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Local and regional variations in conditions for agriculture and food security in Uganda

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Agriculture for Food Security 2030
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Today more than 800 million people around the world suffer from chronic hunger and about 2 billion from under-nutrition.

This failure by humanity is challenged in UN Sustainable Development Goal (SDG) 2: “End hunger, achieve food security and improve nutrition and promote sustainable agriculture”.

The AgriFoSe program directly targets SDG 2 in low-income countries by translating state-of-the-art science into clear, relevant insights that can be used to inform better practices and policies for smallholders.

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Summary

Uganda's agricultural environment is characterized by smallholder farmers. Majority of these are found in rural areas and food insecure. This study specifically explored to understand and put across the determinants of local and regional distribution of key crops grown and livestock reared; constraints and opportunities along the agricultural value chain; and institutional and stakeholder involvement in setting policy agenda. This information was born through review of published and grey literature. The findings of this comprehensive review broadly reveal that the major key crops grown in Uganda today are: coffee, bananas, maize, beans, cassava and rice; while in terms of animals and birds: cattle, goats, pigs and local chicken are the most kept by farmers respectively for food security. In terms of local and regional variations, coffee and banana are highly productive in the eastern and western highlands while the remaining crops flourish in the flat plains and valleys (wetlands). The dryland belt 'cattle corridor' that stretches from north-eastern to south-west Uganda has the highest numbers of livestock reared. Considering both the livestock and crop value chains, constraints which are also the determinants of opportunities, can be categorized along four dimensions, namely: a) production and productivity constraints, b) market access and value addition constraints; c) enabling environment constraints and d) Institutional Framework constraints. Since 2000, informed by the Poverty Eradication Action Plan the agriculture policy frameworks have been formulated against the backdrop of the Plan for Modernisation of Agriculture (PMA) as a multi-sectoral policy framework for agriculture, food security and rural development. Before the formulation of PMA, agricultural interventions were scattered and there was no comprehensive policy framework to guide the sector. Currently, the PMA – thus subsequent policies, programs and plans, have not yet recognised a holistic approach in modernizing agriculture, as well as the interconnection among the various sectoral stakeholders. However, harmonisation and implementation of these policies and associated programmes and plans should provide leverage for enhanced productivity and reduced food insecurity. This study provides synergies between agriculture and food security to guide future policy formulations, enactment of pending bills and allocation of funds. Potential areas of investment in smallholder agriculture are presented and how to transform the sub sector into a profitable venture.

Key words: agriculture, food security, crops, livestock, value chain, institutions, policies

Grazing of cattle and rice farmland in Pallisa District, Eastern Uganda. Photo: Barasa Bernard

List of abbreviations

AfDB	African Development Bank
ASSP	Agriculture Sector Strategic Plan
AU	African Union
CAADP	Comprehensive Africa Agriculture Development Program
CFSVA	Comprehensive Food Security & Vulnerability Analysis
COMESA	Common Market for Eastern and Southern Africa
EAC	East African Community
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
ICT	Information and Communications Technology
IPC	Integrated Food Security Phase Classification
IUCN	International Union for Conservation of Nature
MAAIF	Minister of Agriculture, Animal Industry & Fisheries
MOFPED	Ministry of Finance, Planning and Economic Development
NAADS	National Agriculture Advisory Services
NAEP	National Agricultural Extension Policy
NARO	National Agriculture Research Organization
NDPII	Second National Development Plan
NEMA	National Environmental Management Authority
NUCAFE	National Union for Coffee Agribusiness Enterprises
OPM	Office of the Prime Minister
OWC	Operation Wealth Creation
PMA	Plan for Modernization Agriculture
QDS	Quality declared seeds
SDG	Sustainable Development Goals
UBOS	Uganda Bureau of Statistics
UNRDS	Uganda National Rice Development strategy
WRS	Warehouse Receipting Systems

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1. Introduction

1.1 Overview of Uganda

Uganda is a landlocked East African country, occupying a total land area of about 241,500 sq.km of which 17% is made up of lakes and wetlands. The country is demarcated into three administrative regions and these are: northern, eastern, western and central regions (figure 1). Presently the country has a total of 116 districts. The country is endowed with highly productive soils and a conducive climate that gives it a strategic role and competitive advantage as a food basket for its own people and the region (Wichern *et al.,* 2017). Uganda lies within a relatively humid equatorial climate zone, but the topography, prevailing winds and water bodies cause large differences in rainfall patterns across the country (Babel & Turyatunga, 2015). Average annual rainfall ranges from 800 to 1500mm, generally falling in two seasons experienced in the south, eastern, central and northern (March to May and September to November), and one season is for a long period showed up in the northeastern region - April to October (Onyutha, 2016).

The temperature, on the other hand, varies mainly with altitude and changes little from season to season. Changes in sea surface temperatures in the distant tropical Pacific and Indian Oceans, to a lesser extent, Atlantic Oceans strongly influence annual rainfall amounts and timing in Uganda (Bernard *et al.,* 2013). Year to year variations in annual rainfall can be considerable, and the onset of seasons can shift by 15 to 30 days (earlier or later). In some locations, the length of the rainy season can also change by 20 to 40 days from year to year, on the order of 0.5ºC (Magrath, 2008).

The soils in Uganda are very old and deeply weathered; they have inadequate supply of the major plant nutrients, very low nutrient holding capacity and deficiencies or toxicities of trace elements (Andersson, 2015; Muzira *et al.* 2018). In addition, the nutrients are prone to leaching since rainfall is high in many areas (Komakech *et al.,* 2015). Uganda's soils are majorly classified as vertisols, podosolic soils, eutrophic soils, ferruginous, ferrisols, ferrallitic, hydromorphic, halomorphic and organic non-hydromorphic (Bekunda *et al.,* 1997). Therefore, for soils to remain productive in Uganda, they must be properly managed to maintain organic matter at reasonable levels and to keep good soil physical properties (Mugonola *et al.,* 2015).

However, the country's arable land has decreased from 2005 and 2010 to about 99,700 to 91,150sq.km respectively (UBOS, 2016). High population pressure is majorly responsible for this decrease (Boserup, 2017; Diem *et al.,* 2017). For example, by mid-2016, the country's human population was projected at nearly 36.6 million Ugandans of whom 85% of the population are residents in rural areas (UBOS, 2016), which figure makes, Uganda to have one of the fastest rates of population growth in the world estimated at about 3.3 % per annum (Kirunda *et al.,* 2015; Mwesigye *et al.,* 2017).

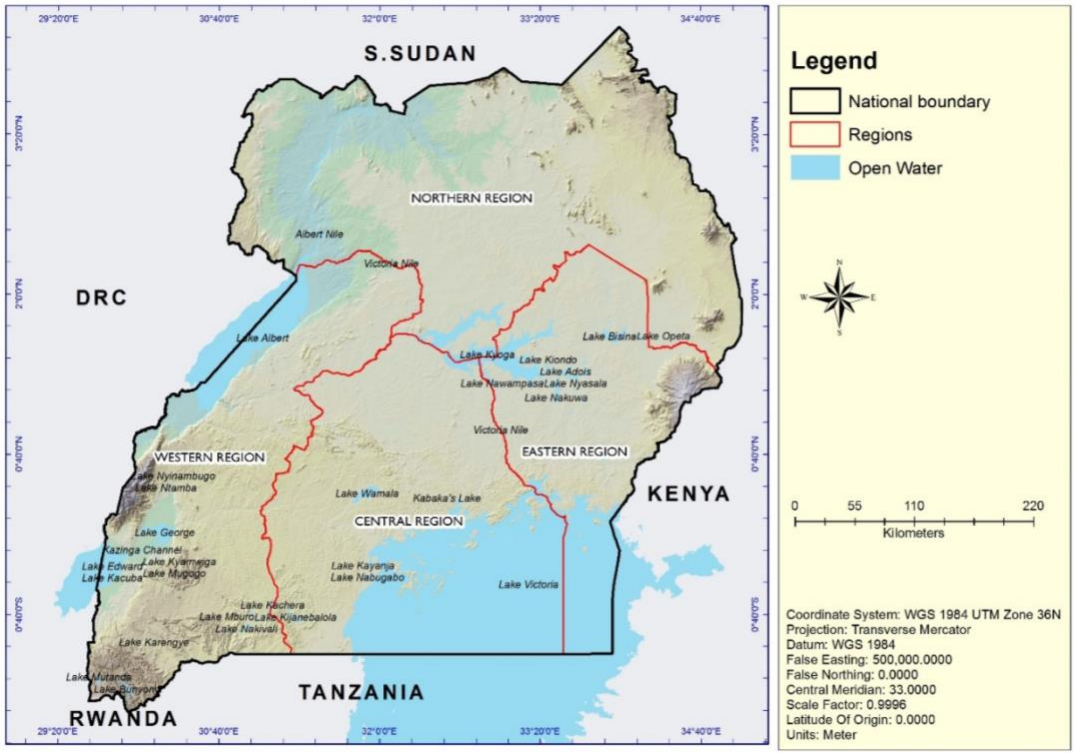

Figure 1: Administrative regions of Uganda (source author)

1.2 Agricultural sector

Uganda's agricultural sector is made up of three subsectors: crop, animal and fisheries. However, this study only considered crop and animal sub-sectors given their importance and hierarchy on Uganda's food security tree. The overall development objective of the sector is to achieve food and nutrition security and to improve household incomes and livelihoods (MAAIF, 2016a). The mission of the Agricultural Sector Strategic Plan 2015/16-2019/20 drafted by MAAIF is to *"Transform subsistence farming to commercial agriculture"*, with a target of increasing agricultural exports from the current USD 1.3 billion to USD 4 billion by 2020. Uganda's agricultural sector is based primarily on smallholder farms, 80% of whom own an average of only 2 hectares of land but contribute 70% of agricultural production (Haas, 2017). Over half of all agricultural production in the country is consumed domestically (Rachkara *et al.,* 2017). This structure has a number of implications for food security both at household and national levels (Shively & Hao, 2012).

Owing to the complex input-output relations, the agricultural sector has very strong intra-sectoral linkages with other sectors like infrastructure, education, security, energy among others (Economic outlook, 2016). Keeping other production factors optimal, the quality and thus marketability of agriculture outputs, and yields are highly dependent on the quality of inputs (fertilizers, seeds, pesticides/insecticides, among others (Dione *et al.,* 2017). Notably, the crop sub-sector supplies the animal husbandry and fisheries sub-sectors with feeds, and the trio feeds into the agro-processing industrial sub-sector with inputs. This calls for an integrated value chain approach in planning for the sector and a strong public sector that can effectively regulate and control all processes and systems delivering inputs and outputs across the entire agriculture sector.

The performance of the agricultural sector has been on a steady decline from 7.9% growth in 2000/01 to 2.9% in 2015/16 (Economic Policy Research Centre, 2009; UBOS, 2016). Malnutrition is one of the parameters that significantly reduce agricultural productivity (Uganda Nutrition Action Plan 2011-2016). This presents a serious challenge regarding poverty eradication as 10% of Uganda's population are chronically poor and depend directly on subsistence agriculture for their primary livelihood (UBOS, 2017). However, the number of people who are food insecure has been slightly reduced from 12 to 10.9 million in 1992 and 2017 respectively due to improvements in the agricultural sector, rapid urbanization and education levels (OPM, 2017). Apparently, 27% of Ugandans are income poor corresponding to nearly 10 million persons (UBOS, 2016/17). Besides, agricultural exports have also significantly

increased in scope and scale (80% of total exports), particularly when informal cross-border trade is taken into account (DSIP, 2010; UBOS, 2017).

