although the PMA secretariat remains in operation, the area of focus has changed more to a planning than a coordinating directorate of multi-sector interventions in agricultural development (MAFAP, 2013).

National Agriculture Policy (NAP)

The National Agriculture Policy (NAP) was formulated in line with the objectives of the constitution of the Republic of Uganda which provides that the state shall “stimulate agricultural, industrial, technological and scientific development by adopting appropriate policies and enactment of enabling legislation and take appropriate steps to encourage people to grow and store adequate food”. The NAP

thus aims at translating these high level national obligations into policies and strategies to enable their achievement. The policy is to guide all agriculture and agricultural related sub-sector policies, policy frameworks and strategies, including those existing and those to be formulated in future. The policy provides guidance to all actors in the agricultural sector to make investments that will increase agricultural incomes, reduce poverty, improve household food and nutrition security, create employment and stimulate overall economic growth. To revamp and enhance agricultural sector performance, the policy sets out to address various challenges facing the sector, such as low production and productivity, low value addition to agricultural produce, lack of sustainable access to markets, failure to maintain a consistent policy regime and functional institutions, insufficient skilled agricultural labor force, high human disease burdens and inadequate attention to natural resources sustainability.

The NAP is guided by six main principles: (i) the Government of Uganda is pursuing a private sector led and market-oriented economy. To achieve this objective, the government aims at removing the constraints that hinder the private sector from investing more in agriculture and strengthening the partnerships with the private sectors; (ii) agricultural development is to be pursued according to the agricultural production zones. Commodities that are best suited for each zone receive public sector support for both food security and commercialization. Efforts are made to support commodity value chain development of strategic commodities in the different zones in order to develop viable agro-industrial centres; (iii) agricultural development services are supposed to be provided to all farmer categories as individuals or in groups, ensuring gender equity; (iv) government is supposed to continue to provide agricultural services through the decentralized system of government and works to strengthen it. In particular, MAAIF is supposed to increase its collaboration with and support to district and sub-county local governments to improve the quality of service delivery to farmers. MAAIF is mandated to improve its supervisory and monitoring functions in local governments; (v) Government interventions are intended to pursue growth and equity. In so doing, agricultural interventions are to be balanced across the different regions, agricultural zones and across genders. Where necessary, the government should pay special attention to parts of the country with specific needs and vulnerable or marginalized groups (MAAIF, 2013); and (vi) different strategies are designed to guide the pursuance of the above principles and to aid in achieving the broader agriculture policy objective of promoting food and nutrition security and household incomes through coordinated interventions that focus on enhancing sustainable agricultural productivity and value addition, providing employment opportunities, and promoting domestic and international trade.

Agricultural Sector Development Strategy Investment Plan (DSIP)

To operationalize the existing and the future agricultural programmes, strategies and policies, the government of Uganda developed a five-year DSIP (2010/11-2014/15) in 2010. The DSIP acts as an overall implementation framework for all agricultural related policies and programmes, those already existing and those yet to be developed (MAAIF, 2010). The DSIP sets out to address the four main constraints facing agricultural sector: (i) low production and productivity; (ii) low value addition to agricultural produce and limited market access; (iii) weak implementation of agricultural laws and policies; and (iv) weak public agricultural institutions. As such, the DSIP was designed to address these constraints in four investment programmes: (i) increasing agricultural production and productivity; (ii) increasing access to markets and value addition; (iii) creating an enabling environment for the private sector in agriculture; and (iv) strengthening agricultural institutions at the centre and in local governments (MAAIF, 2010).

The development objectives of the DSIP are: (i) rural incomes and livelihoods increased; and (ii) household food and nutrition security improved. The immediate objectives are: (i) to sustainably enhance factor productivity (land, labour, capital) in crops, livestock, and fisheries; (ii) to develop and sustain markets for primary and secondary agricultural products within Uganda, the region and beyond; (iii) to develop favourable legal, policy and institutional frameworks that facilitate private sector expansion and increased profitability along the entire value chain; and (iv) to support MAAIF and agencies to function as modern, client-oriented organizations within an innovative, accountable and supportive environment.

Actual implementation of a large proportion of DSIP activities takes place at district level and falls under the responsibility of local governments. MAAIF and its agencies are therefore striving to improve the links with these entities. The local governments need to establish the necessary coordination institutions and linkages with other stakeholder organizations, including sub-counties, CSOs, private sector actors and farmers.

The National Agricultural Policy (NAP) and the DSIP as its implementation framework fall short of addressing most challenges facing the agricultural sector. The NAP recognizes that high population growth rate, through causing land fragmentation and land degradation, is a threat to agriculture but it does not spell out the strategies to combat this problem. Due to high population growth rate, which is 3.1 per cent and second highest in the world, agriculture households have increased significantly and hence agricultural land is increasingly becoming scarce. Subsequently, fallow periods have reduced which, in the absence of soil nutrient enhancing technology such as fertilizer applications, has resulted in land degradation. Secondly, with the depletion of the unused land and the shrinking

of arable areas, people are encroaching on the forests and swamps which affects the environment and as a result the farm output because of long dry seasons and frequent weather shocks that result from environmental degradation. Thirdly, population explosion and the resulting land scarcity has resulted into land fragmentation. The number of parcels operated by each household increased from 2.5 to around 4 parcels between 2003 and 2013. This is a challenge because fragmented farmlands increase administration costs as farmers have to spend a lot of time and resources traveling to different farmlands. Coupled with land fragmentation is the decrease in the size of land holdings as a result of population explosion given fixed land size. Land fragmentation and small land sizes affects technology adoption and mechanization. It is costly to use tractors on small and fragmented parcels. All these affect crop intensification of smallholder farmers.

The agriculture policy also does not provide for crop insurance and other measures to reduce risks and uncertainties facing smallholder farmers. Agriculture in Uganda is rain-fed which makes farmers susceptible to weather shocks such as prolonged droughts and erratic rains and environmental hazards such as floods. Without insurance, smallholder farmers remain hesitant to invest in land in form of fertilizer application and use of improved seeds because of high uncertainty and risks involved. The agriculture policy should therefore come up with strategies such as crop insurance to reduce risks. Innovations such as Kilimo Salama in Kenya which insures maize and wheat farmers against losses from drought and excess rains have proved helpful in reducing smallholder's risks and hence promoting the use of improved inputs, applications of fertilizers and better soil management practices. Given that irrigation is not widely practiced and farmers are not insured against weather shocks, there are concerns that climate change will greatly impact on crop production.

Uganda national land policy

In 2013, the Government of Uganda formulated the national land policy to provide a framework for articulating the role of land in national development, land ownership, distribution, utilization, alienability, management and control of land with an objective of aiding transformation from a peasant society to a modern, industrialized and urbanized society (MAAIF, 2013). Land, through its role on agriculture, is a critical factor of production and an essential pillar of national development and poverty alleviation in Uganda. The way it is used, managed, controlled and transferred has far reaching implications on the well-being of the people and economic development. For a long time, there was no one comprehensive land policy to guide various activities on land, ensure land tenure security and to promote sustainable land use in Uganda. Therefore, the national land policy was formulated to fill this gap.

The vision of the policy is “a transformed Ugandan society through optimal use and management of land resources for a prosperous and industrialized economy with a developed services sector”, and the goal of the policy is to ensure efficient, equitable and optimal utilization and management of Uganda’s land resources for poverty reduction, wealth creation and overall socio-economic development. To attain this goal, the policy introduces essential reforms to stem off escalating land conflicts and land evictions through re-institution of administrative Land Tribunals, creation of a special division in the Magistrates Courts and the High Court, and recognition of the dual operation of both customary and statutory system in land rights administration, land management and land dispute resolution (Ministry of Lands, Housing and Urban Development, 2013). In a nutshell, the land policy sets out to perform two related functions: to clarify on the status of land tenure systems, and to enhance land tenure security, all aimed at improving sustainable land use for national development.

To achieve its objectives, the policy sets out eight principles to guide implementation: (i) ensure equitable access to land for all citizens of Uganda to hold, own, enjoy, use and develop either individually or in association with others; (ii) equity and justice in access to land irrespective of gender, age, disability or any other reason created by history, tradition or custom; (iii) effective regulation of land use and land development; (iv) optimal land use and sustainable management for economic productivity and commercial competitiveness; (v) transparency and accountability in democratic land governance; (vi) reverse the decline in soil and land quality, and mitigate environmental effects; (vii) acquisition of land by non-citizens; and (viii) land as the central factor to leveraging other productive sectors.

The land policy is however not linked to other agricultural-related policies such as water for production policy, and agriculture policy. Yet, irrigation and other attempts to address climate changes involve interplay of different policies. For example, irrigation uses water and land, and can well be implemented by the Ministry of Agriculture. This means that land, water and agriculture policy must be in harmony for this to be successful. Currently the different policies remain fragmented and not integrated.

2.2.3 Other agricultural-related policies in draft

National fertilizer policy

To respond to the low production and productivity in the agriculture sector, partly due to low levels of fertilizer application in the country, the Uganda government is developing a National Fertilizer Policy (NFP). The objective of the NFP is to increase agricultural productivity and profitability through increased and sustainable

access to fertilizers. Specifically, the policy seeks to: (i) create awareness on the importance of fertilizer; (ii) formalize fertilizer trade; (iii) establish a private sector driven fertilizer market system; (iv) promote optimal use of both organic and inorganic fertilizers; (v) support domestic fertilizer production; (vi) establish regulatory and monitoring systems of fertilizer products and by-products; (vii) establish crop and area-specific soil nutrient requirements; and (viii) promote harmonization of related policies.

National seed policy

To curb the challenges facing the seed sub-sector, the government is developing a policy, with the vision of creating a competitive, profitable and sustainable seed sector where commercial and smallholder farmers' access affordable quality seed. Currently, the seed sub-sector is characterized by shortage of seed scientists, high prevalence of counterfeit seeds, lack of protection of local communities intellectual property rights, inadequate capacity for effective seed certification and inspection services, shortage of certified seed multipliers, and inadequate research and development in seed. The draft was released in September 2014. The government states the rationale for the seed policy as: population growth and hence high food requirements; and globalization, reduction in tariffs and non-tariff barriers.

The seed policy is guided by seven principles: (i) pursuance of a well-regulated private sector-led and market-oriented seed sector; (ii) pursuance of a pluralistic viable seed sector with recognized multiple systems of seed production; (iii) transformation of the informal seed system into a formally recognized and regulated system; (iv) protection of plant breeders' rights to foster innovation in the seed sector; (v) enhancement of access to basic seed; (vi) enhancement to productivity in farming systems; and (vii) provision of services to seed value chain actors through a decentralized system.

Extension policy

Uganda has not developed an extension policy to guide the extension service delivery. The extension system in Uganda is complex, with parallel structure in operation; that is, the main stream national extension delivery system and the National Agriculture Advisory Services (NAADS). The national extension system is operated under MAAIF while NAADS is a semi-autonomous programme.

National extension system

Historically, agricultural extension services in Uganda have been organized, managed and provided to farmers through the public extension system. This extension system in Uganda has evolved from the general Transfer of Technology (TOT) approach during colonial times, to the top-down Training and Visit (T&V) and to the decentralized public extension system after 1995 (Semana, 2002).

Until 1991, the delivery of public extension was achieved through parallel extension services in different government ministerial departments. Extension was thus characterized by duplication, conflict and confusion. In order to address these shortcomings, a new government policy sought 'unification' of the service in 1990, leading to creation of a new agriculture Ministry. Specifically, unification of the service was intended to integrate use of scarce resources while also professionalizing extension education through learning and teaching (Semana, 2002). As part of this effort, the World Bank funded Agricultural Extension Project (AEP) started in 1992 which was implemented until 1998 and was aimed at improving the organization and management of extension service in Uganda. This included an attempt to move from centralized planning of extension programmes towards a more bottom-up process, ensuring a single line of command, and regular staff and farmer training activities, with farmer training achieved via scheduled staff visits; and emphasis on strengthening research-extension linkage by involving relevant stakeholders.

The AEP was modeled around the principles of the Training and Visit (T&V) extension system, which from 1987 became the predominant mode of public extension in Uganda (Bukonya, 2010). The main distinguishing features of the AEP concerned the extension approach adopted. In line with the mission of the newly created Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) the AEP used a Unified Extension Approach (UEP). The unified approach to service provision was deemed best suited to address farmer extension needs in a more holistic manner.

However, later evaluations of UEP found challenges and inefficiencies in the new extension approach, such as inadequate involvement of farmers in extension programme development; limited coverage of the farming population (i.e. concentration on members of contact groups); the narrow scope of farm-level problems addressed; the heavily centralized and bureaucratic administrative system; and the inefficiency and unsustainability of the funding. Due to the stated challenges and the stopping of World Bank funding, the AEP was disbanded in 1998 and a new decentralized approach to extension delivery was adopted.