Nevertheless, with a mixed picture at the macro level, the agricultural sector faces a large number of output-level challenges (ASSP, 2016). The most important among these are:

At institutional level

1. Weak extension support with respect to:
    a. Soil fertility management to address the fall out effects of mechanized production
    b. Relevant agronomic knowledge of mechanized agriculture
2. Low level of back-up and support services for machinery
3. Mechanization focuses on production (land opening) without addressing the complete value chain to markets is a disincentive to mechanized farming
4. Multiple policy frameworks and an associated uncertain environment for investors.
5. Uncoordinated efforts among public sector implementing agencies.
6. Poor quality of public investment in agriculture.
7. Inadequate institutional coordination and linkages.
8. Capacity constraints in MAAIF (the Ministry of Agriculture, Animal Industry & Fisheries) to effectively address these issues.
9. Poor market integration.
10. Low levels of productivity across most enterprises.
11. Uncertain land rights leading to underinvestment in agricultural land.
12. The struggle to comply with increasingly demanding international quality standards for traded food and agricultural products.
13. Inadequate infrastructure for value addition processes including marketing, storage and distribution.

At farmer level

1. Limited access to efficient and economically viable machinery and equipment
2. Limited access to financial services for farmers
3. In-adequate knowledge base of farmers in mechanized farming
4. Attitudinal mindset by some farmers that mechanization causes soil degradation

At equipment manufacturers level

1. Inadequate knowledge in manufacturing engineering
2. Lack funds to acquire the critical and specialized manufacturing equipment and tools.

1.3 Food security status

Household food security refers to the situation where all members of a household at all times are consuming enough safe and nutritious food for normal growth and development, and for an active and healthy life (UBOS, 2010). Food insecurity continues to be a major development concern in Uganda in spite of its well-endowed natural resource base with good biannual rainfall amounts received (Suresh, 1997; Zizinga *et al.,* 2017). Low and declining yields of food crops are the primary causes of this condition. Smallholder farmers are vulnerable to food insecurity, especially in times of environmental stress, drought and floods because of high dependence on unreliable rain-fed agriculture (Turyahabwe *et al.,* 2013; Kikoyo & Nobert, 2016).

Food security discrepancies are also influenced by socio-demographic, economic and spatial factors. These included age, education level of the household head, household assets, access to non-agricultural income sources and size of land owned (Sseguya, 2018; Akwango *et al.,* 2017). Uganda's food security situation is complicated by the presence of more than 1,444,873 refugees from neighbouring countries, many of whom lack the means to produce or access food (Shively & Hao, 2012; Uganda Response Plan, 2017). As a result, the country has witnessed farmers suffering from hunger, adoption of environmentally harmful strategies, reduced the quality of life and a sizeable number of farmers in need of humanitarian aid (Sserunkuuma *et al.,* 2001; Weiser *et al.,* 2014).

Most of the smallholders aim at improving their food security by increasing household food production. The traditional way to do this has been to expand the areas under cultivation, often in fragile areas such as wetlands (Turyahabwe *et al*., 2013; Gabiri *et al.,* 2018). One example of this is the short-term mitigation measures undertaken by smallholder farmers in Doho wetlands in Eastern Uganda since 2005, which significantly improved the household incomes of rural farmers in the area (Maxwell, 1995, Oonyu, 2011; Sseguya *et al.,* 2018).

1.4 Objectives of this report

The objectives of this scientific report were to:

1. Examine the distribution of key crops grown and livestock kept in Uganda
2. Establish the constraints and opportunities in agriculture along the value chain
3. Examine the current institutional arrangements and how different stakeholders (local, county, national and international) are involved in agenda setting in policy formulation
4. Assess the impacts of policies, programs and strategies targeting local and regional variations in conditions for agriculture in Uganda

1.5 Purpose of this scientific report

Agricultural production in Uganda is defined largely by a set of farming systems, categorized to as agro-ecological zones (FAO, 2010; Okonya *et al.,* 2013). This countrywide report is based on the above facts with the aim to specifically define the scope of local and regional variations of agricultural productivity and their implications in determining the local and regional distribution of key crops grown and livestock reared, as well as comprehend the constraints and opportunities prevalent in the agricultural value chain. The report also documents the institutional and stakeholder arrangements and further examines the impacts of policies, strategies and programs prevalent in the country. As a result, this report is a lodestone owing to its timely and envisage to directly or indirectly inform or guide policymakers, scientists, and researchers on policy formulations, allocation of funds and distribution of investments in the agricultural sector in order to enhance agricultural growth and alleviate poverty amongst the smallholder farmers distributed throughout the rural areas of the country.

1.6 Methodology

Reviewing literature is an important method for identifying if there any gaps to be bridged by any significant study. A literature review is a valid approach in structuring a research field and forms a basis to ignite innovations (Srivastava, 2007). Detailed reviews can facilitate exploration of theories and documentation of indicators and trends. A national wide approach to the literature review was compressively conducted. At the local level, the scope of information review was at the district level, while at the regional variation: the agro-ecological zones and regional administrative boundaries (western, eastern, northern and eastern) demarcated for Uganda by UBOS (2016) were used in the assessment.

The study conducted extensive desktop reviews of academic literature and secondary grey texts including the Government of Uganda reports (published and unpublished), policy briefs and policies. The reports were accessed from the relevant national institutions on shelf libraries and web portals. In addition, local news articles on agriculture, food security, early warning and agricultural market information systems were reviewed by this study for comparison purposes and validation of agricultural facts.

1.7 Structure of the report

This scientific report presents a general overview of Uganda, agricultural sector, food security status and its performance over time. This report presents the local and regional distribution of key crops grown and livestock kept in Uganda, constraints and opportunities available along the agricultural value chain in crop and livestock production. Further information on the current institutional arrangements and stakeholder involvements in setting the policy agenda in the country is also laid out. The report also displays key institutional policies/programs and strategies with their impacts, gaps and lessons learned.

2. Distribution of key crops grown and livestock kept in Uganda

2.1 Introduction

The key crops grown and livestock kept in the "Pearl of Africa" are dependent on the favouring conditions prevalent in the demarcated agroecological zones in the country (figure 2). According to the Agriculture Sector Strategic Plan 2015/16-2019/20, the traditional cash crops in Uganda are coffee, cotton, tea and tobacco, while the food crops include bananas, cassava, maize, sweet potatoes, Irish potatoes, millet, sorghum, wheat, beans, field peas, pigeon peas, cowpeas, groundnuts, simsim, soya beans and sunflower (Table 1). The most common animals and birds kept are cattle, goats, pigs and chicken, ducks, pigeons among others. In this report, the crops studied are coffee *(Robust and Arabic),* bananas *(Musa acuminata*), maize *(zea mays),* beans *(phaseolus vulgaris)*, cassava *(manihot esculenta)*, and Rice (*Oryza glaberrima*), while the livestock includes cattle, goats, pigs and poultry. The selection of key crops and livestock studied were dependent on commercial viabilities, food security and environmental conservation (Mayanja *et al.,* 2014).

Table 1: Crop Area and Production by region, UCA 2008/09

Crop Type	Area Planted(Hectares)				Production (Tonnes)			
	Central	Eastern	Northern	Western	Central	Eastern	Northern	Western
Plantain bananas	326082	69504	9195	511096	1039837	342234	31626	2883648
Finger millet	5832	86911	105656	51588	13734	106838	78572	77784
Maize	189135	388762	247780	188583	449859	1108554	305798	497745
Sorghum	2261	101645	249330	48016	2678	133313	177088	62716
Rice	2637	36033	25912	10504	2173	128195	43719	16649
Sweet potatoes	98054	159948	60573	121681	312402	847140	292932	366295
Irish Potatoes	4798	1271	594	26096	13290	4624	1311	135210
Cassava	127788	324387	269886	131328	409812	1061186	983124	440189
Beans	120798	108107	146702	241915	167276	98834	251221	411945
Field peas	470	8014	29067	6286	302	3233	10428	2489
Cow peas	1135	12976	9352	354	281	7086	3429	261
Pigeon peas		876	28786	139		219	11031	80
Ground nuts	26504	122404	136893	59431	32757	77247	83182	51497
Soya beans	750	7279	26195	2220	208	5801	15727	1887
Sim-Sim	590	15316	158763	928	127	6774	93562	585

Source: UBOS, 2017

The 2008 livestock census revealed that at least 4.5 million rural families in Uganda (70%) keep at least one form of livestock. The contribution to total GDP of livestock rearing activities in 2016/17 stood at 4.2 percent compared to 4.3 percent as in 2015/16 (UBOS, 2017). Correspondingly, while the growth of total agricultural output has declined, livestock trends have maintained steady growth.

In regard to rearing livestock in Uganda, a smallholder farmer without any form of livestock reared is regarded as a 'poor' household as perceived by society. The smallholder farmers regard livestock as a possible form an 'emergency response' because, in case of famine or hunger, livestock is the most sought off for sale or exchanged for food. The livestock sub-sector is an essential part of Uganda's agriculture and is of historical and strategic importance to the country's economy and population. The sub-sector comprises cattle, goats, pigs, sheep and poultry as illustrated by the table 4 below:

Table 2: Livestock Population trend ('000)

	2008	2009	2014	2015	2016	YOY growth
cattle	11,409	11,751	13,226	13,623	14,032	3 %
sheep	3,410	3,513	3,957	4,076	4,198	3 %
goats	2,450	2,823	4,132	4,256	4,384	3 %
pigs	3,184	3,280	3,692	3,802	3,916	3 %
poultry	37,437	38,557	43,397	44,699	46,040	3 %

Source: Adopted from UBOS 2011 Statistical abstract.

2.2 Factors that influence the distribution of crops grown and livestock reared

Crops and livestock reared in Uganda are dependent on a number of factors such markets, farming systems, agro-ecological zones, government interventions, policies, pests and diseases and environmental conditions (Hill, 1997; Nkonya *et al.,* 2005; Epule *et al.,* 2018). In this report, the in-depth assessments of the distribution of key crops and livestock reared were investigated using the administrative regions, district boundaries and agro-ecological zonal approach (Otim-Nape *et al.,* 1998; Hisali *et al.,* 2011). The agro-ecological zones are classified as Western mid-altitude farmlands, Lake Victoria Crescent, Karamoja, South Kyoga floodplains, Afro-montane, Northern Moist farmland and South-west rangelands (figure 2).

A number of factors, abiotic, biotic and daily activities, highly influence the distribution of livestock in Uganda today. Abiotic factors include slope, distance to water (horizontal and vertical), weather, and barriers. Biotic factors may include forage quality and quantity. However, there are also several farm level management mechanisms that influence livestock distribution and grazing uniformity such as land tenure and grazing type (Ganskop & Bohnert, 2006).

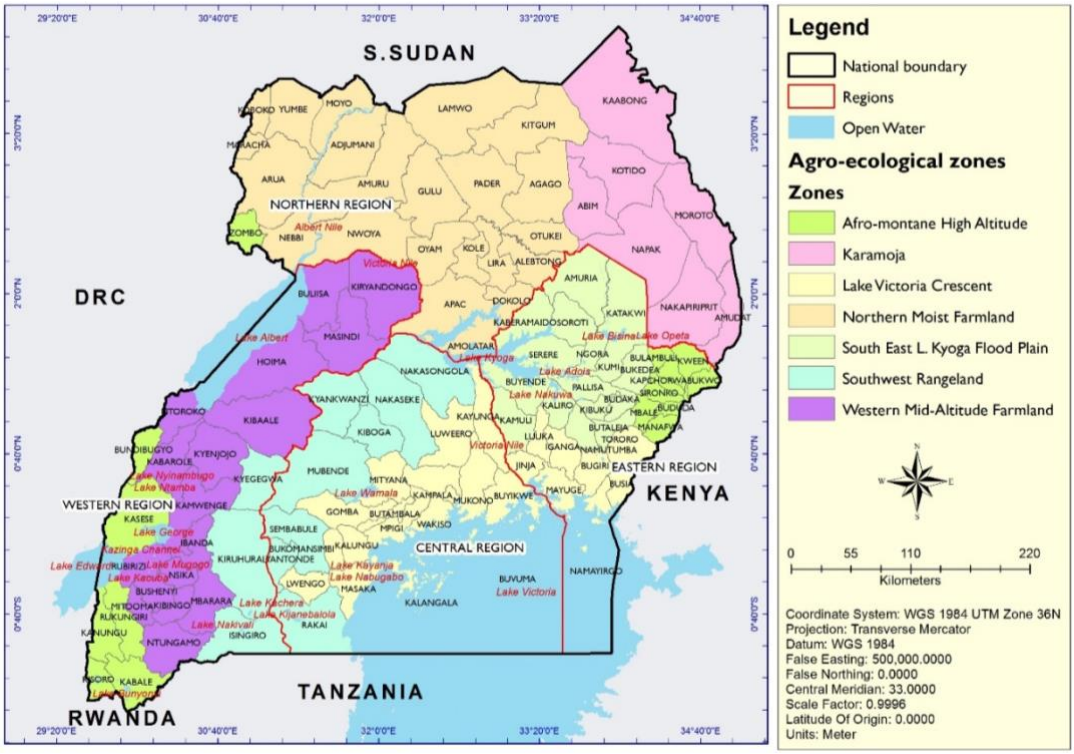

Figure 2: Agro-ecological zones (source author)

2.3 Distribution of key crops grown

2.3.1 Coffee

Coffee is one of the leading foreign exchange earners contributing 17.7% to the total national export value in 2013/2014 (UBOS, 2014). Coffee production as a cash crop has been widely promoted by the Ugandan governments since colonial times and the present government continues this support through its agricultural initiatives and programs such as Operation Wealth Creation, which provides smallholder farmers with seedlings in most part of the country where the crop is believed to be viable. The main varieties cultivated presently are Robusta and Arabic. Robusta coffee is cultivated in the lowlands and Arabica in the highlands, most notably on the slopes of Mount Elgon on the border with Kenya and on the slopes of the Mount Ruwenzori, Kigezi and West Nile highlands because of good soil fertility and appropriate amounts of rainfall received (De Bauw *et al.,* 2016). To maximize plot productivity, the smallholder farmers are encouraged to intercrop coffee with other different food crops to harness both income and food for home consumption (Gram *et al.,* 2017).

However, the lucrative crop production and productivity are affected by ageing coffee trees that require replanting or rejuvenation, as well as, climate changes that continue to affect the viability of coffee production. In terms of profitability, coffee is more profitable than bananas (Bagamba *et al*., 1998). As by 2014, It was estimated that as much as 20% of the entire population earned all or a large part of their cash income from coffee (Mugagga, 2017). Therefore, any attempts to improve the food security status of the households involved in coffee production must first document the needs, available resources and traditional markets for coffee in each AEZ. For instance, in the Afro-montane zone where coffee thrives extremely well if good and sustainable tree cover are kept.

2.3.2 Banana

Bananas are among the crops that are most sensitive to the availability of rainfall and moderately fertile soils. Banana is one of the major crops that promote food security and household incomes. Most of the banana and its bi-products are consumed domestically (MAAIF, 2010; De Steur *et al.,* 2016). There are two main types of banana crops grown in Uganda: cooking bananas (used to make *matooke*) and beer bananas (*mbidde*). Smallholder farmers have for a long time been growing bananas in the Afro-montane, Southwest rangeland, Lake Victoria Crescent and Western Mid-Altitude agro-ecological zones. These landscapes have moderate bimodal rainfall patterns and fertile soils composed of mainly loam (Afro-montane), sandy loams (Lake Victoria Crescent) and volcanic soils (Kikulwe *et al.,* 2016).

About 75% of Ugandan farmers grow the crop on 1.5 million hectares of land, an estimated 38% of arable land under use (MAAIF, 2010). Nearly two-thirds of the total national banana production comes from the Western region, 30% from the Central region, and the remainder from the Eastern region. In these areas, banana is one of the most important food security crops. It accounts for as much as 25% of the total value of agricultural output (Vlaeminck *et al.,* 2016). Pender et al. (2004) estimated that the average profitability of banana production to be 4.5 times higher than that of the cereal production. Also, Bagamba et al. (1998), emphasized that bananas are more profitable than annual food crops (maize, sweet potatoes, cassava and groundnuts), which means that they are more likely to improve the farmer's income levels.

The possibility to intercrop bananas with coffee, beans and yams makes it a good choice for smallholder farmers with limited access to land and labour. The bananas are also widely rooted in farmer's cultures, for example, they hardly miss on the food menus of most farmers and at any traditional ceremony such as weddings in the Buganda, Bugisu and Ankole cultures. Most of the bananas are transported for sale to the major markets in Kampala, Mbale, Jinja, Lira, and Gulu for sale.

Plate 1: Banana plantation in Bushenyi District Western Uganda (source author)

2.3.3 Maize

Maize is a major food security crop in Uganda, produced by nearly all households (MAAIF, 2010). It is a key staple food crop and an important determinant of food security for most smallholder farming communities (Wichern *et al.,* 2017). The crop is intensively cultivated in the Eastern region (Districts: Kapchorwa, Mbale, Kamuli, Jinja, Iganga), Central (Masaka, Mubende) and Western (Masindi, Kamwenge, Kyenjojo, Kasese, Kabarole) parts of Uganda. In particular, according to UBOS (2017), the highest Maize production in the country was reported in the district of Iganga with 303,262 tonnes. The districts with the highest production of Maize in the Central, Eastern, Northern and Western regions were Mubende (171,089 tonnes), Iganga (303,262 tonnes), Adjumani (47,264 tonnes) and Kabarole (91,318 tonnes) respectively. To sum it all, maize alone contributes over 20% of food calories and is a key ingredient in animal feed and extensively used in industrial products (Shiferaw *et al*., 2011; Fisher *et al.,* 2015).

Maize offers farmers some measure of flexibility since it can be dried and stored, fed to livestock, consumed, or sold for cash (Haggblade & Dewina, 2010). Smallholder farmers have expanded the maize acreage because of increasing prices and high demand for maize from neighbouring countries, especially Kenya and South Sudan that often experience prolonged droughts (Nyoro *et al*., 2004; Benson *et al.,* 2008; Montalbano *et al.,* 2018). The preference for Ugandan grown maize is due to its relatively low price compared to the other import options such as South Africa. FAO (2014) estimated that Uganda produced 3.4 million tons of maize in 2016, with a surplus of 200,000 bags, which were exported to the neighbouring countries (Kenya, South Sudan and Rwanda). Maize can be grown twice a year utilizing the bimodal rainfall pattern, and in many parts of the country, it is also intercropped with beans, soybeans or groundnuts. As a consequence, over the last two decades (1993-2013), both maize area and production in Uganda increased dramatically from about from 0.57 million tons in 1993 to 1.37 million tons in 2013 mostly as a result of area expansion rather than yield improvement (FAO, 2014). The crop also has important multiplier effects in other sectors of the economy such as livestock production (MAAIF, 2010; Babel & Turyatunga, 2015).

2.3.4 Beans

In 2010, Uganda was ranked the second producer of beans in the East Africa Community region after Tanzania. The most cultivated type of beans are the yellow beans, K131, Paiidar, Kamwanyi, black beans and red kidney beans. The average land size under beans production ranges from 0.1 ha to 4 ha with an average of 0.4 hectares per household (FAO, 2014). The preference for different varieties of beans apart from agro-ecological qualities driven by properties such as short cooking time, good taste, familiarity and long shelf-life after cooking (Okii et al., 2014). Beans are grown in two seasons, March to June and September to November. The beans are mainly produced in the Western and Northern regions, followed by the Central and Eastern regions. According to Kilimo Trust (2012a), the beans are cultivated because they are highly nutritious and they provide 25% of the total dietary calorie intake and 45% of the protein intake in Uganda.

They are also a major source of complex carbohydrates, essential micronutrients, dietary fibre, vitamin B and antioxidants in the diets of both the rural and urban poor. An increase in smallholder farmer's production of beans will thus definitely improve the country's food and nutrition security (Ddamulira *et al.,* 2014). For centuries, beans have been produced mainly for food security at household level but as per 2010, farmers are producing beans as a major source of income. The producers sell approximately 69% of the beans to village collectors and brokers and 5% to institutional buyers like schools and WFP. The remaining 26% is retained for home consumptions and seed (Kilimo Trust, 2012a; Larochelle *et al.,* 2015). In terms of exports in the beans sector, Busia produce dealers market registered between 500-800 tons of an assortment of beans destined for Kenya in 2017 (UBOS, 2017).
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2.3.5 Cassava

Uganda is among the largest producers of cassava in Africa. In 1981, cassava production was estimated at 100,000 metric tonnes; it later increased to 130,000 metric tonnes in 1987, but declined to 30,000 tonnes in 1994, due to the cassava mosaic disease. Today (2017) Uganda's annual cassava production is 5.5 million tonnes, grown on an estimated 500,000 hectares (UNHS, 2016/17). The major cassava varieties grown in Uganda include TME 14, Akena (TMS 192/0067), Bao (Landrace), Nigeria (TMS 30572), Ariwara, Omongole (TMS 192/0057); and Telengole and others (Kilimo Trust, 2012b). According to Nakabonge et al., 2017 in their study across six agro-ecological zones in Uganda asserted that generally planted cassava varieties were named based on place of origin, for example, Nyaraboke,

Karangwa, Kabiriti and Kirimumpale were the common varieties from mid-western, whereas Gbasumenge, Abiriya, Mingoro and Sanje are common in the northwest. Njule and Kwatamumpale were common in central Uganda. Magana and Ofumbachai were the common varieties in eastern, whereas Bao, Ogwok and Icilcil were common in mid-northern Uganda. Bukalasa was common across all agro-ecological zones surveyed. The choice of planting cassava varieties is mainly dependent on high yields, tastiness, good cooking quality, early maturity, tolerance (Kizito *et al.,* 2005; Yonow *et al.,* 2017).

Cassava is the second most important staple crop in the country after bananas. The main cassava growing regions, based on production volumes of 2008/2009, are the Eastern (Soroti, Pallisa and Iganga) (37%), Northern (Apac, Gulu, Arua and Nebbi) (34%), Western (Masindi and Kibale) (15%) and Central regions (14%) (Kilimo Trust, 2012b). The crop is grown for food and income and is traded as cassava flour, dried cassava chips/pellets and raw cassava (Manano *et al.,* 2017). Fresh cassava trading is hampered by the high perishability of the fresh roots and driven by the price premium that consumers are willing to pay for the freshness (Kilimo Trust, 2012b; Esuma *et al.,* 2016). Although prices vary over the seasons, they also vary on a daily basis depending on the quantities and varieties supplied. Consumers particularly like the red-skinned variety of cassava grown almost exclusively in Masindi district. However, only about a third of the households who grow cassava sell their products to the market (Haggblade & Dewina, 2010), which limits the supply.

2.3.6 Rice

Today both upland and paddy rice is grown almost throughout the country and mainly by small-scale farmers. Smallholder farmers consider rice as a commercial commodity capable of increasing household incomes and hence ensure food security, as well as, producing the resources necessary to improve drainage in paddy rice field (Kaizzi *et al.,* 2018). About 80% of the rice farmers in Uganda have less than 2 hectares of land, use rudimentary tools, little or no fertilizer, and poor-quality seed, as well as, little or no irrigation and poor water management practices (Kijima *et al.,* 2008). The consumption of rice in the country is 250,000 tons annually or about 33 kg per person (Kilimo Trust, 2011).