The 1995 Constitution of Uganda stipulates that powers of all government institutions will be decentralized with the intention of promoting popular participation and the empowerment of local people in development planning and decision-making. Committed to a policy of decentralization, the government embraced proposals to break up the previously centrally-controlled agricultural extension service and re-organized it into a series of district extension services, in the hope of addressing existing extension delivery challenges. Decentralization meant devolving decision-making power to lower levels and a substantial

transfer of political, financial and planning responsibility to local governments. The process of decentralizing the extension service was completed in 1997. Agricultural extension services increasingly became a responsibility of District Local Governments (DLGs). This implied that, henceforth, the decision to make a budget allocation to extension belonged to the District Councils, i.e. to a group of representatives elected by the rural population in their respective districts. Besides increased participation of local stakeholders, it was hoped that decentralization of extension services would lead to improvements in service management (Bukonya, 2010). Currently, this decentralized system runs alongside NAADS programme. Since the inception of NAADS, the mainstream public extension system weakened because most funds were directed towards NAADS and most staff incorporated into the NAADS programme. From 2014, the main extension system is undergoing restructuring to form a single spine extension service delivery system.

NAADS programme

The NAADS formulation in 2001 was highly driven and supported by development partners led by the World Bank (WB) as a demand-driven extension service delivery system. It is a semi-autonomous agency and independent of the mainstream public extension programme implemented under the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF). The institutional design of NAADS was placed in the context of the decentralization reform in Uganda, which came into effect when a new constitution was passed in 1995. The new constitution stipulated that substantial authority had to be transferred from the central government to the districts. In 1997, the government commissioned a post-constitutional restructuring report which specified the implications of the decentralization reform for the agricultural sector (Rwamigisa et al., 2013).

Establishment of NAADS was based on the belief that improving agricultural extension through reforms within the public sector and under the existing extension system was impossible. It was also thought that: new approaches involving the private sector and civil society were needed; farmers' involvement in decision making on the kind of services they needed was critical; and that the role of the public sector should be limited to financing, facilitation and coordination; and service delivery should be a responsibility of the private sector because it is more efficient (Rwamigisa et al., 2013). NAADS was thus designed in such a way that it would promote a shift from the concept of farmers as beneficiaries to users and clients; a change from the system operated by public employees to that largely operated through contracting arrangements; and a shift from the public sector as the provider of services to the role of stimulating the development of a private market for advisory services.

The objectives of NAADS are: to promote food security, nutrition and household incomes through increased productivity and market-oriented farming; to empower all farmers to access and utilize contracted agricultural advisory services; to promote farmer groups to develop capacity to manage farming enterprises; to promote options for financing and delivery of agricultural advice for the different types of farmers but with an emphasis on subsistence farmers particularly women, youth and people with disabilities; to gradually shift from public delivery to private delivery of agricultural advice; to develop private sector agricultural advisory capacity and systems and assure quality of advice; and to catalyze the participation of the private sector to fund agricultural advisory services (NAADS Act, 2001).

The NAADS programme is a public-funded private sector-contracted extension system designed to take 25 years and is to be implemented in phases. The first phase of its implementation was originally designed to last seven years (2001-2007) at a cost of U\$ 108 million, but the project stretched to June 2010. The second phase of NAADS (July 2010–June 2015) under the Agricultural Technology and Agribusiness Advisory Services (ATAAS) project was to cost at least US\$ 450 million. Besides NAADS, the ATAAS project has another component focusing on agricultural research as well as joint activities on research and extension, and the whole project is estimated to cost US\$ 666 million (Okoboi et al., 2013).

While the programme has been in operation for more than 12 years, its success is questionable. A number of empirical studies evaluating the impact of NAADS find inconclusive results. For instance, Benin et al. (2012) find mixed and weak results regarding the impact of NAADS on agriculture revenue. Okoboi et al. (2013) also finds similar results while evaluating the impact of NAADS on the use of credit for agriculture, application of improved agricultural technology and on agriculture productivity. For example, the study reports that NAADS participants applied more manure but no impact on herbicides/pesticides and mixed results on improved seeds. Similar results were found on productivity impact of NAADS. For instance, while they find a positive impact of NAADS on productivity of ground nuts, the results are negative for maize.

Also, anecdotal evidence, newspaper reports cite major problems with NAADS, such as: farmers' ambivalence towards the mismanagement of the programme, limited understanding of the programme by farmers, questionable capacity of private service providers; and low technology uptake by farmers and far too rapid roll out of the programme (Rwamigisa et al., 2013).

It is because of the perceived unsatisfactory performance of NAADS and the mismanagement of funds that the programme has been suspended several times.

The President suspended NAADS programme in 2007 and re-opened it in 2008. The President again stopped NAADS funding in June 2010 and later lifted the suspension in December the same year. Currently, the programme is undergoing restructuring after the old extension delivery system was disbanded in 2014 and controversially left the input distribution in the hands of the army.

2.2.4 Summary of agricultural related policies

The Government of Uganda has formulated a number of policies aimed at enhancing agricultural production and productivity. These include the national agricultural policy, the land policy, fertilizer policy, seed policy, water for production policy, among others. However, little has been done to combat climate change and to insure farmers against weather vagaries. For instance, there is no policy that addresses climate change. Secondly, the available policies remain fragmented and not clearly linked, thus are unable to address the climate change concerns such as floods and long droughts. Also, there are no clear programmes to sensitize farmers to adopt climate sensitive farming practices that ensure sustainable use of land and water.

Specific interventions are required to address climate change and weather shocks. Such interventions can be in form of investments in irrigation and better water management practices, attracting and enabling the private sector to invest in crop insurance so as to shield farmers against weather shocks, and formulating laws and regulations that prevent deforestation in addition to encouraging farmers to plant trees.

3. Trade in Agricultural Production

3.1 Introduction

As pointed out earlier, the agriculture sector is an important contributor to Uganda's total GDP, national employment and export earnings (UBOS, 2006 and MAAIF, 2010). In addition, a significant part of manufacturing activity comprises agricultural food processing. Thus in view of its contribution to the economy, agriculture forms a central component of Uganda's economy and comparative advantage. In recent years, there has also been a revival in the importance of the sector as a critical stepping stone to the realization of the country's Vision 2040 of transforming Uganda into a middle income country.

In line with the importance of the sector as a whole, agricultural trade in particular constitutes an important component of Uganda's development strategy. The thrust of Uganda's policy aims at increased value added production and industrialization within an export-oriented market based framework. Uganda's Plan for the Modernization of Agriculture (PMA), the agriculture sector Development Strategy and Investment Plan (DSIP), the National Development Plans I and II (NDP I and II) and the National Trade Sector Development Plan (NTSDP) all prioritized agricultural commercialization and trade as key in the success of the country's strategic development policy effort (MAAIF 2010; MTTI, 2007). The PMA in particular was a holistic sectoral and inter-sectoral strategy aimed at modernizing and commercializing agriculture in Uganda. The plan aimed to guide the sector from smallholder subsistence agriculture into commercial agriculture to enable farmers to significantly increase their income and welfare. Agricultural trade which is also largely but not entirely made up of food items is also an important strategy for combating food insecurity as it enhances access to food especially for those not directly involved in subsistence food production.

3.2 Agricultural Output and Trade

Uganda's agriculture sector comprises the food crop, cash crop, livestock, fisheries and forestry sub-sectors. Much of the country's agricultural activity especially in the food crop, livestock and fisheries sub-sectors is undertaken on small land holdings for household subsistence. Accordingly, the level of agricultural mechanization and commercialization in the country remains generally low. However, some trade in agricultural commodities is picking up especially in the non-traditional sub-sectors such as bananas (sweet and beer), soya beans, rice, maize, irish potatoes, and beans (Figure 3.1a and Figure 3.1b). Maize is one of the

crops that has been identified as having significant potential for regional trade as it is consumed widely in the EAC and COMESA regions.

Looking at the level of agricultural output produced and traded, it is clear that much effort is needed to realize the objective of agricultural commercialization, the key goal of the PMA. There is potential for more domestic and regional trade in agricultural produce consumed throughout the region but more especially in maize, rice, beans, simsim, groundnuts, millet, bananas, peas, soya beans and cassava. Figure 3.1b shows that less than 50 per cent of the quantities of commodities such as maize, irish potatoes, food bananas, simsim and many others produced (Figure 3.1a) are traded (MAAIF, 2010). To enhance domestic and regional trade in these types of agricultural produce, there is need to invest in transportation and storage infrastructure that links production areas to markets, and facilitates the preservation of the commodities. The magnitudes and proportions sold have a strong bearing on food security. The statistics therefore suggest that although food insecurity can be mitigated by food trade, there is a limit of the extent to which this avenue can work.

Figure 3.1a: Agricultural commodities produced

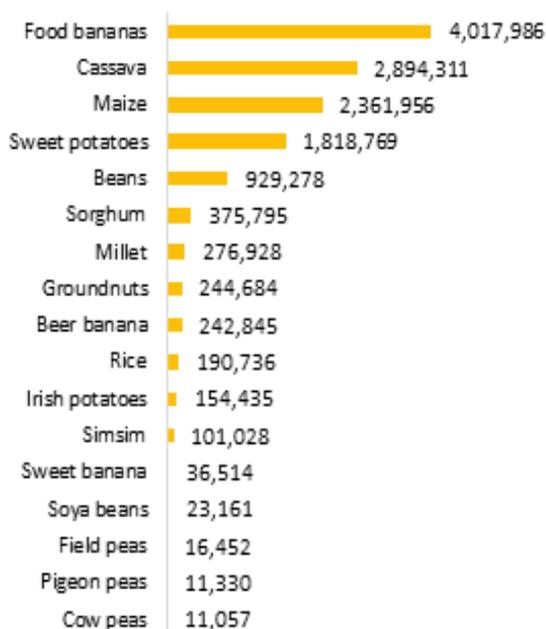
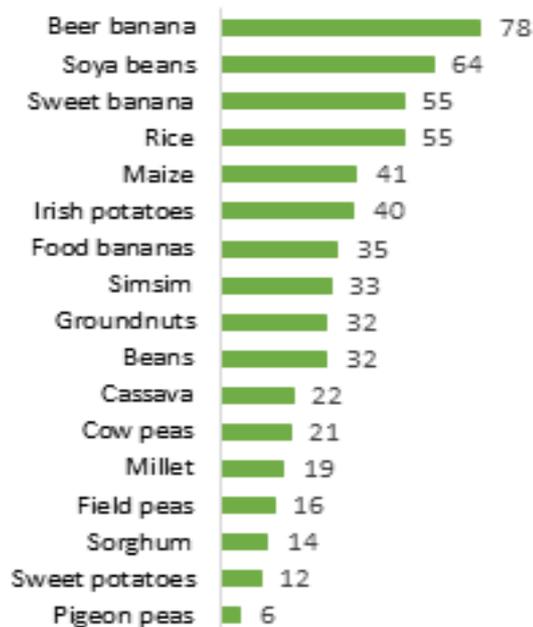


Figure 3.1b: Agricultural commodities traded



Source: MAAIF (2010)

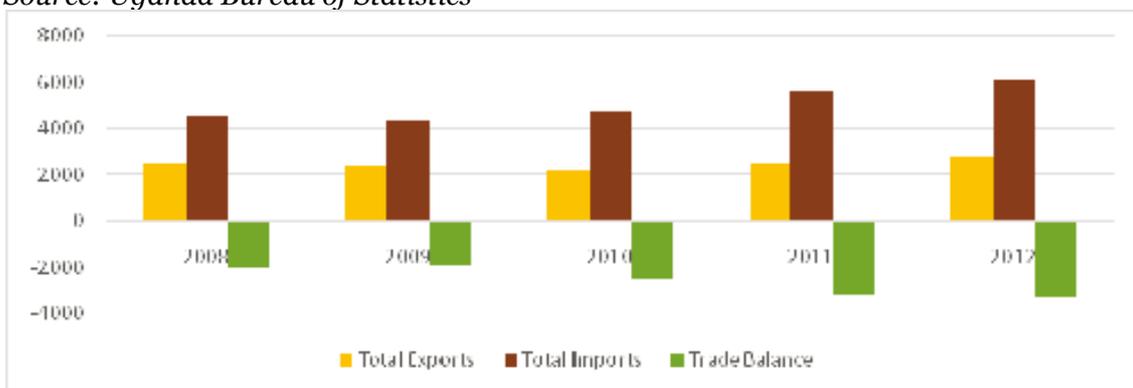
There are also vast opportunities for trade in agro-processed products and in associated value chains. As the EAC region further integrates economically and explores free trade arrangements with regional integration blocs such as Common Market for Eastern and Southern Africa (COMESA) and Southern Africa Development Community (SADC) and as agro-based manufacturing picks up across the regions, agricultural trade and trade in agro-processed products in the region is likely to increase in the coming years.

3.3 External Trade Performance

As pointed out earlier, agriculture contributes significantly to Uganda's external trade but more especially to the country's export earnings. In terms of total trade with the rest of the world, both exports and imports have shown upward trends but with imports rising at a slightly higher average rate of 12 per cent a year over the period 2008 to 2012 while exports rose at a rate of approximately 9.7 per cent over the same period. This disparate growth rates have led to a widening trade deficit, peaking at just over US\$ 3 billion in 2012 (Figure 3.2). Uganda's negative trade balance has so far been offset by receipts in the finance and capital accounts of the balance of payments. These receipts comprise remittances, official development assistance, foreign direct investment and other inflows.

Figure 3.2: Total exports, imports and trade balance for Uganda: 2008-2012 (US\$ million)

Source: Uganda Bureau of Statistics



In its strategic policy framework, Uganda aims to transform the agricultural sector into a modern commercially oriented sector as a means for eradicating poverty in the country. Along with the drive for commercialization and trade is the need to expand production output so as to avoid shortages and adverse effects on food security which may arise as a result of attendant domestic shortages engendered by faster growth in exports of commodities consumed domestically; land and capacity constraints leading to inability to expand production in tandem with growth in

trade; a shift in productive resources from the production of domestic to foreign consumed goods; more rapid increase in the prices of domestic commodities than the income of those who use the markets; and deterioration in the terms of trade against domestic exporters who then incur income losses.

3.4 Uganda's Agricultural Exports and Imports

The contribution of the agriculture sector to total exports has declined steadily over the years as the export sector expanded. In 2005, agriculture contributed approximately 61 per cent of total export revenue. This contribution has since declined to 56, 47 and 46 per cent in 2006, 2007, and 2008, respectively (Table 3.1).

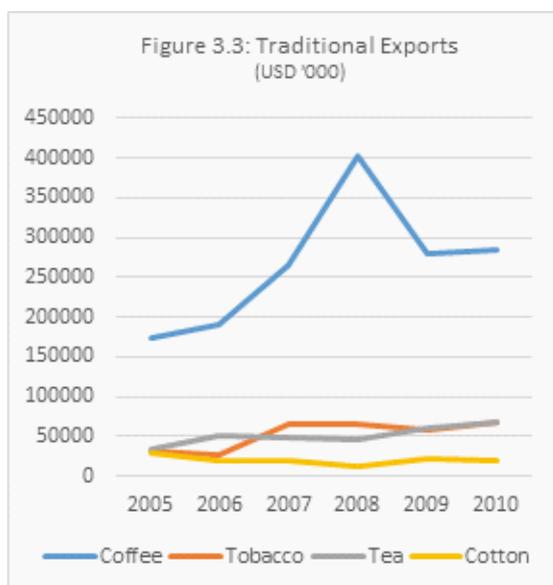
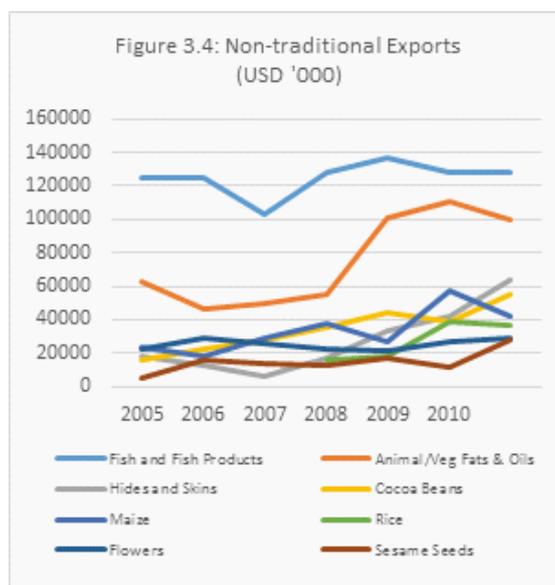
Table 3.1: Contribution of agriculture to Uganda's export revenue

	2005	2006	2007	2008	2009	2010
Total exports (US\$ '000)	1,017,010	1,187,640	1,685,920	1,724,295	1,567,614	1,618,603
Total imports (US\$ '000)	2,054,137	2,557,307	3,493,354	4,525,859	4,247,371	4,664,338
Trade balance (US\$ '000)	- 1,037,127	- 1,369,667	- 1,807,434	- 2,801,564	- 2,679,757	- 3,045,735
Agriculture exports (US\$ '000)	415,965	454,172	673,223	878,068	774,423	839,678
Agriculture imports (US\$ '000)	336,307	396,392	476,638	629,319	542,352	583,625
Share of agriculture exports (%)	40.9	38.2	39.9	50.9	49.4	51.9
Share of agriculture imports (%)	17.8	15.5	13.6	13.9	12.8	12.5

Source: UBOS, URA, UCDA

For much of the colonial and post-independence period, Uganda has relied on a limited range of what have come to be referred to as “traditional” cash crops for export revenue for many years. These are coffee, tea, cotton and tobacco. Coffee has and continues to be the most dominant of these “cash” crops (Figure 3.3).

Uganda's highly concentrated export sector carries considerable risk especially in relation to possible instability in international demand and volatility in commodity prices. From around the year 2000, however, Uganda embarked on a drive to diversify its exports so as to enhance export revenue but also to spread the risks

Figure 3.3: Traditional exports (US\$ '000)**Figure 3.4: Non-traditional exports (US\$ '000)**

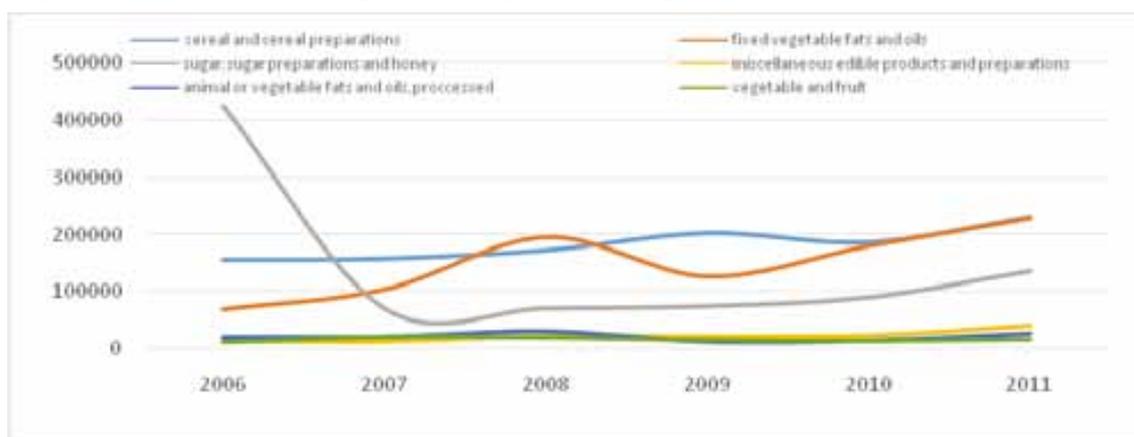
Source: MAAIF and UBOS

of dependence on a narrow range of primary agricultural products. This effort led to an increase in “non-traditional” exports, namely fish and fish products, maize, flowers, rice, cocoa beans, sesame seeds, hides and skins, vanilla, animal and vegetable fats and oils. These non-traditional exports have contributed significantly in driving growth in Uganda’s exports contributing nearly two thirds of total exports (Figure 3.4).

Two of Uganda’s biggest export destinations are the COMESA and the European Union (EU) while the Middle East is also coming up. Uganda has considerable potential for trade in agricultural commodities. This potential derives from the country’s huge agricultural potential, including: relatively fertile soils; availability of arable land; good climatic conditions, and reasonable rains and abundant water bodies and associated resources. However, Uganda’s huge potential has yet to be harnessed and translated into high agricultural productivity to the benefit of the nation.

Although Uganda largely exports primary agricultural commodities, it also imports a considerable amount of agriculture-based products many of which are processed, from the rest of the world. On top of Uganda’s imports list are cereals and cereal preparations, fixed vegetable fats and oils (crude, refined or fractionated), sugar and sugar preparations and honey and others (Figure 3.5).

Figure 3.5: Uganda's imports of agricultural products: 2008-2011 (US\$ '000)



Source: MAAIF and UBOS

Uganda's overall imports have grown rapidly in recent years. Agricultural imports, however, represent a relatively smaller proportion of Uganda's total imports which have comprised largely of manufactured goods, petroleum and other processed materials. It is important to note that many of Uganda's agricultural import items such as rice, sugar, vegetable oils and others are also being produced in the country. There is therefore scope to increase domestic production of these products.

3.5 Factors Constraining Uganda's Agricultural Trade

Without output enhancement, trade is likely to be constrained and food insecurity likely to become a bigger issue. It is therefore critically important that growth in agricultural output is addressed as part of the strategy to enhance agricultural exports. The main constraints in Uganda's trade in agricultural products include among others, factors discussed in section 2.1.5 that relate to productivity. Other constraints according to (MAAIF, 2010) include:

- Constraints arising from infrastructure, information asymmetry, legal framework, and others in domestic trading which continue to hamper accessibility to food in different parts of the country;
- Poor infrastructure especially roads, railways, waterways, storage and cooling facilities which add to the instability of supplies and the general cost of doing business for farmers involved in export trade;
- Low standards development and certification of products in Uganda, making the country's products uncompetitive due to lack of recognition and dubious quality assurance; and

- Available evidence shows that there is still a significant level of food insecurity in Uganda especially in form of less than the recommended caloric intake of 2,300 calories per person per day and malnutrition among children and mothers (UNICEF, 2009; Ssewanyana and Kasirye, 2010). This insecurity appears to have two key dimensions: inadequacy of food/income, and poor nutritional practices. The inadequacy dimension has to be addressed as part of the strategy of boosting agricultural exports.

It is important to note that while trade can alleviate food insecurity by enhancing accessibility to food, it may also inadvertently compound food insecurity especially where production has not kept pace with rapid growth in trade. Uganda experienced this phenomenon during the rapid increase in exports of fish to Europe and more recently as a result of food exports to South Sudan. Growth in trade with these two regions led to shortages and price increases of the affected commodities. This is an example of trade induced food insecurity or nutrition insecurity. Uganda's existing policy framework does not emphatically address insecurity induced by increased export of agricultural food commodities. Both increased agricultural exports and food security are important policy objectives for Uganda.

3.6 Policy Implication

Uganda's overriding objective for the agricultural sector is to modernize the sector by strengthening productivity, export competitiveness and food security (MAAIF, 2010; MTTI 2007). As pointed out earlier, a number of policy initiatives have been instituted towards realizing this goal, including the PMA, NAADS, the DSIP and the NDP. To unlock Uganda's agricultural trade potential, the overall effect of these policy measures must be to increase productivity and enhance control over production conditions. This should include developing controllable water systems for agricultural production, road, rail and other transport infrastructure and access to affordable agricultural finance, inputs and mechanization. These measures will be necessary to address the issue of output instability and production efficiency as means for enhancing competitiveness in agricultural trade and food security in the country. It is also noted that although an efficient trade system will alleviate food insecurity challenges since food will be moved from areas of surpluses to deficits, it has the potential to increase food insecurity when households sell all produce and remain with less or nothing to depend on.

Uganda currently imports agricultural products whose value is less than exports implying a positive agricultural trade balance. Uganda has the potential to produce local agricultural products that are currently imported if the production supply constraints are addressed.

3.7 Trade Policies

Uganda's trade policies target transformation of the country into a dynamic and competitive economy, with the trade sector stimulating the productive sectors to enhance the capacity to improve the welfare of the citizens (MTTI, 2007). The trade policies aim at developing and nurturing the private sector to foster its ability to trade at both domestic and international levels. Therefore, the trade policy focuses on enhancing the competitiveness of Uganda's products and services; strengthening trade institutions; trade facilitation; improving market access; providing trade/market information to the business community; developing capacity for both domestic and foreign trade; and ensuring that the gains from growth in trade are equitably shared. This is all summarized in Uganda's national trade policy which is strategically divided into domestic and foreign administrative components/domains.

The domestic policy actions target strengthening of selected commercial and/or trade laws, setting up a market information system to facilitate the collection and dissemination of trade information, launching public-private sector partnership programme, among other things. The particular policy interventions to achieve these include: preparation of commercial laws, adherence to adequate standards, reduction of shortages of products and services in parts of the country and implementation of particular sectoral interventions, such as the Marketing and Agro-Processing Strategy (MAPS). Furthermore, the National Trade Policy proposes a framework to: review the tax system to eliminate double taxation of goods crossing internal borders, review issuance of trade licenses to ease burdens on businesses, design strategies to promote value addition, promote niche marketing, develop and implement a national standards policy, promote Uganda's participation in the global value chain, and encourage the use of local materials in the production process.

On the other hand, the external trade policy actions focus on ensuring effective integration of the economy into the regional economy and the multilateral trading system, enhancing national capacity to take advantage of the above, while minimizing the negative effects of globalization (Republic of Uganda, 2012). In effect, the external focus is to competitively trade what is domestically produced internationally by using trade negotiations to gain market access; and adapting Uganda's economy to regional and global trade integration. Therefore, government policy actions in the international trade sub-sector aim at: (i) ensuring that the sub-sector effectively and efficiently complements the domestic trade and production sub-sectors; (ii) ensuring that what is produced domestically can be competitively traded at international level; (iii) using trade negotiations to influence policies and practices of the country's trading partners' so that they are

conducive to the development of Uganda; and (iv) adapting Uganda's economy to the trade and trade-related policies and practices of the country's trading partners (MTTI, 2007). The national trade policy has synergies and complementarities/cross-cutting policy issues crucial to achieving its goal. These include synergies and complementarities with other government agencies, including linkages with other ministries, district commercial offices and the private sector.