Most rice in Uganda is grown in Eastern Uganda (Butaleja, Iganga, Bugiri, Pallisa, Kibuku, Namutuba among others) followed by Western Uganda due to the presence of many favourable and connected wetland systems with high moisture content throughout the growing season. Nonetheless, market information and collective marketing have enabled farmers to negotiate for better prices (Masika *et al.,* 2017). In addition to paddy rice, New Rice for Africa (NERICA), a high-yielding upland rice variety suitable for the African environment, was introduced in Uganda to increase food security and reduce poverty in rural areas in 2002. However, more than 50% of the NERICA adopters in 2004 had abandoned it in 2006 because of low productivity (Kijima *et al.,* 2011).

Plate 2: Rice Busembatia trading centre eastern Uganda (source author)

Table 3: Agro-ecological zone and key crops grown

Agro-ecological landscapes	Part of Uganda	Rainfall distribution	Farming systems	Cash and food crops grown
Afro-montane	Eastern	Bi-modal high rainfall (>1,200mm/year)	Banana-coffee systems	Coffee, Banana, Cassava , Sweet potatoes, Irish potatoes, Maize, Sorghum, Finger millet, Rice
Karamoja	North eastern	Uni-modal low rainfall (400-700mm/ year)	Agro-pastoral system	Finger millet, Pearl millet, Maize, Sorghum, Irish potatoes, Beans, Cowpeas, Ground nuts, Cassava, Sweet potatoes
Lake Victoria Crescent	Central	Bimodal high rainfall (>1,200mm/ year)	Banana – coffee system	Banana, coffee
Northern moist	Northern	Uni-modal low to high rainfall (1000-1,200 mm/year)	Mixed cropping system	Cereal, cassava, cotton, legumes
South East L.Kyoga floodplain	Eastern	Bimodal high rainfall >1,200mm/ year	Mixed cropping systems	Finger millet, banana, maize
Southwest rangeland	South west	Bimodal low to medium rainfall (900-1,200 mm/year)	Banana-coffee system	Bananas, coffee, cereal, sweet potatoes
Western Mid-altitude	Mid-western	Bimodal average rainfall of 1,270mm/ year with high variability	Banana-coffee system	Maize, beans, irish potatoes, sorghum, sweet potatoes

Source: Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) 2009, and Uganda Bureau of Statistics 2016

2.4 Distribution of livestock reared

2.3.7 Cattle

Cattle production is widely distributed and recognized by the Ugandan government as one of the most important means to liberate smallholder farmers from hunger and poverty (MAAIF, 2009). Cattle production is certainly an important source of livelihood; with about 60% of the population directly involved in livestock rearing. However, the nomadic pastoral livestock keepers are amongst the poorest in the country because the reared livestock is not for sale but for cultural heritage and prestige (MAAIF, 2002; UNHS, 2017). Smallholder farmers rare animals purposely for milk and meat production, manure collection, draft power and various social functions (Kabunga *et al.,* 2014). Despite their poor production and reproductive performance, indigenous cattle are still the most popular in Uganda because of their versatility and adaptability to the local climatic and disease burdens. The 2008 national livestock census estimated that about 94% of the Ugandan cattle herds were indigenous comprising of Ankole (30%) and Zebu/Nganda (70%) (UBOS, 2010).

Regionally, nomadic pastoralism constitutes the principal livelihood for many households in the Northeastern part of Uganda (Karamoja agro-ecological zone). Also, the 'cattle belt' or the 'cattle corridor', stretches across the middle of Uganda from the base of the highlands in Southwestern Uganda through Lake Kyoga basin to Northeastern Uganda, characterized by the extensive cattle-dominated farming system (Ransom *et al.,* 2017). The cattle belt offers vast and scattered patches of savanna grasslands and thickets/shrubs that are palatable to cattle and available most of the year because during drought livestock hardly have adequate forage (Katongole *et al.,* 2016). Intensive livestock production is common in areas with higher population densities, where dairy cattle ownership is an important characteristic of economically progressive farmers (Benon *et al.,* 2015). In terms of milk production, there are four types of traditional milk production systems: small-holder extensive, medium-holder extensive, pastoralist (semi-nomadic pastoralist) and agro-pastoralists who sell milk to agents, cooling centres and for home use. Due to its productivity, Mdoe et al., (2002) support the notion that livestock often generates higher and more reliable income compared to the other traditional agricultural activities and thus offers a genuine potential for households to increase their incomes through improved production, processing and marketing of livestock and sale of livestock products.

Plate 3: Cattle rearing in Rubirizi district - western Uganda (Source: author)

2.3.8 Goats

Smallholder farmers have traditionally reared goats (*Capra hircus*) for small-scale sales, but with the increasing nationwide demand for meat and milk; the number of farmers taking up goat production is steadily growing. Much as goat rearing is not carried with profit motives, they are a source of tangible benefits in the form of regular cash income, meat, manure and milk, as well as, intangible benefits including acting as insurance against household emergencies (Mwebe *et al*., 2011). The breeds that are majorly reared include the Small East African Goat, which is a small and low weight type, the Mubende, which is a fairly heavy and tall type and Kigezi goat (Siefert & Opuda-Asibo, 1994). Countrywide, the total numbers of goats are estimated at about 12.5 million (UBOS, 2011). From the study conducted by UBOS (2009), goats are reared in most parts of the country but the Western Region had the highest number of goats estimated to about a 3.5 million or 30 % of the total herd, followed by the Northern Region with 2.7 million (20%).

The Small East African Goats are extensively reared in the Northern and Eastern short savannah ecological landscapes and the drier areas of Buganda (Luwero, Buruli, Bulemezi and Bugegere). The Mubende goat is mainly concentrated in Mubende District, while the Kigezi goat is common in Kabale, Kisoro and Rukungiri. The continual rearing of traditional goats is because of the farmer's needs to maximize output from animals that can survive and reproduce under harsh tropical climatic conditions (Bisson *et al*., 2010; Ampaire & Rothschild, 2010). Some farmers opt for goat cross breeds as a means of improving the performance of their goats rather than through feed improvement (Jimmy *et al.,* 2010).

2.3.9 Pigs

By 2007, Uganda had the largest pig population in the Eastern African region standing at 3.2 million because of steadily growing demand for pork (UBOS, 2009). Pigs are kept for the production of pork and bacon. Regionally, the Lake Victoria crescent had the highest number of pigs, followed by the Western and Northern regions (UBOS, 2009). Pig farming is one of the fastest growing livestock activities throughout the rural areas of Uganda and has become a very attractive means of increasing food, income and employment (Atuhaire *et al*., 2013).

In all the regions, pigs access food mainly through scavenging and feeding on kitchen/butchery leftovers from hotels, restaurants, schools among others (Ouma *et al.,* 2015). The rise in pork consumption is driven by population growth rates, urbanization, increasing incomes and changing taste preferences (Jagwe *et al*., 2015). Therefore, an increment in the production of tasty pork will be a must which is likely to result in increased uptake of pig rearing and smallholder incomes.

2.3.10 Poultry

Poultry production plays vital socio-economic roles in the predominantly smallholder production systems of Uganda. Chickens are the most common poultry, but turkeys, ducks, geese, pigeons and ostriches are also kept in some areas. Indigenous chickens make up over 80% of the national flock (UBOS 2009; MAAIF, 2010). Investment in intensive poultry production, both layers and broilers, have over the past 15 years since 2008 become increasingly common in peri-urban areas of Uganda (UBOS, 2009). According to the livestock census conducted in 2008, Uganda's chicken population had increased from 23.5 million in 2005 to 37.4 million in 2008 (UBOS, 2011). The Eastern and Northern moist regions have the highest percentage of free-range birds while the Central region has the largest proportion of exotic poultry by 2006 (FAO, 2007). UBOS (2009) revealed that the districts of Wakiso, Bugiri, Lira and Masindi had the highest number of chicken in the Central, Eastern, Northern and Western regions respectively.

The steady growth of poultry production in these regions is primarily due to the availability of land (rearing) and favourable tropical climatic conditions. A study conducted in Kamuli District, Eastern Uganda in 2010, showed that the indigenous chickens were mainly reared for sale in order to raise income for the households to meet the demand for their domestic necessitates and were also used as a source of food (Natukunda *et al*., 2011; Dickson & Eddie, 2017). Eggs are mainly for consumption and hatching; the average household flock is about 29.36 ± 2.04 birds and most of these are sold in small shops and supermarkets in addition to the neighbouring countries such as Kenya (Nyapendi *et al.,* 2003). Overall poultry contributes to improved human nutrition and food security by being a leading source of high-quality protein in form of eggs and meat (MAAIF, 2010; Rukundo *et al.,* 2017).

Table 4: Agro-ecological zone and type of livestock reared

Agro-ecological landscapes	Regions	Livestock systems	Animal/bird type
Afro-montane	Eastern	Mixed farming	Cattle, goats, pigs, chicken, ducks, sheep, turkey
Karamoja	Northeastern	Pastoral system	Cattle, goats, chicken, sheep, pigs, camels
Lake Victoria Crescent	Central	Agro-pastoral system	Cattle, goats, pigs, chicken, ducks, sheep, turkey
Northern moist	North	Mixed farming system	Cattle, goats, pigs, chicken, ducks, sheep, turkey
South East L.Kyoga floodplain	Eastern	Mixed farming	Cattle, goats, pigs, chicken, ducks, sheep, turkey
Southwest rangeland	Western	Agro-pastoral system	Cattle, goats, pigs, chicken, ducks, sheep, turkey
Western Mid-altitude	Western	Agro-pastoral system	Cattle, goats, pigs, chicken, ducks, sheep, turkey

Source: Author

3. Food security conditions

Uganda is self-sufficient for most food groups, except cereals (mainly wheat and rice) and vegetable oils (Shively & Hao, 2012). These are imported from as far as China, Pakistan and India among others to meet the deficits (Kikuchi *et al.,* 2016). In terms of regional distribution, according to the UBOS (2010) agricultural census the eastern region had the highest percentage (30.4%) of households that reported food shortage followed by the northern part with 27.6% while the central region had the least numbers of households that reported food shortages (17.3%). Food shortages in the eastern region are mainly caused by prolonged dry spells and flash floods that increased crop and livestock failures and losses in smallholder farming systems. Civil strife in the Acholi sub-region is partly to blame for the prolonged food shortages. In addition, poor storage capacity, gaps in the cropping calendar frequently translate into hunger seasons, especially in the northern region (FAO, 2010).

At the district level, severe food shortages are frequently experienced in the districts of Abim, Katakwi, Amuria, Kaboong, Dokolo, Yumbe, Lyatonde and Bukwo while Kalangala and Kampala had the least numbers of food insecure households (UBOS, 2010; Mbolanyi *et al.,* 2017). Most of the food shortages in the country are reported in the months of June, May and July respectively. In response to food insecurity, the farmers have adopted immediate coping measures such as skipping meals, eat less preferred foods, reducing the size of meals and area under cultivation and growing a limited range of crops (MAAIF, 2010; Akwango *et al.,* 2017). The farmers also adopt short/long-term coping strategies such as the use of savings to buy food, taking out a loan, selling assets, getting help from relatives and government. It is worth noting that Uganda's agricultural ability to generate income for the poor, particularly women, is more important for food security than its ability to increase local food supplies (MAAIF 2010; Sseguya *et al.,* 2018).

4. Constraints affecting agriculture along the value chain

4.1 Uganda's agricultural value chain

The agricultural value chain simply describes activities that occur at each of the stages of production, from inputs through to consumption, or from primary production to secondary processing, as well as the actors involved at each stage. The main drivers of Uganda's agricultural value chain are the growth of domestic and regional markets, adoption of improved production and value addition technologies/ innovations and availability and influence of main actors involved in improving the system. Therefore, assessing Uganda's agricultural value chain is an asset in understanding the constraints faced in smallholder farming since it analyzes the system beyond production. It's worth mentioning here that the constraints faced in the production of key crops and livestock are not boundary specific either local or regional but affect the entire country as a whole.