3.7.1 The existing trade policy practices - import measures²

Registration, customs procedures and valuation

To operate in Uganda, all legal entities and persons engaged in international trade must be registered with the Uganda Registration Services Bureau (URSB) and obtain a license from the relevant local authorities. Consequently, a Tax Identification Number (TIN) is issued by the Uganda Revenue Authority to all taxpayers after registration. Although there has been resistance from some sections of the business community, the government has implemented pre-shipment inspection of goods imported into Uganda. The ASYCUDA++ system is used for customs clearance. Uganda uses the ASYCUDA++ system where a Single Administrative Document (SAD) from the importer is required together with other documents such as a customs bill of entry, commercial invoice, freight invoice, certificate of origin, permits and bill of lading, airway bill or railway consignment note. Additional documents may be required for import of specified commodities such as bee products; animals, plants, and their products; drugs; and second hand clothing. To avoid pricing problems, a valuation database is used as a reference and application of alternative valuation methods where a declaration is found unsatisfactory during the vetting process.

Rules of origin

The operational rules of origin in Uganda draws from the EAC rules of origin set out in Annex III to the Protocol on the establishment of the Customs Union. Goods are said to originate in Uganda if they are wholly produced or undergo substantial transformation (import content of the goods is no more than 60 per cent of the c.i.f. value of materials used in their production or the value-added resulting from the production process accounts for at least 35 per cent of the ex-factory cost of the goods or there is change in tariff heading).

Tariffs

The EAC CET which Uganda applies is broadly set according to category of goods: raw materials and capital goods generally attract a zero rate, intermediate goods 10 per cent, and finished goods 25 per cent. Higher rates, ranging from 35 per cent to 100 per cent, apply to 58 tariff lines of sensitive items that include rice and

² This section largely draws from the WTO Policy Review (2012)

sugar among others. Uganda's tariff bindings cover 15.9 per cent of all its tariff lines, i.e. all tariff lines for agricultural products (WTO definition), and 2.9 per cent of total lines for non-agricultural products. The bindings are at ceiling rates of 80 per cent on most agricultural products, except for 75 tariff lines with bound rates between 40 per cent and 70 per cent; and between 40 per cent and 80 per cent on non agricultural products. Note that tariffs along the EAC borders for the five countries have been totally eliminated.

Tariff preferences

Uganda is still under the preferential trade regime and has attained 80 per cent reduction of tariffs on goods originating in other COMESA countries that are outside EAC (This is likely to change during the implementation of the tripartite). Arising from Uganda's membership to COMESA, the country applies a preferential tariff on imports from COMESA member states of zero per cent for raw materials and plant and machinery, 4 per cent for intermediate goods, and 6 per cent for finished goods.

Duty and tax exemptions and concessions

A number of schemes exist and their intention is to promote production and trade. The duty remission scheme of the East African Community Customs Management Act (EACCMA), grants Uganda permission to import specified raw materials and industrial inputs free of duty for five years with effect from 1st January 2005. This was extended for one year as of 1st July 2011. The specified imports include packaging, paper and newsprint, malt, yarn and iron³. The fixed duty drawback scheme and the manufacturing under bond scheme allow exporters access to VAT refunds and duty drawback⁴. The goods in transit bond that exempt importers from customs duties are used for goods shipped through Uganda. Uganda charges a withholding tax of 6 per cent on the c.i.f. value of imports from all companies unless they are exempted. It also applies to local purchases. This is a deposit on income tax and is taken into account at the end of the fiscal year following filing of returns to the Uganda Revenue Authority.

Import prohibitions, restrictions and licensing

These provisions aim at controlling the importation of certain goods for the sake of protecting human, animal and plant life. They are therefore set standards and procedures to prevent importation of what would be injurious. It is a requirement that importers of agri-chemicals are registered with and obtain approval from the Agricultural Chemicals Board (ACB), set up by the Agricultural Chemicals (Control) Act (2006). Furthermore, they must seek approval from the National Drug Authority (NDA) for imports of pharmaceuticals. Finally, importers must apply to the NDA for registration and certification under the National Drug Policy

³ For a full list see Legal Notice No. EAC/10/2007, *East African Community Gazette*.

⁴ East African Community Customs Management Act, 2005, Sections 138-144

and Authority Statute of 1993. The URA may require supplementary documents at the entry point for certain imports like a license and quality clearance certificate issued by the NDA. To import flowers, fruits, vegetables, and plants phyto-sanitary certificate is required. A health certificate is required for animal imports, certifying that the animal is free from infectious or contagious diseases. Bees and bee products require an import permit. A fumigation certificate is required for second-hand clothing. There are several goods that are prohibited from importation into Uganda, as listed in the second schedule to the EACCMA and other domestic laws.

Standards and other technical requirements

Standards in Uganda are regulated and enforced by the Uganda National Bureau of Standards (UNBS), the sole statutory organization responsible for the formulation, promotion and enforcement of standards and technical regulations which was constituted under the UNBS Act 1983 Cap 327, and became operational in 1989. UNBS duties entail market surveillance to detect sub-standard or counterfeit products, carrying out shipment inspection and conformity assessment for exports, imports, and tender supplies, and liaising with national, regional, and international standardization and related bodies. Technical regulations and standards may be initiated by the public or private sector to the extent that between 2006 and June 2012, Uganda submitted 256 notifications under the Technical Barriers to Trade (TBT) Agreement, majority of which concerned food standards, animal feed, environmental protection, and safety⁵. In 2012, out of a total of 1,429 standards published, 1,228 were based on international standards and covered food products, chemical, engineering, and other products, metrology, electro-technology, and information and communications technology products. Domestic and imported products are tested for conformity to Uganda technical regulations and other specifications. There is an Import Inspection and Clearance Scheme that requires all imported products subject to technical regulations to be inspected for conformity to the relevant Ugandan standard before release onto the market. Imports are subject to a technical regulation and must be accompanied by a test certificate indicating compliance with the Ugandan standard or EAC partner state mark.

Sanitary and phyto-sanitary (SPS) regulations

Article 108 of the treaty establishing the EAC, addresses issues of SPS with regard to plant and animal diseases control. Uganda, as a partner state, is expected to harmonize policies, legislation and regulations for enforcement of pests and disease control, harmonize and strengthen regulatory institutions and co-operate in surveillance, diagnose and control strategies of trans-boundary pests and animal diseases. Uganda's SPS-related legislation includes the Food and Drugs

⁵ WTO document series G/TBT/N/UGA/

Act (1964), the Public Health Act (1964), the Plant Protection Act (1964), the Drugs Act (1993), the Seeds and Plant Act No. 3 of 2007, and the Agricultural Chemicals (Control) Act No. 1 of 2007. Uganda's SPS standards are developed in accordance with international standards. Uganda has not submitted any notifications to the WTO's SPS Committee. There have been several cases where Uganda's agricultural exports have been rejected in foreign markets due to failure to meet SPS requirements. Products prohibited from importation into Uganda on SPS grounds include beef (due to mad cow disease); dressed chicken and poultry (due to bird flu); soil; banana leaves; rice straw; wheat straw; leaf; leaf mold; and chaff. Imports of parent stock poultry are permitted from countries listed by the World Organization for Animal Health (OIE).

Labeling, marking and packaging requirements

With regard to labeling, marking and packaging, it is a requirement that imports and exports are marked with the following information: importer/exporter name, consignee, flight/vehicle's details, place of discharge, number of packages, container identity, description of goods, airway bill number/bill of lading and country of origin/destination.

3.7.2 The existing trade policy practices - export measures⁶

Procedures

With regard to procedures, initially it was a requirement for the registration of export enterprises. However, this was removed with the intent to ease export processes as a way of promoting export trade. However, exporters of the following commodities are required to acquire export permits or licenses: flowers, fruits, vegetables, plants, bees and bee products, coffee, cotton, and game and trophies for purposes of regulation. Similarly, export certificates are required for export of precious metals, fish, and hides and skins for related reasons. The rest of the commodities are only given export permits in exceptional cases where the importing countries demands for them. The removal of requirements for the registration eases clearance of exports through customs which on average takes less than one day, unless there is need to verify the information provided.

Export taxes, charges and levies

During the liberalization phase of the economy in the early 1990s, Uganda abolished taxes on exports as a way to promote and boost exports. However, Uganda maintains a cess of 1 per cent on exports of coffee (collected by the Uganda Coffee Development Authority), which is used for coffee development activities, 2 per cent on cotton (Cotton Development Organization) for similar reason; and US\$0.8/kg on raw hides and skins. The tax was intended to promote local value

⁶ This section largely draws from the WTO Policy Review (2012)

addition on hides and skins. Therefore, largely Uganda has a tax free export regime whose main objective is create incentives that promote the export sector.

Export promotion and marketing assistance

Promotion of export trade in Uganda is mandated to the Uganda Export Promotion Board (UEPB). UEPB was created by Statute No. 2 of 1996 and mandated to coordinate all activities that lead to export growth on a sustainable basis. Its current form, functions and activities are fully governed and guided by this statute. It conducts market and product development, trade promotion of trade services, policy advocacy and human resource development. UEPB periodically runs a strategy that identifies the commodities and how to promote them externally and also boosting local production of the same. There are other agencies like the Private Sector Foundation Uganda that provides support for 700 companies. Activities undertaken include company diagnostic and planning; training; management systems; production-related domestic and international marketing; sales and production; feasibility; and market research and trade promotion.

3.7.3 Measures affecting production and trade

Intellectual Property Rights (IPRs)

Uganda subscribes to the Paris Convention for the Protection of Industrial Property, the Convention that established the World Intellectual Property Organization (WIPO). In addition, Uganda is a member of the African Regional Intellectual Property Organization (ARIPO). At regional level, there are regional cooperation initiatives on IPR under the EAC Common Market Protocol described in the Common Report; Chapter III (3) intended to harmonize the EAC IPRs. The Trademarks Act provides for the registration of trade-marks that meet the requirements of distinctiveness for goods or services. Trademarks are valid for seven years, renewable thereafter every ten years upon payment of a fee. On the other hand, the Copyright and Neighbouring Rights Act 2006 protects literary, scientific, and artistic intellectual works, which include audio-visual works, computer programs, electronic data banks, and derivative works such as translations. The Patents Act Cap 216 of 1993 caters for inventions, whether products or processes that are applicable to industrial activities. Patents are granted for 15 years (with possible extension for 5 years), subject to payment of annual fees. In the event of infringement, the patent holder has a right to initiate proceedings in the High Court for damages, an injunction (including border measures) and other remedies in the event of infringement. The Ugandan Registration Services Bureau (URSB) administers the Trademarks Act No. 12 of 2010, the Copyright and Neighbouring Rights Act No. 19 of 2006 and the Patents Act, Cap 216 of 1993. The Trade Secrets Protection Act No. 2 of 2009 provides for

the protection of undisclosed information in commercial transactions and other related matters. Trade secrets include information relating to a formula, pattern, compilation, program, method, technique, or process, or information contained or embodied in a product, device or mechanism that has economic value from not being generally known (WTO, 2012).

State-trading enterprises, state ownership, and privatization

Although Uganda continues to hold shares in a number of enterprises, the country does not have any state-trading enterprises (WTO, 2012). This is done in pursuance of the Public Enterprises Reform and Divestiture Act, Chapter 98 (the PERD Act) that sets out the legal framework for privatization and the operation of state-owned enterprises in Uganda. The Produce Marketing Boards and other trade parastatals no longer exist illustrating the non-state participation in trade as a matter of policy. As a liberalized economy, the private sector is left with the responsibility through market and price incentives to trade.

4. Climate Change and its Implications on Agricultural Food Production in Uganda

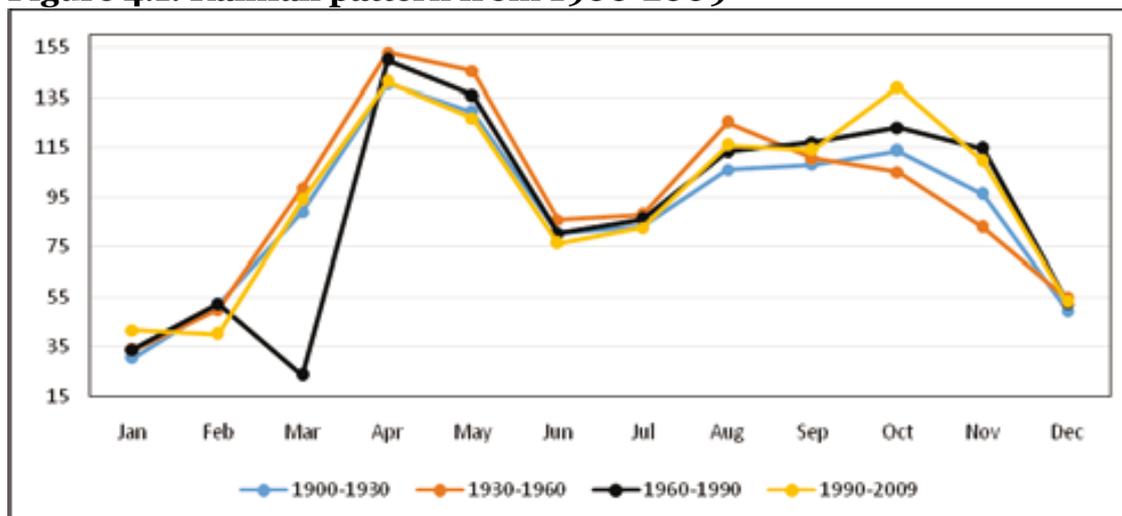
4.1 Status of Climate Change in Uganda

Understanding the consequences of climate change on agricultural production requires knowledge of the climate change situation or status in Uganda. Basically, climate change refers to the long term alteration of weather patterns and is reflected through variations in the mean state of temperature, precipitation and wind. The change occurs over time and may be attributed to natural variability or human-induced activities such as deforestation, urbanization, agriculture and population explosion etc., which increase Green House Gases (GHGs) in the atmosphere.

Rainfall

Uganda is characterized by an equatorial climate and is relatively humid. The topography, prevailing winds, lakes and rivers cause local variations in annual precipitation and temperatures are responsible for the large differences and pattern of annual rainfall. Most of the country (especially the southern region) experiences two rainy seasons, which occur in early April and October. Little rain falls in June and December. As one moves to the north eastern parts, the two seasons merge into one main rain season. Rainfall is the most sensitive climate variable given that it affects the social and economic activities. Data illustrates that there is very little variation in rainfall patterns over the last 100 years as can be observed in figure 4.1.

Figure 4.1: Rainfall pattern from 1900-2009

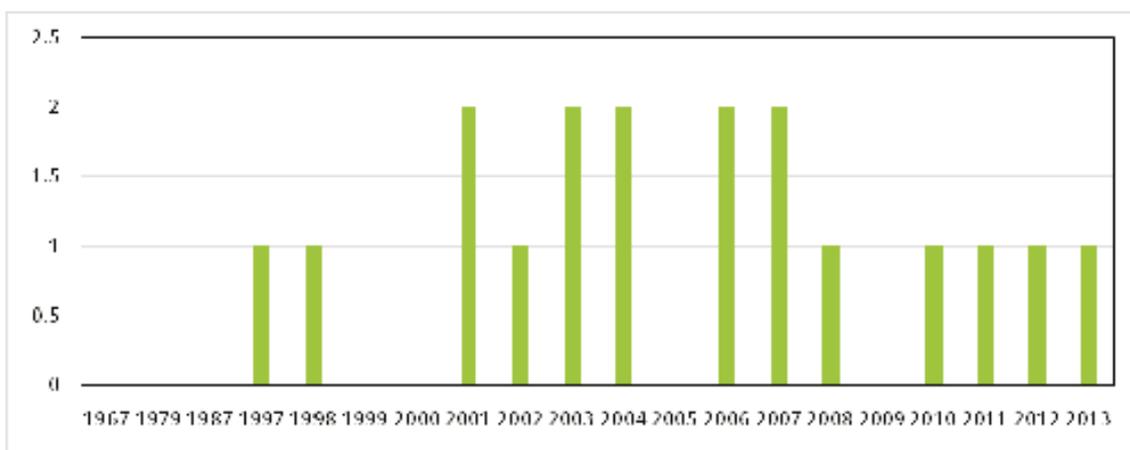


Source: EM-DAT: The OFDA/CRED International Disaster Database, 2015

The average long-term annual rainfall for Uganda registers at about 1,318 mm, and is considered adequate for agricultural activities. Mean annual rainfall is

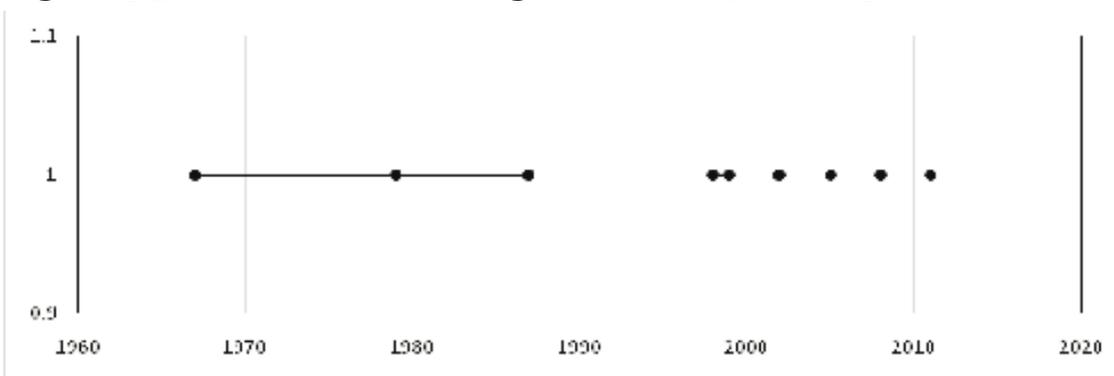
highest in areas near Lake Victoria (often exceeds 2,100 mm), moderate in the mountainous regions of the south-east and south-west (about 1,500 mm) and lowest in the north-east regions (about 500 mm). Recent years have witnessed erratic onset and cessation of rainfall seasons. The western, northern and north-eastern districts are experiencing frequent longer droughts and become more vulnerable to climate change. It has been observed that floods and droughts have become more frequently heavier and more violent than before in some parts of the country see figures 4.2 and 4.3.

Figure 4.2: Frequency of floods: 1967-2013



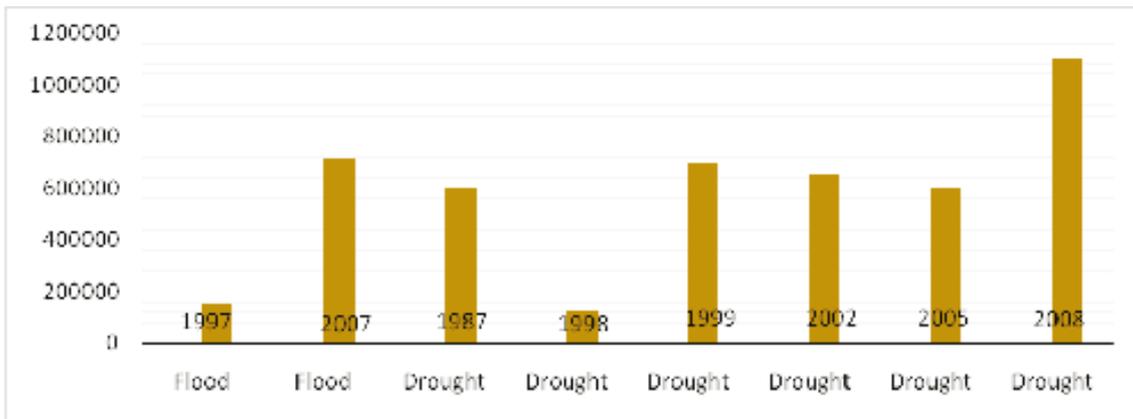
Source: EM-DAT: The OFDA/CRED International Disaster Database, 2015

Figure 4.3: Occurrence of droughts events: 1960-2013



Source: EM-DAT: The OFDA/CRED International Disaster Database, 2015

Figure 4.4: Number of people affected by floods and drought events over time

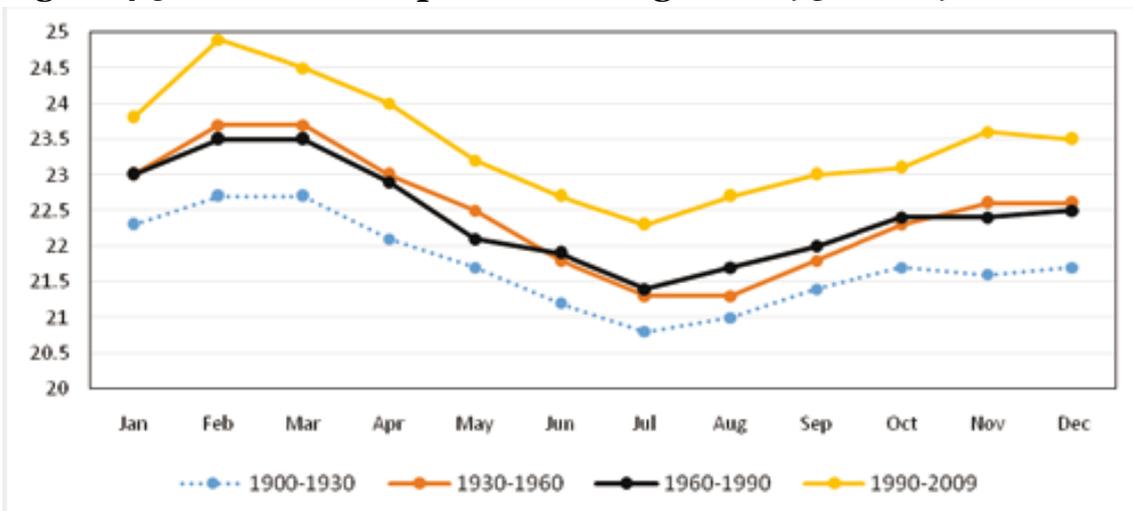


Source: EM-DAT: The OFDA/CRED International Disaster Database, 2015

Temperatures

Temperatures are moderate throughout the year with the mean daily being 28°C. The lowest temperatures of below 0°C are experienced in the mountainous regions of the Ruwenzori and Mt Elgon. Ruwenzori has a permanent ice cap, which is vulnerable to global warming. The highest temperatures of about 30°C and over are in the north and north-eastern part of the country particularly Gulu, Lira and Soroti districts (UBOS, 2009). Scientific evidence shows that Uganda is getting warmer especially in the two decades as demonstrated in figure 4.5.

Figure 4.5: Trends in temperatures in Uganda: 1930 -2009



Source: EM-DAT: The OFDA/CRED International Disaster Database, 2015

South-western regions have been warming up at a rate approximately 0.3°C per decade (IPCC, 2001). Within these regions, the minimum temperature is rising faster than the maximum temperature. The warmer temperatures have been associated with the increased incidence of malaria in the areas which were originally relatively free of the disease (Ministry of Health). The country is likely to get warmer in the future. Analysis by USAID (2013) predicts higher temperatures, but very little change in rainfall levels in the long term. The study concludes that when it comes to agriculture, it will be more critical to focus on how higher temperatures within current rainfall levels and seasonality will affect the sector in the future. The analysis revealed increased likelihood of more frequent intense rainfall events and heat waves whose effects on agriculture also ought to be understood.

4.2 Implication of Climate Change on Agricultural Food Production

Generally, Ugandan agriculture relies heavily on rainfall making it vulnerable to the vagaries of weather and climate change. In fact, many past and current policies underscore the dependency on rainfall as the primary factor undermining the country's agricultural performance ((Poverty Eradication Action Plan (PEAP), 2004); Plan for the Modernization of Agriculture (PMA), 2000; DSIP, 2010; NDP, 2010)). The policies further call for quick response to adaptation to secure increased sustained production. Agriculture in Uganda is constituted by crop, livestock and fisheries production. According to the IPCC (2007) and UNFCCC (2007) reports, climate change can affect agricultural production in several ways. Changes in the biophysical climatic conditions of temperature and precipitation (rainfall) can either promote or discourage production, for instance for crop agriculture, slightly warmer temperatures of 1°C to 3°C are predicted to benefit cereal production in mid to high altitudes. The same changes result in reduced production in the lowlands and semi-arid areas where temperatures are already warm.

The negative impact of warmer temperatures extends to fish production where small rises of 1.5-2.0°C have been predicted to lower productivity on the fisheries in north-west Africa and the East African lakes. Extinctions of particular local fish species have been projected to occur at edges of ranges. Livestock production is also likely to suffer under increased levels of carbon dioxide and global warming. This is because such conditions promote growth of unpalatable and invasive plant species damaging the nutritional value of extensive grazing grasslands. Climate change may favor multiplication of pests and diseases and proliferation of weeds that could hinder agricultural production.

Aside from this, frequently occurring climatic extreme events such as floods and droughts can directly damage crops thus lowering long-term yields. Heavy rainfall can hasten soil erosion resulting in substantial crop loss. On the side of livestock, droughts have been associated with death of animals. Droughts, storms and heavy floods (El-Nino) events have been the most serious events affecting agricultural production in Uganda (MWE, 2007). Reports indicate that these disasters have destroyed crops and livestock, caused landslides, displaced people thus disrupting agricultural activity and resulted in fluctuations in the levels of lake water (PEAP, 2004; Thome, 2010; IRIN, 2011). Further evidence comes from the Uganda Household National Surveys (2005/06) where 42 per cent of households reported their agricultural production being affected by drought or insufficient rainfall and 15 per cent had experienced floods and hailstorms (UBOS, 2006).