4.2 The scope of agricultural constraints

According to MAAIF (2010) the main constraints affecting the agricultural sector in Uganda are;

1. constraints related to production and productivity, mainly at the producer level,
2. constraints related to market access and value addition, defined by demand and supply-side factors,
3. constraints related to the enabling environment, reflecting policy and regulatory gaps,
4. constraints related to the institutional framework, problems with competing for authority and poor coordination.

4.3 Constraints affecting crop production

This section presents constraints that tremendously limit the production of major key crops grown in Uganda

4.3.1 Producer level

a. In the production of cassava, the major constraints at processing level are pests and diseases, unpredictable and unfavourable weather conditions, limited access to improved cassava varieties for planting and high labour costs. Other constraints include high production costs, limited extension services, limited land for production, limited access to improved farm equipment and soil degradation (IFPRI, 2009; Kilimo Trust, 2012a).

b. Beans are hampered by the unpredictability of weather conditions compromising on bean yield, limited access to improved inputs due to low incomes and limited access to credit exposes producers to the threat of pests and diseases, poor farming methods leading to soil degradation, low productivity and limited access to proven post-harvest technologies leading to high post-harvest losses (Nkonya *et al.,* 2005). In addition, the per capita consumption of beans is decreasing and hence threatening the future of the bean value chain in Uganda (Salami *et al.,* 2010).

Plate 4: Left: Orange dog pest on a citrus plant – Kakuuto Sub-county, Right: A heavily BBW infested banana plantation, Kagamba Sub county Rakai district

c. High prices of planting materials such as seeds. Most farmers use home saved seeds from previous harvests; these seeds can be local varieties or improved varieties (maize Longe 5). The high prices make it difficult for farmers to have access to improved seeds, such as beans (ACF, 2014).

d. Most farmers use rudimentary tools to work their land; however, the high prices make them very difficult to purchase. The lack of access to farm equipment (for example ox ploughs) or farm power (for example oxen) is an important constraint to cultivate or open land for crops such maize and rice.

e. Rice production is limited by a lack of capital and access to rural credit; the majority of farmers lack access to formal financial services. When farmers manage to contract a loan, the interest rates are high, around 20% per year (ACF, 2014).

f. Limited adoption of modern agricultural practices. Traditional agricultural practices by farmers are common in every region and can be attributed to a general lack of agronomic knowledge on soil preparation, pest handling, and planting (for example row planting).

Plate 5: Maize storage (post harvesting handling) in Masindi District Western Uganda (source author)

4.3.2 Processing level

a) The Kilimo Trust (2012a) study reported that low cassava prices, limited access to reliable markets, poor road infrastructures, limited access to market information, price fluctuation of cassava and its products as well high transportation costs are the major constraints that have hampered cassava production at the processing level.

b) The bean processors are constrained by inadequate and modern processing machinery. Bean processors are yet to improve their processing technology to modern efficient machinery. This could be associated with the high investment capital required to upgrade coupled with a 'thin' market for value-added bean products (Kilimo Trust, 2012b). When farmers manage to process their own crop, they add significant value to their product and therefore can sell it at a higher price and in the end increase their revenues as well as their bargaining power.

c) Farmers lack postharvest handling equipment. Lack of proper postharvest handling equipment for their produce, such as solar dryers, tarpaulins for drying, gunny bags, wire cribs, and even traditional granaries. This often leads to the production of poor quality products that fetch low prices on the market (IFPRI, 2009).

d) Poor knowledge of postharvest handling and value addition: Farmers do not quite well know the economics of selling processed versus unprocessed products, for example, unshelled and shelled groundnuts; paddy and milled rice (Nkonya *et al.,* 2005).

4.3.3 Marketing and supply level

a) Cassava is constrained by the poor quality of products supplied, inadequate supplies, transport problems, high prices, few processors to handle large quantities, delay in delivery of supplies, price fluctuations and lack of efficient farming machines.

b) The fragility of the bean market hampers their production. This level of production is constrained by the fluctuation of bean prices and unreliable supply of quality beans due to weak linkages between the traders and suppliers in addition to the inadequate availability of appropriate financial services. Lack of fast cooking flatulence free bean varieties is a threat to the consumption of beans and hence the whole value chain (PMA, 2009, Kilimo Trust, 2012b).

c) Markets and supplies are inflicted by pests and diseases (for example coffee wilt disease, twig borer among others), fluctuating world coffee prices and unstable exchange rate regimes, increased supply from large-volume producer countries (such as Brazil and Vietnam,) inadequate infrastructure especially to effectively connect different value chain actors located in different geographic areas, unpredictable weather that affects productivity, competition for

land within high producing areas like the central region (competition with traditional crops and urbanization (Schreinemachers, 2007; Kilimo Trust, 2012c).

d) Lack of appropriate storage facilities for most cultivated crops. These facilities enable farmers to bulk and store their harvest in order to sell in larger quantities and when prices are more attractive, thus increasing farmer's bargaining power (MAAIF, 2012).

e) Poor market information is a constraint that cannot be underestimated. Although some farmers have access to market information disseminated by AgriNet in most parts of the northern region, they need to know how to analyse it to their own advantage (Namazi, 2009; ACF, 2014).

f) High costs of marketing limit farmers involved in the cultivation of maize, rice, and cassava among others in the country. Due to the poor conditions of roads and the lack of access to means of transportation, it is costly and time consuming for farmers to market their produce (ACF, 2014).

g) Low market opportunities for some of the crops varieties which are inferior on the market. For example, super commanded a premium price than other rice varieties (upland and Sindani) (PMA, 2009).

h) There are a diverse array of challenges and barriers to upgrading at different segments of the maize chain. However, three fundamental constraints impede the development of the sector. These include (1) lack of cash and finance for farmers; (2) lack of commercial component; and (3) lack of communication of market signals and standards. These shortcomings lead to the prevalence of low-quality maize, which has the effect of driving actors to the informal market since: (1) Smaller-scale informal traders do not differentiate between qualities and immediate sources of cash; and (2) formal aggregators demand higher-quality maize (Daly *et al.,* 2016).

i) According to Makosa (2015) in his study of rice markets in Uganda revealed that low rice quality was attributed to poor postharvest practices where foreign matter mixes with paddy during the drying process. High energy cost amounting to 69% of electricity operated and 89% of diesel operated machines during milling lowers farmers' income. Small volumes of rice supplied by individual farmers to the market also weaken their bargaining power.

j) The most market-related challenge to rice farmers is lack of drying facilities. Paddy is most times dried on bare ground than the use of tarpaulins and as a result, it ends up mixing with a lot of foreign matter. Coupled with poor moisture control, this leads to low milling quality. Failure of farmers to dry different rice varieties separately lowers their potential income (Makosa, 2015).

4.4 Constraints affecting livestock production

2.3.11 Producer level

a) The major constraints to Ugandan livestock are the presence of animal diseases and limited provision of animal health services. Livestock diseases impose heavy costs on producers and reduce incentives to invest in higher yielding crossbred or exotic animals that tend to be more vulnerable (Ocaido *et al.,* 2009). Tick-borne diseases are a major constraint to the improvement of livestock production in Uganda. The major tick-borne diseases in Uganda are anaplasmosis, babesiosis, cowdriosis and East Coast fever (ECF). These constitute the single most important constraint to the livestock production in Uganda (Ekou, 2013). While in poultry, the most common diseases affecting production include Newcastle disease, fowl typhoid, Salmonelloses among others.

b) The low animal productivity at producer level is caused by low genetic potential, poor feeding and animal health, low adoption of improved management practices and technologies, infrastructure for collection, storage and chilling of milk is extremely limited across the entire country, limited incentives for smallholders and loose milk traders to participate in the formal segment, unavailability and inaccessibility of essential services including extension services, financial services, input supply, and business development services and inadequate specialized animal breeders (Staal *et al.,* 2003; UBOS, 2009).

However, producers for the cattle livestock (dairy and beef cows) realize very good levels of profitability and thus high return on investment (in spite of the low productivity levels for the dairy enterprises). Therefore they have the capacity to demand for commercial finance and are thus Creditworthy (Centenary Bank, 2014).

c) The producers were constrained by productivity levels in terms of poor incentives to invest in the improvement of productivity due to low returns, drought problems, and unavailability and high costs of necessary inputs (Lukuyu *et al.,* 2009).

d) In poultry production, this level of production is majorly affected by the high cost of animal feeds of inconsistent quality and lack of consistent supply of quality day-old chicks (USAID, 2010). The inadequate supply of day-old chicks is attributed to inadequate parent stock and inadequate promotion of trade within.

e) The animal feed industry is underdeveloped, unable to ensure supply of quality feed all year round. The lack of quality controls and the failure by authorities to crack down all those selling and supplying fake agriculture inputs has let down pig farmers in Uganda (Tatwangire, 2014).

2.3.12 Processing level

a) Feed quality along the chain is affected due to use of unsuitable modes of transport; poor feed handling during transportation from one actor to another, poor storage across the chain and feed adulteration in transit as well as during repackaging by traders (Kisamba-Mugerwa *et al.,* 2006).

b) Wholesale traders are highly constrained by poor infrastructure and facilities such as dilapidated cold chain systems and poor road networks in rural areas. Meat processors are hampered with poorly constructed abattoirs and slaughter slabs, lack of facilities like weigh scales, saws and cold chain equipment, lack of appropriate technology in meat cutting and packaging and unhygienic environment (Centenary Bank, 2014; Mpairwe *et al.,* 2015).

c) Meat and milk processors are constrained by inadequate credit required to invest in processing meat and milk. This is attributed to low returns to investment, lack of collaterals and lack of awareness of existing credit windows. In addition, the processors are further constrained by the inadequate and low-quality supply of raw material to fully utilize installed processing machinery capacity (Kisamba–Mugerwa *et al.,* 2009).

d) This level is also constrained by low per capita consumption rates for livestock products due to limited awareness, culture and taboos resulting from inadequate knowledge on health and nutritional benefits of meat and inadequate financial capacity (Kilimo Trust, 2009).

e) East Africa has the most expensive electricity on the continent. Reduced water levels in the major water bodies such as Lake Victoria, River Nile and higher operational costs have affected the generation of power at the Owen falls dam, Bujagali hydroelectric power station among others. High electricity tariffs have eaten into the profit margins of the agro-processors. Sometimes the businesses remain at standstill in the absence of generators. Tushabomwe-Kazooba (2006) also adds on that this situation is alarming when it comes to businesses that deal in milk cooling. When power is cut off at night in the absence of automated generators, their situation is worsened

2.3.13 Marketing level

i. Livestock markets are operated on a four-tier system; farm gate, primary, secondary and terminal markets (Ayele *et al.,* 2003; Mpairwe *et al.,* 2015). However, this stage is characterised by high fixed transaction costs with no framework for market intelligence and clear information flow such as quality and quantity requirements, prices, delivery time needs. This limits the ability of actors to negotiate for competitive prices in the chain (Centenary Bank, 2014).

ii. Kilimo Trust (2009) observed that productivity, handling and processing are some of the intriguing constraints to the marketing and trade of livestock in Uganda. Other issues reported were the informality of livestock trade, high transaction costs, inadequate supportive infrastructure, heavy taxation, lack of classification and grading systems, poor hygiene of most outlets, unfair

competition from imported products, and limited business management capacity along the value chain.

iii. The key constraints that continue to affect pig farmers include; poor structure of pig industry, many traders participating at each stage of the supply chain; high transaction costs, lack of capital, lack of improved transport, and limited access to information which leave the majority of smallholder farmers out of higher-end markets of pig products (Tatwangire, 2014; Jagwe *et al.,* 2015).

iv. Seasonal availability of birds. The seasonal effects of price fluctuations depend on festive seasons, crop activities and disease outbreaks. Thus in a period when Newcastle Disease strikes, most farmers will sell most of their chickens (Mpairwe *et al.,* 2015).

v. At festive seasons such as Christmas, the prices will be higher due to increased demand (FAO, 2007).

vi. Lack of information on prices. The farmers depend on information given to them by traders and often the traders will want to maximize their own profits by offering as low a price as possible.

vii. Lack of streamlined marketing channels. Although farmers get information that chickens may fetch high prices in towns or if they were sold to institutions, they lack the capacity and economies of scale to gather enough stock for such a transaction (FAO, 2007).

viii. Market access and growth potential for a number of agricultural products is constrained by many factors including low purchasing power in producing areas, weak market chains, inadequate economies of scale, difficulties in linking small and medium enterprises (SMEs) with market buyers, difficulties in conforming to produce quality requirements, negative attitudes towards commercialization, and inadequate post-harvest handling facilities especially storage (Benin *et al.,* 2007; Kilimo Trust, 2015).