A majority of the population (66.6 per cent) is involved in agriculture (UBOS, 2013). A wide range of crops and livestock are grown throughout the country. However, the distribution of farming activity varies depending on the type of prevailing farming system and agro-ecological zone in a particular part of the country. The nature of these systems is shaped by the soil type, topography and climate pattern in that region. The seven main systems and characteristics are provided in chapter two in section 2.1.3 and summarized in Appendix (Table A4). The implication here is that impacts of climate change on production will vary from one region of the country to another.

In order to boost agricultural investment, food sufficiency and economic development, the government has prioritized the production of ten commodities/enterprises. These include: maize, beans, cassava, bananas, coffee, tea, fish, poultry, beef and dairy (DSIP, 2010). Maize, beans, cassava, and bananas are staple and critical to diets of households in Uganda while coffee and tea are cash crops. Climatic impacts on production of these could thus slow economic advancement. None the less, current statistics indicate that production of nearly all these commodities has increased in the last seven years except banana where yields have remained almost stagnant as illustrated in Table 2.2 in chapter two. The higher production has been attributed to expansion of the cultivation area and better technology rather than climate change (UBOS, 2011:2013).

A recent assessment of climate change impacts on agriculture in Uganda (USAID, 2013) offers an indication of how resilient and sensitive production of some of the above crops is and will be to alterations in precipitation and small changes in temperature of 1.5 °C (See table 4.1).

Figure 4.6: Trends in production of coffee and tea

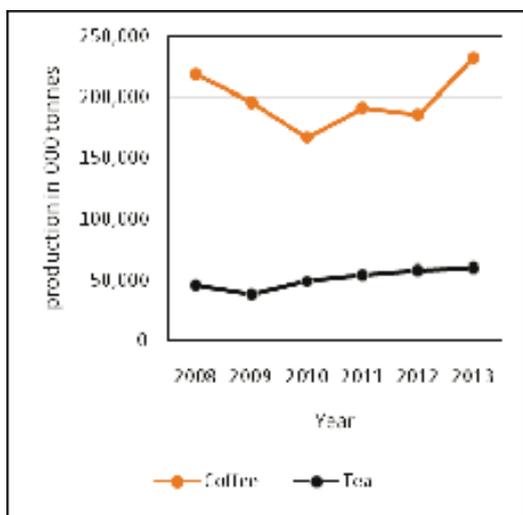


Figure 4.7: Beef and milk production: 2008-2013

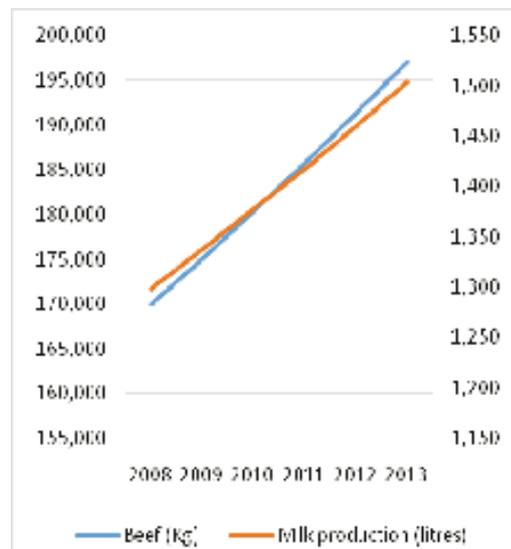
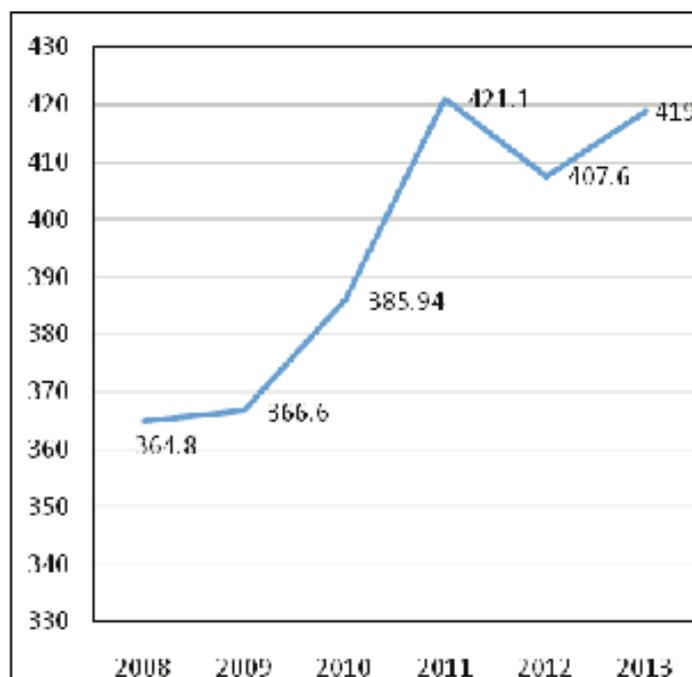


Figure 4.8: Trend in fish catch from 2008-2013



Source: Uganda Bureau of Statistics Abstracts, 2011:2014

Table 4.1: Vulnerability of crop production to climate change

Vulnerability	Coffee	Matooke	Maize	Beans	Cassava
Rising temperature threatens suitability for production	***	**	**	*	
Falling soil fertility reduces yields and makes crop more vulnerable to climatic stresses	***	***	***	**	*
Poor moisture retention capacity of soils increases vulnerability to precipitation variability	***	***	**	**	*
Pests and diseases increasing with rising temperatures	***	***	*	**	-
High temperatures and unseasonable rain promote rapid spoilage and threaten quality	***	***	**	*	*
Shortages of disease-free planting materials, exacerbated by unreliable precipitation	***	***			***
Increasing variability of precipitation and extreme events threatens suitability for production	**	**	***	***	*
Note: *** = most vulnerable, ** =Vulnerable, * =less vulnerable					

Source: USAID, 2013

Maize and beans which are grown in wide range of climatic conditions appear less likely to be affected by the predicted temperature changes of 1.50C. However, their production is highly vulnerable to high inter-annual rainfall variability and precipitation. Maize production will be susceptible to short-term water stress or hail, and beans to fungal and viral diseases in the event of excessive rainfall during critical periods. The problem is made worse by declining soil fertility and structure which fail to retain water, thus making nutrients less available to the plants.

Cassava matures over a long period of time (24 months) and will remain fresh underground up to 18 months after maturity. The crop grows well at temperatures higher than those projected to result from climate change over the next 30 years. Thus productivity is fairly resilient, with little chance of complete failure due to climate variability. However, cassava is highly susceptible to pests and diseases and yields could suffer where climate change promotes the multiplication of such. In addition, the increasing predictability of precipitation and extreme events is a significant threat to production and preservation of planting materials during the dry season.

Both arabica and robusta coffee are produced in the country. However, arabica coffee which grows at high altitudes will be most vulnerable to climate change. The crop is susceptible to rising temperatures inter-annual variability and erratic precipitation. The conditions lower productivity and promote the multiplication of diseases and pests which migrate to higher altitudes. The potential impact of climate change on robusta coffee is more uncertain. The crop can grow in much warmer temperatures than have previously been experienced in Uganda. However, where climate change encourage the increased growth of pest and disease, production is likely to suffer.

In the case of banana in particular *matooke*, increased temperatures will favor production in Uganda compared to West African regions. Such findings assume the existence of technology to move to favorable areas and no effect of pests and diseases. There is very limited knowledge on effects of climate change on tea production. The most recent study suggests that higher temperatures will result in changes in shrinking of geographical production areas by 2050 (CIAT, 2011)

Likewise there is very limited evidence on the effects of climate change on poultry production. Most recent reports associate increased production to prevention of animal diseases and improvement in livestock production systems as a result of routine livestock extension interventions. Projection of future production and climate change are lacking (Kulabako, 2013).

Evidence of the impact of climate change on fisheries is quite substantial although most of it relates to the Lake Victoria which has been most productive. Studies indicate that average lake levels in the future may be reduced by higher evaporation from the lake's surface due to higher temperatures unless increases in rainfall outweigh this effect. Any reductions in water level and the impacts of extreme climate events resulting from climate change may have significant negative effects. Higher temperatures may also have an impact on fisheries productivity and the ecology and species composition in the lake ecosystem. The impacts of climate change will act in conjunction with the impacts of other stresses on the lake and the population. These include over-fishing, poor land management, erosion in the catchment, sedimentation and pollution of lake water (Goulden, 2008; Tate et al., 2004; Hepworth and Goulden, 2008).

The above studies reveal that implication of climate change on agriculture production will differ depending on the type of agriculture being practiced i.e. crop, livestock or fisheries. While warmer temperatures may have negative effects on fisheries, results could be different for livestock production. Certainly effects will be different amongst crops. USAID (2013) report finds that the order of vulnerability amongst crops increases from cassava, beans, banana (*matooke*), maize and coffee respectively. Impacts are likely to be influenced or hastened by other stresses that affect agricultural production.

4.3 Food Security in Uganda

According to FAO (2003), there are four dimensions to food security: availability, accessibility, utilization, and stability. Food security, at the individual, household, national, regional and global level is achieved when all people, at all times have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life.

In terms of food availability, most people in Uganda have food to eat and food varieties to enjoy. The country has great agricultural potential. Overall, about 81 per cent of all households (4.2 million) are involved in agriculture though it is over 90 per cent in the northern and western regions, and 69 per cent are engaged in livestock production with the eastern and northern regions the main livestock farming areas (UBOS and WFP, 2013). Households grow a wide variety of crops with more than 1.5 million growing maize, beans and bananas and more than a million cassava and sweet potatoes. Added to this, many grow millet, sorghum, rice, field peas, cow peas, groundnuts, simsim, soya beans and Irish potatoes. Plantains, cassava, sweet potatoes, maize and beans are considered the major food security commodities consumed regularly in Uganda. Table 4.2 presents the major food security commodities with their relative contribution to average daily intake in Uganda. Plantains, cassava and maize dominate the list of the major food security commodities with over 40 per cent of the calorie intake.

However, in terms of nutrition content, food security is unsatisfactory. Nationally, almost half (48 per cent) of Ugandans are food energy deficient. In other words, their regular diet fails to provide them with the minimum dietary energy requirement to lead an active and healthy life. The proportion is relatively similar across regions and there is no difference between urban and rural Uganda.

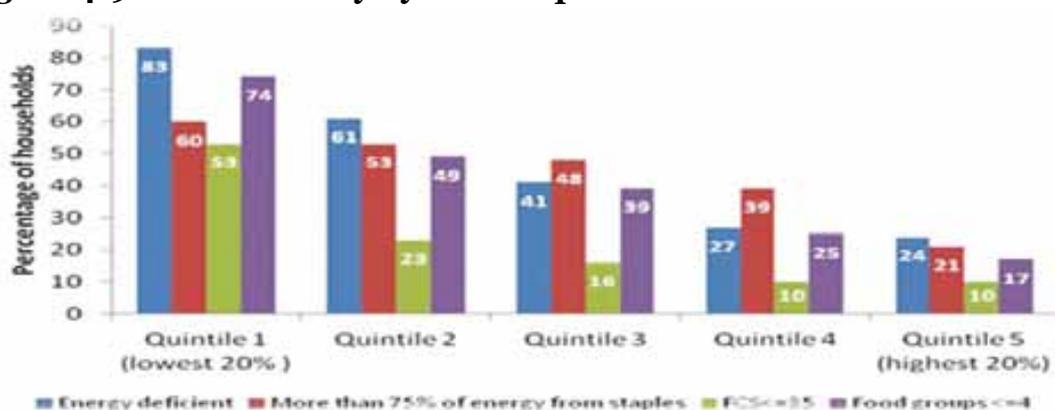
Table 4.2: Major commodities consumed by the household and their relative contribution to calorie intake in Uganda (2007)

Commodity	Average calorie intake (calorie/capita/day)	Percentage contribution to total calorie intake
Plantains	348	17
Cassava	285	14
Maize	205	10
Sweet potatoes	190	9
Millet	122	6
Beans	109	5
Sugar	85	4
Wheat	79	4

Source: FAO, 2013

However, the percentage spikes at 59 per cent in northern Uganda which is the most food insecure region. Some 12 per cent of northern households are surviving on one meal a day compared with 6 per cent at national level (UBOS and WFP, 2013). More than a fifth of rural Ugandans have poor or borderline food consumption. This measurement combines food diversity, food frequency (the number of days each food group is consumed) and the relative nutritional importance of different food groups. Nearly 5 per cent have poor food consumption which represents an extremely unbalanced, likely energy deficient, protein-lacking diet, chiefly composed of starchy maize or *matooke* (plantain) flavored with some vegetables (UBOS and WFP, 2013).

Figure 4:9: Food security by wealth quintile



Source: UBOS and WFP, 2013

Food insecurity is also indicated by poor children's health which shows up in form of stunting, i.e., children are abnormally short in relation to their age. For instance, more than a third of Ugandan children under the age of five years are stunted (UBOS and WFP, 2013). The stunting rate is higher than average in eastern Uganda (36 per cent) and in western (42 per cent). Boys are slightly more likely to be stunted than girls as are rural Ugandan children in comparison with their urban counterparts (37 versus 14 per cent). Protein deficiency and food insecurity is common for poor households. Poor farmers are unable to invest in the inputs required to boost their own yields and have to sell any surplus soon after harvest to earn income and repay debts, exposing themselves to fluctuating market prices as well as not being able to benefit from selling when prices rise. According to UBOS and WFP (2013), some 16 per cent of those in the lowest wealth quintile are surviving on one meal a day. Overall, two in five households restrict themselves to two meals a day.

Poverty also underlies the fact that female headed households are more food insecure in terms of food diversity and deficiency than those headed by men. This inequality stems from the fact that they have only one bread winner and a high dependency ratio. They work far longer hours than men and bear the double burden of ensuring

that their households are fed adequately. Women are less likely to get loans than men (44 versus 39 per cent) and across all regions, women are far less likely to be able to read or write, especially in rural Uganda and the north and east, locking them into a cycle of low paid work, poverty and food insecurity (UBOS and WFP, 2013).

Households cite weather shocks, such as drought and erratic rains, as one of the major causes of food insecurity. In 2009, nearly half (46 per cent) of Ugandan households said they had suffered drought/irregular rains in the last year. In the north the proportion was as high as 74 per cent. UBOS and WFP (2013) reports that nearly all households that experienced drought claimed the shock had led to a decline in food production (94 per cent) and income (81 per cent). Indeed, Asiimwe and Mpuga (2007) report that rainfall shocks have important implications for both income and consumption of households, with strong policy implications towards cushioning agricultural households. They thus suggest that programmes to protect households against rainfall shocks such as irrigation schemes, storage facilities for dry produce, staggered planting and crop diversification can provide helpful avenues to reduce income variability among agricultural households.

To curb the threat of food insecurity, policies that enhance agriculture production and productivity are critical in achieving this goal. Such policies should aid crop intensification such as adoption of fertilizers and improved seeds. The policies should also support irrigation especially in areas that face severe droughts like northern Uganda. Post-harvest handling such as safe and better storage facilities should be ensured. This will reduce wastage and prevent loss to farmers. The price of most farm produce is very low during harvest and very high during other seasons and this is mainly because of poor storage facilities. There is therefore a need to smoothen consumption throughout all seasons by storing during the boom (following harvest season) so as to maintain enough and stable food supplies.

4.4 Climate Change, Trade and Food Security Linkages

Dynamics between climate change, food security and trade are well documented and are standard to what would occur in any part of the world including Uganda (Elbehri et al., 2011). Precisely, food security is contingent on food availability, food access and food utilization. Climate change can directly or indirectly impact on these three pillars of food security. On the other hand, agricultural trade depends heavily on the supply of agricultural produce. This supply is an outcome of the domestic production, import and export food prices all of which are vulnerable to climate changes (Ludi et al., 2007). Moreover, food security is highly dependent on trade which mitigates food insecurity disasters caused by climate change by encouraging access to food resources.

The previous section revealed how climate change could affect agriculture production. Where production falls, there is reduced availability of food and agricultural supplies increasing the threat of food insecurity and reduction in trade particularly the exports. Among the ten prioritized commodities, there are those that are being promoted for food security reasons, export purposes or both as illustrated in table 4.3.

Table 4.3: Priority crops for national development

Crops	Food security	Export/trade
Maize	†	†
Beans	†	†
Cassava	†	
Bananas	†	
Coffee		†
Tea		†
Fish		†
Beef	†	†
Cattle	†	†
Poultry	†	†

Source: DSIP, 2010

As the previous analysis has shown, production of most of the food security crops suffers less susceptible effects of climate change. However, certain vulnerabilities relating to trade and food security have been indicated by USAID (2013) (see table 4.3). Nonetheless, the country is considered self-sufficient in the production of staples except cereals whose volumes have to be supplemented by imports (FAO, 2010). Thus food availability in staples is generally not a problem in the country. However, seasonal availability of food is a challenge especially in the north eastern parts which have one production season a year (WFP, 2013; Kaggwa, Hogan and Hall, 2009). Occurrences of droughts and flooding are common and have further contributed to the seasonal limitation of food supplies. There is surmounting evidence that nutritional inadequacy is on the increase in these parts, particularly in Karamoja region (WFP, 2008). Many a times, trade has become important in maintaining adequate food supplies in these areas and will become more critical as the country experiences climate change in the future.

Table 4.4: Vulnerability of agricultural trade and food security to climate change

Vulnerability	Coffee	Matooke	Maize	Beans	Cassava
International prices increasingly volatile as a result of climate change impacts on supply	**	0	**	0	0
High temperatures and unseasonable rain promote rapid spoilage and threaten quality	***	***	**	*	*
Rising international concern over carbon footprint may threaten demand for exports	***	**	0	0	0
Crop is perishable. Extreme precipitation and flooding make transport more costly and difficult	**	**	*	*	**

*Note: *** = most vulnerable, ** = vulnerable, * = less vulnerable*

Source: USAID, 2013

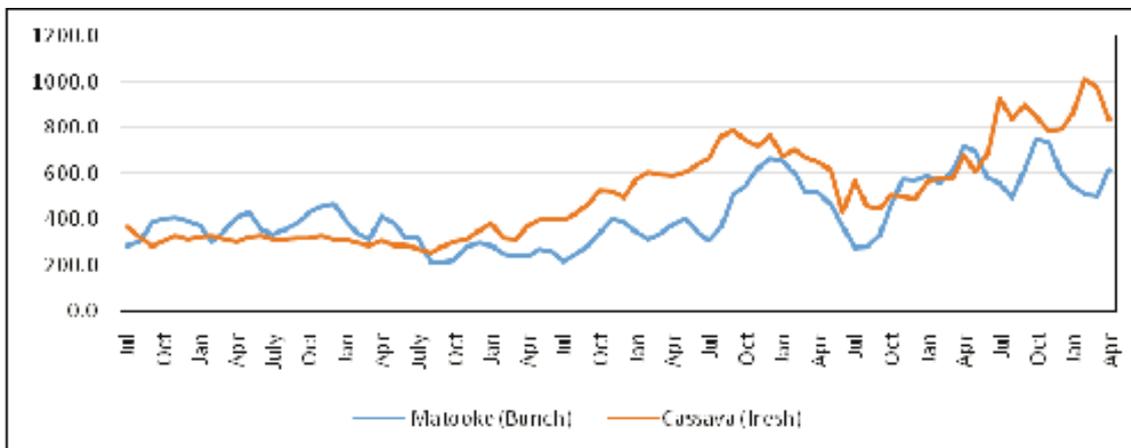
These effects are compounded by weather related destruction of trading infrastructure which facilitates access to food and agricultural resources and maintains equilibrium of food availability during the periods of climatic stresses (IPCC, 2007). In Uganda, climatic disasters in particular EL-Nino characterized by heavy rainfall and flooding have been observed to disrupt and destroy roads, ports and markets (PEAP, 2004; Thome, 2010; IRIN, 2011).

Climate change affects the quality of agricultural produce, human and animal health which in turn limits food utilization. Evidence of increasing malaria incidences due to climate change signify under food utilization. The fact that climatic impacts will reduce food production and hinder food access, incidences of hunger will increase. Increased hunger results into increased susceptibility to disease. In situations where climatic disasters will continue to disrupt production and income as has been the case in the north eastern parts, underutilization of food is likely to increase (WFP, 2013; Nuwagaba and Namateefu, 2013).

As can be explained from the laws of supply and demand, changes in agricultural production also have implications on prices. Reduced agricultural production and supply will lead to higher prices and vice-versa. Recent climatic models have shown increased production from areas that will benefit from the climate change. They will be smaller compared to those areas that will lose. The result is increased agricultural prices under climate change (Boko et al., 2007; Kurukulasuriya et al., 2006).

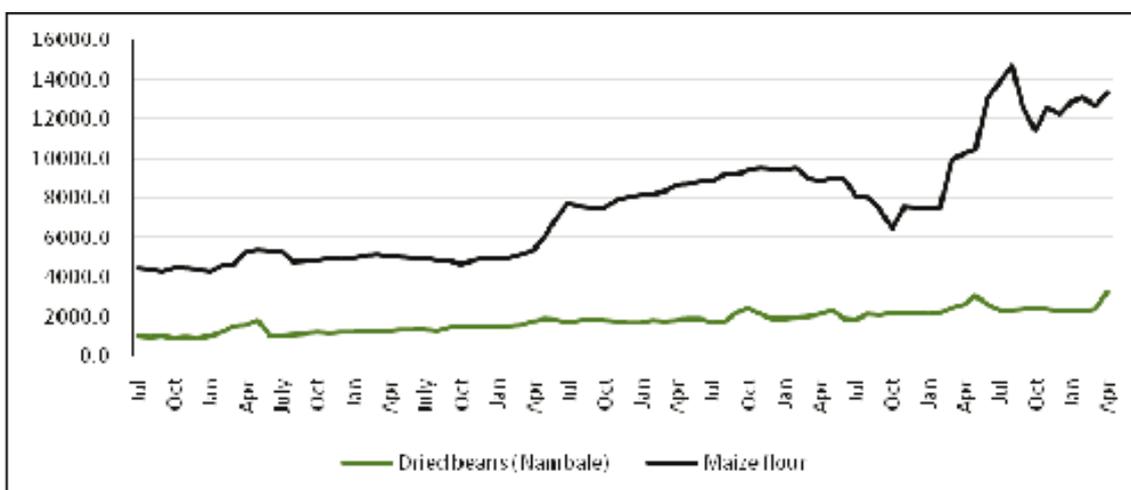
Statistics indicate increases in prices of staples (as observed in figures 4.10 and 4.11) in the country in the recent years (2006-2012).

Figure 4.10: Monthly prices of matooke and cassava in shillings from July 2005-March 2012



Source: UBOS, 2013

Figure 4.11: Monthly prices of maize and beans in shillings from July 2005-March 2012



Source: UBOS, 2013

Studies have attributed the increase in prices to the seasonal production and occurrences of climatic events such as heat waves and dry spells which have subsequently lowered production. The extreme events have also cut off supplies markets leading to sharp rises in prices. Markets are the main source of food calories for about 50 per cent of Ugandan households, thus increases in food prices will increase their vulnerability to food insecurity. Districts where food production is limited are more prone to sharp rises in prices compared to higher production areas. However, high food prices have also been associated with other

factors including rising food and fuel prices in international markets and varying exchange rates. The impact of fuel prices is linked to trade given that fuel is needed to produce and transport various food items (Simler, 2009; UBOS, 2013b; WFP, 2013).

Higher food prices also mean higher income for those involved in export agriculture. For a country striving out of poverty, this could offer greater benefit to raising household capacities to food access. However, this is not as guaranteed as evidence indicates that in Africa where farming is practiced in dry lands or semi-arid areas, crop revenues are expected to fall with a 1 °C rise in temperature (Boko et al., 2007; Kurukulasuriya et al., 2006). More so, caution ought to be exercised in trade of foods such as maize/cereals in general where the country still relies on imports to meet nutritional adequacy. In such cases, food stability may be subject to the variability of world prices. A more open trade regime could further expose domestic food markets to the vagaries of international market and exacerbate the food insecurity problem.

Attaining food security is already a challenge to Uganda. From the above discussions, it is quite clear that climate change poses even greater risk to food security. Trade may offer a means of mitigating the various shocks caused by climate change. Measures adopted must aim towards achieving price stability, food sufficiency and income supports. Implementation of such trade strategies must proceed with care to worsening of food insecurity problem.

5 Conclusion and Policy Recommendations

5.1 Conclusion

Although agriculture is the backbone of the Uganda's economy and will remain as such for the foreseeable future, the sector has experienced slow growth in the last decade and its contribution to GDP has considerably reduced. It can be argued that reduction in the contribution to GDP is not necessarily a challenge, as the economy is structurally transforming, albeit, Uganda has fallen short of the sector growth rate of 6 per cent per annum targeted by the African Union in Maputo, Mozambique, in 2003 under CAADP. The challenges the sector is facing negatively impact productivity: land scarcity that has resulted into land fragmentation, less adoption of better farming technologies such as high yielding seed varieties, limited fertilizers application and inadequate irrigation, pests and diseases and weather shocks such as prolonged dry spells and floods.

Uganda's agricultural output is heavily reliant on natural climatic conditions and this is not sustainable given the effects of climate change. Since agriculture in Uganda is rain fed, this makes it susceptible to weather shocks such as prolonged droughts that lead to crop losses and hence threatening food security. Farmers are still using poor and rudimentary production technologies which are characterized by low output and productivity. The fact that Uganda's use of fertilizers, Kg/ha/year, is one of the lowest in East Africa clearly demonstrates that productivity is low and therefore food security issues remain elusive. There is existence of poor market access by most farmers especially those in remote areas due to poor infrastructure. This is compounded by information asymmetry which acts as a disincentive to farmers who opt not to invest heavily in agriculture because they are not certain of the markets.