5. The opportunities available to address the above constraints

5.1 Introduction

Smallholder agriculture in Uganda continues to play a pivotal role in sustaining the food security status of farmers. Opportunities in the agricultural sector emanate from challenges such as climate change and variability, pests and disease, declining soil fertility, population pressure, land fragmentation and increasing produce/product demand (Salami *et al.,* 2010). Due to the complexity and spontaneity of some of these issues, innovation is imperative, it becomes a precursor to opportunities.

In the strengthening of food security and nutrition safety nets at national and decentralised levels. A wider gap exists for the establishment of a National Food and Nutrition Information System. This is one of the low hanging opportunity in the agriculture sector. The opportunities are hereby presented below:

5.2 Opportunities in the crop sub-sector

5.2.1 Producer level

a) The coffee value chain is supported by several policies that include Agriculture Sector Development Strategy and Investment Plan (DSIP, 2015/16 – 2019/20), Uganda coffee plan, Uganda National Coffee Regulations Statute1994 and the draft National Coffee Strategy. The sub-sector has also attracted support from various development partners, although more support is needed in the structuring of the chain, enforcing quality, developing storage facilities, combating the coffee wilt disease, and organizing marketing by producer enterprises (Kilimo Trust, 2012c)

b) Cassava is relatively resistant to drought with fewer post-harvest handling losses. The crop also has a long shelf life to sustain the smallholder farmers food needs (Hillocks, 2002).

c) Local consumption of coffee has experienced very modest gains. An increasing share of the market for coffee products consumed is slightly increased due to the availability of value-added coffee products and brands produced in Uganda like Star Café and Good African Coffee brands. Penetration of these products into the East African Community (EAC) market is still at its nascent stages but, have promising results so far (Kilimo Trust, 2012c)

d) Establishment of the single spine extension system that has created a pool of staff to facilitate technology dissemination and uptake (MAAIF, 2016). The system is a single decision-making process from the top (MAAIF), without subsidiary bodies sharing the final decision about what is to be done in extending agricultural services to the farmers in Uganda (EPRC, 2016)

e) Increasing use of urban agricultural residues/waste and up-coming residues/by-products from the oil industry, as an alternative to fertilizer production (Gold et al., 2004).

f) Diversification of demand. Urbanization and rapid economic growth in the country and many neighbouring countries have increased consumers' purchasing power, generated rising demand for food, shifted food demand away from traditional staples toward higher-value foods like fruits and vegetables (Salami *et al.,* 2010).

g) Availability of service providers in the bean segment. The National Agricultural Research Organisation, Uganda Grain Traders Limited, World Food Programme, NAADS and Uganda National Bureau Services have implemented programmes to promote bean production and marketing through enterprise development; market information and market linkages; research; advisory services and quality standards (MAAIF, 2010).

h) In Uganda, supermarket operators vertically integrate collection, distribution, and retail sale of food have made farmers more responsive to changes in prices and consumer tastes by linking customers and farmers more effectively (Salami et al., 2010).

i) Supporting sustainable coffee production. This should be done while at the same time appreciating the potential adverse impacts of climate change on the subsector. The benefits of the coffee subsector are dependent on the stochastic form of biotic and abiotic constraints that could increase due to climate change. For full benefits to be realized in the subsector, Uganda should invest in the adoption of climate change adaptation strategies to mitigate the negative effects of drought and floods.

j) There is increased access to appropriate finance by providing incentives for financial institutions in collaboration with other service providers (for example collateral managers and meteorology agencies) to develop agricultural finance products for farmers, including insurance products. Banks and development finance institutions endeavour, to ensure that products are conducive both to producers and exporters.

k) There is an enormous potential to invest in the growing of coffee especially in the northern parts of the country and double exports. The region has enough land to accommodate coffee plantations on a large scale.

l) Warehousing systems are inadequate. This subsector has an opportunity of establishing warehousing systems in different production areas important for storage and credit access

5.2.2 Processing level, Marketing and supply level

a) Current government's goodwill and commitment to providing infrastructure (roads, ICT and markets) for development. This has eased distribution and market penetration, while the use of local radio, mobile phones and the internet, has increased the avenues for timely and wider delivery of useful market information (AfDB, UNECA, and OECD, 2009).

b) Cassava has a long shelf life of chips and flour, growing demand by the beer and bakery industries in the manufacture of bread and alcohol. Substitutes imports of starch and ethanol.

c) For the traders, cassava supply has the potential to be increased especially in the northern parts of Uganda owing to land availability and there is growing demand from export neighbouring countries such as Kenya and South Sudan (Agriterra, 2012).

d) In key crop production, improvements of the feeder roads in the rural areas and roads in the urban areas to ease access to suppliers and the markets, increased multiplication of improved cassava varieties by NARO coupled with robust extension and advisory services from NAADS have been availed to boost production (Kilimo Trust, 2012a).

e) The Ugandan government has also subsidized electricity bills to encourage more SME's to venture into value addition of cassava including processing into high-quality cassava flour (HQCF), having contracts with suppliers, training on the post-harvest handling of cassava and increased production by the farmers (Kaijuka, 2007).

f) Processing opportunities prevail in the construction of bulking centres, collective marketing and procurement of trucks to facilitate transportation. Capacity building gaps also exit in order to improve quality of farm supplies, use of tarpaulins for drying cassava, procuring of processing small-scale factories to add value (Kilimo Trust, 2012a).

g) Strengthening business linkages at all levels of the chain to meet the growing demand. This has been enhanced to facilitate the capacity of value chain actors and enable a functional formal national and regionally integrated bean value chains to boost trade in beans and bean-food products (Nabbumba & Bahiigwa, 2003).

h) The processors have been facilitated through the provision of storage and drying facilities, enough training and sensitization on beans processing, financial institutions to provide credits at low interest, producers should increase beans production and the market should be developed for bean products

i) Opportunities exist in coffee processing and packaging for final products like instant coffee (Salami *et al.,* 2010)

5.3 Opportunities in the livestock sub-sector

5.3.1 Producer level

a) In diary production, the pronounced opportunities may include investment in Milk Collection Centre, investment in Supply Milk Tankers, investment in the unpackaged pasteurized milk distribution system, upgrade of Informal Actors into Mini Dairies and existing dairy plants, investment in integrated farming/processing dairy businesses and investment in transportation tanker cleaning facility. The Southwestern and Karamoja regions are in dare need of these opportunities if the smallholder farmers are to improve their livelihoods.

b) For poultry, the prevalent opportunities include the establishment of hatchery, commercial poultry farm, chicken slaughter and processing facility and the establishment of animal feed processing plants throughout the country (Agriterra, 2012).

c) The number of pigs imported in Uganda and pigs exported to various countries, including Kenya, Tanzania, Rwanda, Southern Sudan and D.R. Congo is still low. However, there is the potential for regional trade and exports of live pigs and pork products, especially in neighbouring countries is very high. By and large, the pig sector in Uganda is still dominated by the domestic market. An improvement in household income, quality of pork processing, and good pork marketing has increased demand for premium pork and pork products (Tatwangire, 2014).

d) Animal stocks in Uganda are still highest for cattle, followed by goats, pigs and are least for sheep. However, the increase in average production (in tonnes) has been mostly registered in pigs, followed by sheep, cattle, and is lowest in goat meat. The growth rate in pork and pork products provides the country with an opportunity to increase local consumption and exports of animal-sourced foods.

e) Cooperatives in Uganda, especially those involved in cash crops, successfully provided agricultural-related services to farmers until the mid-1980s. At that time, due to political instability, liberalization of markets, and mismanagement, among other reasons, almost all the cooperatives failed. However, a few survived, and cooperatives are enjoying a revival in Uganda. Due to their highly democratic and locally autonomous nature, cooperatives have a potentially strong role in reducing poverty and social exclusion and promoting rural and national development (Nana and Korugyendo, 2010).

f) Dipping of livestock in dip tanks as a practice to kill off ticks and nuisance flies is no longer undertaken in most districts of Uganda. Farmers have since then failed to dip their livestock resulting in high prevalence of ticks and tick-borne diseases. There is, therefore, need to rehabilitate and construct community dip tanks as a key intervention in the control of ticks and tick-borne diseases (Ekou, 2013).

5.3.2 Processing level

a) Kyeyamwa et al., (2008) in their study of structure and dynamics of livestock marketing in rural Uganda recommended a structured approach to livestock marketing, market infrastructure development, and emphasis on arbitration systems as specific ways of improving the efficiency of livestock marketing in Uganda and other developing countries.

b) There is a clear room for additional investments in ultra-high temperature processing (UHT) and powder milk facilities. These provide access to wider markets and reduce the need for immediate selling (Agriterra, 2012).

c) Pastoralists should be sensitized on the importance of market-oriented cattle production and the benefits of wealth storage diversification through workshops seminars, farmer – trader sharing platforms, radio programmes and extension education. Subsequently, cattle farmers will appreciate the importance of raising cattle such as steers specifically for beef production

that can easily be sold to generate higher incomes for investment in better business opportunities thus increasing their participation in cattle marketing and commercialisation of livestock production.

d) There is a need for the cattle keepers to form associations/cooperatives for collectively marketing their cattle to abattoirs. This will help them to reduce transportation costs by collectively transporting their cattle, negotiating better prices and contracts to supply directly to the abattoirs. Such efforts should include initiating, strengthening and supporting pastoral producer marketing associations (for example Uganda Beef Producers association - UBPA) and livestock trader - pastoralist associations to enable them access services such as advisory and credit facilities

e) There is a prerequisite to developing well-functioning information systems that are accessible and can effectively reach the widely dispersed producer populations with information on buyer preferences, animal and meat prices, livestock supply and demand levels within different regions of the country.

f) There is also a necessity for investment in areas such as improvement of road networks, transport systems and setting up modern market infrastructure (i.e. weigh stations and slaughter slabs/abattoirs) through increased public investment.

5.3.3 Marketing and supply level

a) The government's policy on liberalization of the economy is an opportunity in the livestock marketing system in most parts of the country. As result, considerable volumes of livestock have flowed through the various channels as smallholder producers attempt to get the utmost benefits from their marketed animals and competitive efforts on the part of traders to ensure the best possible deals (Ekou, 2013).

b) There is no clear-cut distinction between marketing and supply opportunities. A demand analysis of the livestock sector reveals a robust and growing demand, which would justify investment and trade both in the formal and informal segments (Agriterra, 2012) because of:
   i. High demand in the region (Sudan, Kenya, DRC, Middle-East and North Africa).
   ii. Current high product pricing and margins offer entry and competitive strategies, through low-cost production, and therefore, competitive price positioning.
   iii. The narrow range of product offerings offers more opportunities for innovative ideas.
   iv. The informal segment is attractive from its sheer size and opportunities in this channel are perceived more in the area of trade, through selling, implementing and servicing improved technologies for collection, quality checking, cooling, transporting and distributing to larger and smaller end users.
   v. Fast growing local consumer market through the growth of population and per capita income.
   vi. Exploitation of existing deficits of livestock and poultry products in the regional market (especially South Sudan and the Democratic Republic of Congo) using comparative advantages of EAC and COMESA arrangements.
   vii. Relatively less stringent sanitary requirements for regional export destinations.