Land tenure insecurity in many parts of Uganda discourages investment in land such as the use of more efficient and productive technologies and also increases incidences of land conflicts and land grabbing. Where land is communally owned, land markets are not functioning which affects efficient use of resources since unproductive farmers cannot rent out or sell their land to the productive farmers. Given the poor post-harvest handling methods and lack/poor storage and cooling facilities, there is wastage and loss to farmers, a major disincentive for investment in the sector and a source of food insecurity.

These factors partly result into food insecurity which is exacerbated by post-harvest loss, poor infrastructure to move food from points of surplus to points of deficits which is manifested in form of violent price fluctuations and high special

price differentials. Available evidence shows that there is still a significant level of food insecurity in Uganda especially in form of less than the recommended caloric intake of 2,300 calories per person per day and malnutrition among children and mothers. This insecurity appears to have two key dimensions – inadequacy of food income and poor nutritional practices. The inadequacy dimension has to be addressed as part of the strategy of boosting agricultural trade.

It is noted that in spite of the challenges, Uganda over time has ably formulated policies in response. Uganda has the 2040 vision of transforming Ugandan society from a peasant to a modern and prosperous country within 30 years. In 2010, Uganda formulated a 5-year NDP as a medium-term planning framework which addresses structural bottlenecks in the economy in order to accelerate socio-economic transformation for prosperity. It is noted that the agricultural sector is identified in the plan as one of the primary growth sectors deserving a lot of emphasis. Uganda's overriding aim for the agricultural sector is to modernize the sector by strengthening productivity, export competitiveness and food security. A number of policy initiatives have been instituted towards realizing this effect including the PMA, NAADS, and the agriculture sector DSIP. To unlock the Uganda's agricultural trade potential, the overall effect of the policy measures must be able to increase productivity and enhance control over production conditions. However, implementation of the provisions of the policy documents has been the major challenge. For example for all the years that the PMA framework was in operation, only the first two areas out of the seven were implemented through the NARO and NAADS secretariat. Attempts to increase farmers' access to financial services have not been successful. The Marketing and Agro-processing Strategy (MAPS) was drafted and not implemented. This is a clear demonstration that although challenges are identified and policies/strategies and programs are formulated to address them, the missing link is implementation. Therefore, although it is necessary to develop relevant interventions, this is not sufficient unless implementation takes place to realize tangible outputs and outcomes, which seems not to be the case. However, it is evident that the government has not put in place policies to specifically address climate, which is a major gap.

Currently, Uganda imports agricultural products whose value is less than exports implying a positive agricultural trade balance. Furthermore, the country has the potential to produce locally agricultural products that are currently imported if the production supply constraints are addressed. However, this potential for trade in agricultural commodities has to be achieved through harnessing agricultural productivity.

A vibrant domestic trade regime can alleviate artificial spatial commodity shortages in the country by enhancing accessibility to commodities produced in

other parts of the country. This should contribute to the goal of realizing food and nutrition security in the country. However, constraints arising from infrastructure, information asymmetry, poor legal framework, and others in domestic trading continue to hamper accessibility to food in different parts of the country. Poor infrastructure especially roads, railways, waterways, storage and cooling facilities add to the instability of supplies and the general cost of doing business for farmers involved in export trade. It is necessary to address these challenges as part of a drive to expand agricultural commodity exports. Low standards development and certification of products in Uganda make the country's products uncompetitive due to lack of recognition and dubious quality assurance.

It is however important to note that while trade can alleviate food insecurity by enhancing accessibility to food, it may also inadvertently compound food insecurity especially where production has not kept pace with rapid growth in trade. Uganda experienced the latter phenomenon during the rapid increase in exports of fish to Europe and more recently due to rapid increase in the export of food materials to South Sudan. Growth in trade with these two regions led to shortages and price rises of the affected commodities. This is an example of trade induced food insecurity or nutrition insecurity in Uganda. Uganda's existing policy framework does not emphatically address insecurity induced by increased export of food agricultural commodities. It is also noted that although an efficient trade system will alleviate food insecurity challenges since food will be moved from areas of surpluses to deficit, it as well has the potential to increase food insecurity when households sell all produce and remain with less or nothing to depend on.

Uganda's trade policies target transformation of the country into a dynamic and competitive economy, with the trade sector stimulating the productive sectors. In essence, the trade policies aim at developing and nurturing the private sector to foster its ability to trade at both domestic and international levels. The policies aim at enhancing the competitiveness of Uganda's products and services; strengthening trade institutions; trade facilitation; improving market access; providing trade/market information to the business community; developing capacity for both domestic and foreign trade; and ensuring that the gains from growth in trade are equitably shared. Specifically, whereas the domestic policy actions target strengthening of selected commercial and/or trade laws, setting up a market information system to facilitate the collection and dissemination of trade information, launching public-private sector partnership program, among other things, the external trade policy actions focus on ensuring effective integration of the economy into the regional economy and the multilateral trading system, enhancing national capacity to take advantage of the above, while minimizing the negative effects of globalization.

Increasing agricultural production is crucial to securing food security and more foreign exchange through trade. However, Uganda's climate is already changing and bound to compromise such advances. The rising temperature and climate extreme events present challenges for managing of agricultural production and trade activities for further economic development. Risks from climate change come at a time when the country is facing degradation making it imperative to take on sustainable adaptation. Attaining food security is already a challenge to Uganda and it is quite clear that climate change poses even greater risk to food security. Trade may offer a means of mitigating the various shocks caused by climate change. Measures adopted must aim towards achieving price stability, food sufficiency and income supports. Implementation of such trade strategies must proceed with care to worsening of food insecurity problem.

5.2 Policy Recommendations

- (i) There is need to formulate specific interventions to address climate change and weather shocks. These may include investments in irrigation and better water management practices, attracting and enabling the private sector to invest in crop insurance so as to shield farmers against weather shock effects and formulating laws and regulations that prevent deforestation in addition to encouraging farmers to plant trees. Furthermore, there is need to promote water saving technologies such as irrigation so as to ensure steady food supply throughout the year, use of fertilizers, land consolidation and land use intensification to curb the threat of food insecurity;
- (ii) Infrastructure (road, rail and other transport) development is critical to improve access to markets by farmers. Post harvesting technologies (such as safe and better storage facilities) should be passed to farmers. Investment in infrastructure that store and preserve produce should be made a priority. These can be enhanced by adequate provision of market information as an incentive to investment in agriculture infrastructure. These measures will address output instability and production efficiency as means for enhancing competitiveness in agricultural trade and food security in the country;
- (iii) The complex land tenure system in the country needs to be revisited with the intention to improve the functioning of land markets to ensure investments in the land;
- (iv) To promote exports of agricultural products, Uganda should: pursue value addition to increase returns to act as an incentive for investment; develop standards and certify products to make the country's products competitive; and strengthen commercial laws and trade laws domestically; and ensure

that the economy is effectively integrated into the regional economy and the multilateral trading system; and

- v. Uganda should formulate climate change policies and put in place a framework to address and mitigate the adverse impacts that come with this phenomenon. The framework should be integrated and inclusive to take care of existing policies that affect climate change, trade, agricultural production and food security.

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Appendices

Appendix Table A1: Uganda's traditional exports (US\$ '000)

	2006	2007	2008	2009	2010	2011	2012	2013
Coffee	189,830	265,852.90	403,179	280,209	283,889	466,659.50	372,165.90	424,891.30
Cotton	20,474	19,571.24	13,214	23,186	19,919	86,009.69	74,898.24	31,686.38
Tea	50,873	47,628.93	47,222	59,761	68,263	72,126.28	73,902.31	85,589.31
Tobacco	26,964	66,300.81	66,448	57,170	68,663		69,746.26	120,200.90

Source: MAAIF and UBOS Statistical Abstracts

Appendix Table A2: Uganda's non-traditional exports (US\$ '000)

	2007	2008	2009	2010	2011	2012	2013
Live animals	1551.421	1822	3908	3986	1653.583	1748.00	2797.14
Fish and fish products	124710.7	124436	103372	127651	136783.1	128321.50	128134.00
Flowers	22782.46	28790	26275	22477	21457.35	26801.70	28725.25
Beans/Other legumes	10098.71	17630	14720	10199	20423.91	14237.24	20577.41
Bananas	429.6367	211	118	128	294.2883	466.06	239.24
Fruits	1975.694	5332	932	722	1442.982	1189.61	1501.54
Pepper	256.3813	580	617	497	1218.115	2052.69	1743.95
Maize	23816.18	18250	29066	38207	26752.42	56916.32	41948.51
Ground-nuts	148.4961	28	69	89	188.4686	2496.42	1749.65
Sesame seeds	5447.215	15884	13369	12882	17318.14	11713.58	28468.26
Cocoa beans	15936.05	22834	27829	35122	44546.07	38433.73	54832.82
Hides and skins	18113.67	12518	5996	17061	33066.99	41631.80	64352.04
Vanilla	6261.795	3039	4908	4352	2956.802	2362.49	2731.316
Soya beans	1330.769	1536	1076	294	874.7932	1230.23	886.79
Sorghum	22.50888	4034	1839	1405	346.0285	3793.31	25564.53
Animal/Veg fats and oils	62849.9	46121	49519	55182	101110.8	110426.50	100050.40
Sugar and sugar Confectionary	33451.23	39611	45224	60169	81954.12	122672.00	85304.33
Rice				16457	18442.24	38885.80	36958.25
Vegetables				4292	3483.94	8305.76	11730.36

Source: MAAIF and UBOS Statistical Abstracts

Appendix Table A3: Uganda's imports (US\$ '000)

Description	2007	2008	2009	2010	2011
Live animals other than animals of division 03	862	1,244	1,304	2,663	2,254
Meat and other preparations	933	1,242	1,277	1,719	3,241
Dairy products and bird's eggs	5,589	5,727	3,978	4,426	5,578
Fish, crustaceans and mollusks and preparations thereof	698	839	759	1,486	2,768
Cereal and cereal preparations	158,779	173,226	203,044	187,126	231,112
Vegetable and fruit	20,303	19,705	15,205	13,809	16,685
Sugar, sugar preparations and honey	71,349	71,457	75,216	90,556	136,345
Coffee, tea, cocoa, spices, and manufactures thereof	5,032	6,801	6,335	7,755	8,352
Feeding stuff for animals(not including unmilled cereals)	1,172	758	949	1,082	1,833
Miscellaneous edible products and preparations	12,885	22,558	21,220	22,960	40,308
Beverages	19,294	40,012	43,875	35,888	37,367
Tobacco and tobacco manufactures	9,283	10,669	11,895	11,952	14,018
Hides, skins, and fur skins, raw	69	9	4	33	769
Oil-seeds and oleaginous fruits	5,085	5,377	3,850	1,955	1,378
Crude fertilizers and minerals(excl coal, petrol, precious stone)	17,974	26,866	24,519	27,927	28,375
Crude animal and vegetables materials	4,489	4,578	4,430	5,320	6,201
Animal oils and fats	28	74	162	199	203
Fixed vegetable fats and oils, crude, refined or fractionated	103,325	195,529	126,277	179,921	228,959
Animal or vegetable fats and oils, processed	21,771	31,846	13,132	15,321	27,699
Organic chemicals	31,927	48,271	50,393	49,260	66,061
Inorganic chemicals	18,545	31,894	28,616	26,649	30,036
Fertilizers, manufactured (other than those of group 272)	12,140	36,930	40,877	20,596	24,464

Source: MAAIF and UBOS Statistical Abstracts

Appendix Table A4: Farming systems in Uganda

System	Main farming activity	Geo ecological characteristics
Teso (Eastern Uganda)	Mixed farming (livestock and crops). Millet, Sorghum, Maize, oil seeds and cotton	Short savannah grassland deal for grazing; bimodal rainfall with very long dry season, sandy- loam soils of medium to low fertility
High rainfall banana-coffee (Lake Victoria and Western Uganda)	Bananas, Robusta coffee, mixed food crops, some livestock	Evenly distributed rainfall (1 000 - 1 500 mm); soils of medium to high productivity, vegetation is forest-savanna mosaic
Banana/finger millet/cotton (Western and Eastern Uganda)	Cotton, beans and maize, millet livestock	Less rainfall than for the banana-coffee system, The vegetation is moist savanna with moderate biomass production.
Northern	Cotton, tobacco, finger millet and cassava	Has short grassland which promote pastoral activities, low annual rainfall of about 800 mm or lower, severe dry seasons, drought resistant crops are cultivated
West Nile	Tobacco, cotton, coffee, sorghum and cassava	Similar rainfall pattern to the northern system; rainfall levels increase at higher altitudes
Montane (mountainous areas of West and East)	Arabica coffee, bananas, maize, temperate crops	High and effective rainfall and cloud cover. High population intensities and intensive agriculture are the norm because of small holdings of about 1.5 hectares.
Pastoral (Northeast and Southern Uganda)	Pastoral livestock combined with sorghum and millet	Annual rainfall is low (under 1 000 mm). The system is characterized by short grassland suitable for grazing

Source: Mwebaze, 1999

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