6. The current institutional arrangements and stakeholders involved in setting policy agendas

6.1 Introduction

Agriculture remains the backbone of Uganda's economy, accounting for about 23.2% of Gross Domestic Product (GDP) (NDPII, 2015). However, productivity growth has stagnated due to the apparent weak political will to support agriculture, combined with price risk and generally non-conducive policies (AGRA, 2013).

Public sector economic functions are broadly categorised as (1) policymaking, (2) service delivery, and (3) oversight and accountability (AGRA, 2013), enshrined within an institutional framework. Once policies are developed, the government delegates their implementation to the various government agencies and departments responsible for the respective areas especially within Ministry of Agriculture Animal Industry and Fisheries (MAAIF) and Ministry of Water and Environment (MWE). Notably, policies, laws, and regulations though well formulated, unless implemented effectively, will not yield desired results – thus, necessitating a strengthening of responsible institutions including regulatory agencies to perform their duties. The incentives created by the policies, laws, and regulations shape the actions of public officials.

6.2 Current institutional arrangements

The National Agricultural Advisory Services Organization (NAADS) is a semi-autonomous public agency within the Ministry of Agriculture Animal Industry and Fisheries (MAAIF), was established with the aim to extend public agricultural advisory/extension services. During the period 1997–2001 a key institutional change took place that had fundamental implications for both research and extension services. This change began with the development of the Poverty Eradication Action Plan (PEAP) in 1997 and the subsequent adoption of this as the Poverty Reduction Strategy Paper for Uganda and emergence of Policy for the Modernization of Agriculture: Eradicating Poverty in Uganda (PMA) (Hall & Yoganand, 2004; Kibwika *et al.,* 2009).

NAADS has been supporting the development and strengthening of farmers' groups and farmer's forum as the institutional mechanisms through which individuals can access NAADS services and support. These farmer institutions are expected to increase the participation of people in the governance of their local and national agri-food systems (Ntambirweki-Karugonjo, & Barungi, 2012).

Household consumption surveys suggest that the downward trend in rural poverty indicators recorded in Uganda during the 1990s has been reversed since 2000. Ugandan government's strategy to reduce rural poverty, the Plan for Modernization of Agriculture (PMA) argues that PMA focuses on reducing absolute income poverty through increased agricultural productivity (Bahiigwa *et al.,* 2005).

Uganda has put in place a comprehensive framework for poverty reduction known as the poverty eradication action plan (Craig & Porter, 2003). A subcomponent of the PEAP, the plan for the modernization of agriculture (PMA) is designed to address the goal of reducing poverty in rural areas. Research findings show that rural poverty is strongly associated with lack of land and livestock, as well as inability to secure nonfarm alternatives to diminishing farm opportunities. Meanwhile, rural families encounter a rural taxation regime associated with fiscal decentralization that is basically inimical to the expansion of monetary opportunities in rural areas. A fundamental contradiction between the goals of PEAP/PMA and decentralized rural taxation is revealed (Ellis & Bahiigwa, 2003).

The government of Uganda and its development partners are targeting farmer groups as the vehicle for agricultural development because of the potential role they could play in promoting value addition, market and credit access (Benin *et al.,* 2007; Quisumbing & Pandolfelli, 2010). The use of the local language in publicity materials is also important in ensuring participation among the illiterate and the less educated. Overall, there is a need for concerted efforts by all institutions supporting groups to ensure that existing groups have improved access to agricultural technologies and noticeable outcomes are achieved so as to attract more farmers (Adong *et al.,* 2013).

In Uganda, land continues to be a critical factor, as it is the essential pillar of human existence and national development (Cheney, 2008). Uganda lacks a clearly defined and/or consolidated National Land Policy since the advent of colonialism in the nineteenth century. This National Land Policy was formulated to consolidate a number of scattered policies, which exist on various aspects of the land question but are diverse, sectoral and inconclusive in many respects. Post-independence and recent attempts to settle the land question by the Land Reform Decree 1975, the 1995 Constitution of Uganda, and the Land Act 1998 failed to deal with the fundamental issues in land tenure due to the absence of clear policy principles to inform the enactment of legislation that offers political, social and technically feasible solutions. The Government of Uganda has formulated a 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 (MLHUD, 2011). The policy provides guidance to all stakeholders to begin the transition from a peasantry-based society to a modern society where land is optimally utilised for growth and development.

The National Fertiliser Policy (NFP) brings together all the related fragmented regulations into a single and comprehensive policy framework on fertilizer (Ntege-Nanyeenya *et al.,* 1997; Bayite-Kasule, 2009). In the past, Government served as the central agency responsible for fertiliser importation and delivery to designated points in the country, until the liberalisation policy was adopted in 1990. During this period and thereafter, there have been policy and regulatory frameworks to control agricultural chemicals. Currently, the law in place is the Agricultural Chemical (Control) Act, 2006, which controls and regulates the manufacture, storage, distribution and trade in, use, importation and exportation of agricultural chemicals. However, this Act is broad and hence the need for a specific policy to guide stakeholders in increasing availability and sustainable use of fertilisers (MAAIF, 2016; NEAP, 2016).

The process of current institutional arranges in setting policy agendas is still on-going in the country despite few concerns and issues. However, this process calls for more inclusiveness of a range of stakeholders in the country and establishment of priority setting and technology development (Hall & Yoganand, 2004).

MAAIF has witnessed re-arrangements in its operational structure (Semana, 1999). For example, the Directorate of policy, planning and support services were created in 2016 to strengthen policy and planning functions. In addition to the department of agribusiness and sustainable markets were demarcated with the aim to improve the profitability of produce cultivated by the smallholder farmers. The restructuring processes have improved coordination between MAAIF and local government in implementing agricultural related projects that enhance agricultural production such as the construction of markets and roads.

The Constitution of the Republic of Uganda requires the state to encourage and promote good nutrition to build a healthy Uganda. It further mandates the Ministry of Health (MoH) and the Ministry of Agriculture, Animal Industries and Fisheries (MAAIF) to set minimum standards and develop relevant policies to ensure the provision of quality food and nutrition services in the country. Thereafter, a National Food and Nutrition Strategy was drafted, as was a Food and Nutrition Bill (2008) to put in place statutory regulations and institutions for implementing the Uganda Food and Nutrition Policy (UFNP), in particular, the Uganda Food and Nutrition Council (FNC) (Uganda Nutrition Action Plan, 2011-2016)

The health sector strategic plan II of 2005-2010 aims to reduce child hunger and emphasizes micronutrient supplementations throughout the country. The Uganda Nutrition Action plan for 2011-2016 was borne and has been operationalized. In addition, there is the promotion of appropriate agricultural technologies and crops that provide significant nutrition advantage by MAAIF.

Public education of agricultural programmes has been prioritized all over the country amongst all categories of farmers. For example, MAAIF has implemented an agricultural sector communication strategy. This has positively influenced the understanding, knowledge, positive attitudes and choices and increase media advocacy in improving agricultural productivity along the value chains.

Accurate agricultural statistics is vital in the national planning and development of the growing smallholder agricultural sector in Uganda (Appleton & Balihuta, (1996). A national food and agricultural statistics system has been created primarily for building sustainable and effective systems to produce annual and spatially disaggregated estimates of agricultural production in 2015. The system has

achieved documenting merits and demerits faced by the value chain actors and how they can be supported to increase agricultural production

6.3 Stakeholders

A variety of stakeholders are either directly or indirectly involved in setting the agricultural policy agenda of Uganda for the benefit of smallholder farmers. It must also be noted that some are only engaged in smallholder segments along the value chain. The stakeholder can be categorized as follows

Table 5: Some of the stakeholders involved in Uganda's agricultural production

Local/county	National	International
• Smallholder farmers • Model farmers • Traditional cultural institutions and faith based organizations • Processors	• MAAIF • Private sector • Civil society • Media • Non-Governmental Organisations • Financial institutions • Input dealers and suppliers • Agro-processors • Farm equipment dealers • Uganda National Farmers Federation • Uganda Cooperative Alliance • Uganda export promotion board • Uganda National Bureau of Standards • Universities and research institutions	• World Food Programme • Food and Agriculture Organisation • United Nations Development Programme • Japan International Cooperation Agency • European Union • German International Cooperation • Embassies, for example, China, the Netherlands among others • World bank

While the economy appreciates the support offered by the ever-growing number of stakeholders, few are engaged in setting the smallholder agricultural policy agenda and these are highlighted as follows:

a) The Ministry of Agriculture, Animal Husbandry, Industries and Fisheries is involved in managing and coordinating agricultural policy and coordinating the statutory bodies such as Uganda Coffee Development Authority, Uganda Cotton Development Organization, Dairy Development Authority, National Animal Genetic Resources Centre and Data Bank among others.

b) Private Sector has played an important role in helping the government review the national land policy. This policy is seen as a vehicle to move smallholder farmers from subsistence agriculture to commercial farming

c) The civil society continues to play an advocacy role in reminding government to allocate more funds to the agricultural sector according to the signed declarations, treaties and agreements such as the AU 2003 Maputo Declaration with to improve smallholder food security status

d) Development partners have continued to set the policy agenda in the agricultural sector through funding and providing technical support to the agricultural projects such as countrywide soil mapping and provision of milk cooling machines to farmer groups especially in the western part of the country. The partners have also funded the review of international, regional and bilateral protocols and agreements.

e) The traditional, cultural and faith-based organizations have helped to mobilise farmers to access credit, farm inputs and markets. They have also added a helping hand in monitoring government agricultural programmes. In addition, they have contributed to the review of proposed agricultural policies.

7. Outcomes of policies, programs and strategies targeting local and regional variations in conditions for agriculture and food security in Uganda: Lessons and gaps.

7.1 Introduction

In Uganda, the agriculture sector has been guided by a number of institutional and policy frameworks, which have raised concerns over policy consistency and their impact on sector performance. This section lays out the key policies/programs and strategies that guide the agricultural and food security conditions in Uganda.

7.2 Key Policies/programs and strategies

7.2.1 Sustainable Development Goals (SDGs)

Through the implementation of the Agriculture Sector Strategic Plan (ASSP) (MAAIF, 2016), National Agriculture Policy and National Fertilizer Policy, National Agricultural Extension Policy, the government through MAAIF is striving over the medium term, to attain the following Sustainable Development Goals (SDGs):

- Goal 1. End poverty in all its forms everywhere;
- Goal 2. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture;
- Goal 6. Ensure availability and sustainable management of water and sanitation for all;
- Goal 12. Ensure sustainable consumption and production patterns;
- Goal 13. Take urgent action to combat climate change and its impacts.

7.2.2 Comprehensive Africa Agriculture Development Programme (CAADP)

The CAADP is a growth-oriented agricultural development agenda of the African Union (AU) and the New Partnership for African Development (NEPAD, 2004) aimed at increasing agriculture growth rates to 6% per year to create the wealth needed for rural communities and households in Africa to prosper.

Government through the ASSP is actualizing all the four pillars of the CAADP (CAADP, 2008) as follows:

a) CAADP Pillar 1 - Extending the area under sustainable land management and reliable water control systems and CAADP Pillar 3 – Increasing food supply, reducing hunger, improving responses to food emergency crises in the context of increasing production and productivity through various interventions under the ASSP strategic themes on sustainable land management and increasing water for production;
b) CAADP Pillar 2 – Improving rural infrastructure and trade-related capacities for market access through prioritisation of specified value chains including value addition; and,
c) CAADP Pillar 4 – Improving agriculture research, technology dissemination and adoption through prioritization of agricultural research and technology dissemination and adoption.

7.2.3 Vision 2040

Vision 2040 recognizes that agriculture is among the strategic opportunities that need to be strengthened to accelerate the growth of the economy. Indeed, Vision 2040 policy identifies agriculture as (a) a major contributor to the gross domestic product (GDP); (b) a key source of employment for the labour force in the country; and (c) as a sector whose labour productivity will have to increase. It aims at transforming Uganda from a predominantly peasant and low-income country to a competitive upper middle-income country by 2040.

7.2.4 Second National Development Plan (NDPII)

The National Development Plan (NDP) II 2015/16 - 2019/20 is the successor to the NDP I. Its goal is to attain middle-income status by 2020. This is to be realized through strengthening the country's competitiveness for sustainable wealth creation, employment and inclusive growth by pursuing a private sector-led, export-oriented and quasi-market approach. The plan has four objectives, namely:

a) Increasing sustainable production, productivity and value addition in key growth opportunities;
b) Increasing the stock and quality of strategic infrastructure to accelerate the country's competitiveness;
c) Enhancing human capital development; and
d) Strengthening mechanisms for quality, effective and efficient service delivery

Over the NDP-II period, the Government of Uganda (GoU, 2016) is targeting to increase agricultural exports to USD 4 billion by 2020 from USD1.3 billion in 2015 and halving the labour force engaged in subsistence production from six to three million (Katunze & Kuteesa, 2016). Over the 5 year period, the key focus areas include: increasing production and productivity. The plan also intends to address production challenges such as increasing access to critical farm inputs, increased and more efficient mechanization and increased access to and availability of water for agricultural production; improving agricultural markets and value addition in the 12 prioritized commodities and institutional strengthening for agricultural development (Kajumba & Karani, 2015).

7.2.5 Operation Wealth Creation

The government of Uganda through Operation Wealth Creation (OWC) programme, emphasizes that national policies, interventions and programs aimed at transforming agriculture from subsistence to commercial agriculture with a target of raising household incomes to a minimum Uganda shillings 20 million per household per year. Significant attention is given to generating and disseminating improved research through the National Agriculture Research Organization (NARO) and the revamped National Agriculture Advisory Services (NAADS) – which is currently responsible for procurement and distribution of improved agro-inputs and technologies. Indeed, Operation Wealth Creation complements efforts to achieve the NDP II and ASSP objectives.

7.2.6 Uganda National Agriculture Policy 2011

The policy is meant to guide the agricultural sector and provide anchorage for all agriculture-related sub-policies, policy frameworks and strategies – existing or to be formulated in the future. It also aims to achieve food and nutrition security and improve household incomes through coordinated interventions that focus on enhancing sustainable agricultural productivity and value addition. Furthermore, the policy looks at providing employment opportunities, and promoting domestic and international trade through six inter-related strategic objectives, namely:

a) Ensure household and national food and nutrition security for all Ugandans;
b) Increase incomes of farming households from crops, livestock, fisheries and all other agricultural related activities;
c) Promote specialisation in strategic, profitable and viable enterprises and value addition through agro-zoning;
d) Promote domestic, regional and international trade in agricultural products;
e) Ensure sustainable use and management of agricultural resources;
f) Develop human resources for agricultural development.

7.2.7 National Agricultural Extension Strategy

This National Agricultural Extension Strategy is a five-year plan for extension service development that began in FY 2016/2017 and continuing until FY 2020/2021. Ineffective agricultural extension service delivery limits the wide-scale adoption of appropriate and sustainable agricultural technologies that are essential for increasing production, productivity, incomes, exports, and food security. The new strategic direction is to transform extension from a system of parallel institutionally fragmented public and non-state actors to a well-coordinated, harmonized, regulated pluralistic service with multiple providers addressing diverse needs. One of the core principles of this strategy is that the provision of agricultural extension shall continue to be a decentralized function with MAAIF providing technical support and backstopping in line with the decentralization policy.

7.2.8 Uganda Nutrition Action Plan

Uganda's Development Strategy, Investment Plan and the draft National Agriculture Policy recognize food and nutrition security as key factors for the country's social and economic development. Also, nutrition and food security have become central components in the draft School Health Policy, the draft

School Feeding Policy Guidelines, and the National Orphans and Other Vulnerable Children Policy (Uganda Nutrition Action Plan, 2011-2016).

7.3 Policy impacts and lessons learned

Most of Uganda's policies have not been fully implemented; thus, assessing their impacts is rather indirect. However; their impacts on the agriculture sector can be mirrored through a number of lessons learnt and these include:

7.2.1 Enabling agricultural environment

Uganda has created a conducive agricultural environment that supports economic and agricultural growth aimed at reducing food insecurity for example, agricultural equipment imported into the country is exempted from domestic taxes since 2010 (MAAIF, 2016a). In order to address issues raised by sector actors, the Government regularly conducts reviews of policies and their implementing regulations and strategies to address issues raised by sector actors. Additionally, through the Agriculture Sector Strategic Plan (ASSP), the government is piloting a weather index insurance to mitigate crop production risks (MAAIF, 2016). It is also strengthening the physical infrastructure for transportation, distribution, storage and handling of agricultural inputs.

7.2.2 Provision of agricultural incentives

To help smallholder farmers reduce production losses, there is need to put forward transparent policies that will improve/provide incentives to the key players in the agricultural sector involved in the value chain. In this regard, under the ASSP, the government is piloting a commercialization fund to enable individual farmers or farmer groups to acquire necessary production equipment, processing facilities and technical skills on a competitive basis. The fund seeks to support enterprises that catalyze technology upscaling such as maize shellers, promote institutional development for joint marketing and enhance the development of market infrastructure and agro-processing (Francis & James, 2003).

7.2.3 Food security improvements

The seasonal food security gains recorded in the country arise from an improvement in smallholder agriculture, rapid urbanization and education (Uganda Nutrition Action Plan, 2011/2016). Maize was previously grown mainly for household consumption but it's now a commercial crop for many smallholder farmers. Corn is sold to schools, World Food Program and neighbouring countries such as Kenya, Rwanda, South Sudan among others. This shift from subsistence to commercial farming is characterized by increased use of modern (hybrid or open-pollinated) seed varieties, proper spacing and use of fertilizers by a good number of both small and large-scale farmers.

7.2.4 Institutional and stakeholder overlaps

Poor institutional planning in terms of jurisdiction and obligation are still prevalent in the institutional framework of Uganda. This situation has seen duplication of roles amongst the stakeholders such as between the central government and local government; in addition to the concentration of powers, there is the existence of land overlapping rights under institutional constraints/overlaps that affect agricultural production (Hickey, 2013). Also what protrudes out of this study is that most of the stakeholders are less informed of their mandates and operational policy frameworks. However, a profitable agricultural sector can only be attained if all stakeholders (producers, farmers, processors among others) are involved in all stages of the agricultural value chain.

7.2.5 Establishment of farmer field schools

Smallholders wholly benefit from collective actions taken at any stage of the agricultural value chain. For example, the development partners such as FAO have funded the formation and operation of Farmer Field Schools (FFS) to facilitate farmers cope with drought through seed multiplications, irrigation, and construction of valley dams and provision of drought-resistant crop varieties in districts such as Mubende, Kiboga among others (Erbaugh *et al.,* 2010; Fris-Hansen *et al.,* 2014). The FFSs have brought together farmers with same needs and skill gaps, however, a more strategic approach is needed that includes smallholder farmers countrywide.

7.2.6 Monitoring along agricultural value chains

The processors continue to find difficulties to trace the owners, origin and health of any animal or crop products supplied by most smallholder farmers such as coffee. The traceability systems are inadequate

to help the traders control the quality of products supplied. The farmers are limited to packaging and labelling materials of commodities in addition to marketing and certification by standards bodies.

7.2.7 Policies, strategies and programs

The following lessons from years of implementation of a number of government policies, strategies and programs, have been made and should inform the review of existing as well as the development of future policy instruments (MAAIF, 2016).

a) Involvement of community-based seed producers in planting material and seed production of quality declared seeds (QDS) expedites multiplication, ownership and access to improved seeds and planting materials.
b) Commitment, goodwill and support from national and grassroots political leaders are critical in the promotion of technology uptake.
c) Market availability can trigger enormous supplier response.
d) Smallholder farmers can utilise bank facilities for agricultural development and with technical support and appropriate loan product, and have the capacity to repay their loans.
e) Despite the development of physical infrastructure is challenging, it is much easier than the development of effective farmer lead management structures.
f) Establishment of national, regional and district level platforms enhances commodity promotion, and motivation of staff in the agricultural sector is critical in enhancing their work.
g) Proactive engagement with key stakeholders is important in resolving issues of concern in implementation.
h) Use of appropriate agricultural mechanisation technologies is greatly hindered by poor extension services, lack of financial capacity, inadequate skills development and poor marketing system.
i) There is low budgetary allocation by the Ugandan government to invest in agriculture despite the signing of Declarations and agreements such as the African Union agreed to increase national budgets with 10% of the agricultural sector and AU 2003 Maputo Declaration on Agriculture and Food Security
j) Pork is not one of the 17 strategic commodities that are addressed under the DSIP framework and Agricultural Sector Strategic Plan 2015/16-2019/20
k) Vision 2040 seeks to advance the establishment and strengthening of early warning systems and disaster preparedness and management related infrastructure
l) The policies and programs highly favour large-scale farmers such as accessibility to land, tax exemption despite the investments made in the agricultural sector

7.2.8 Adoption of regional strategies

Uganda adopted the African Regional Nutrition Strategy of the African Union. The strategy's main focus is to advocate for a renewed commitment to nutrition, intensify member states' efforts to sustainably address malnutrition in the wake of the worsening nutrition status of vulnerable groups across Africa, and stimulate actions at national and regional levels that result in improved nutrition outcomes.

Uganda has also adopted the Comprehensive Africa Agriculture Development Programme (CAADP), an African Union-driven initiative for substantially improving agricultural production. Nutrition and food security are one of the four pillars of the CAADP (Uganda Nutrition Action Plan, 2011-2016).

7.4 Gaps that remain

a) Financing. Over the years, there has been a widening gap between the NDP Medium Term Expenditure Framework and the approved share for agriculture. For example, the target for percentage agriculture to the total domestic budget was projected to increase from 4.7% in 2011/12 to 5.2% in 2013/14; instead, it was reduced to 3.3%. This means the sector has remained underfunded; thus, the dismal growth rate.
b) Intra and inter-sector coordination. Poor coordination of sector activities emanating primarily from poor communication among sector stakeholders has led duplication of interventions. The limited sharing of information has led to the existence of many islands of success, while in the wider context, minimal improvements are visible.
c) Increased farm productivity. Smallholder farmers need to embrace the adoption of improved seed varieties, trained on better agronomic practices, access climate information and form cooperatives if there to realize tangible benefits from agricultural production.

d) Post-harvesting handling. Improvements in the post-harvesting handling and value addition need to be comprehensively carried out throughout the country and the farmers trained on value addition in addition to facilitating them procure small processing equipment
e) Strengthening market linkages. Smallholder farmers hardly access market information, limited promotion of collective markets and existence of a weak relationship between farmers and traders
f) Nutritional gaps are still large in supporting households and communities to increase access to and consumption of diversified foods throughout the year through their own food production or purchased foods.

8. Conclusions

This report intrinsically reveals that from the local and regional variation of crops and livestock reared, coffee, bananas, maize, beans, cassava and rice are the key crops grown while cattle, goat, pigs and poultry are the most reared livestock by the smallholder farmers. Regionally, coffee and banana are highly productive in the highlands found in the eastern (Mt. Elgon) and Western (Mt. Rwenzori) regions while the remaining crops have flourished in the flat plains and valleys (wetlands). For livestock, the cattle corridor (dry land) that stretches from north to south-west Uganda has the highest numbers of livestock.

Despite the local and regional variations, the agricultural sector is embroiled with constraints that have hampered productivity at the different levels (producer, processing and marketing) of the agricultural value chain. For instance, in the cultivation of key crops, the notable constraints include pests and diseases, unpredictable and unfavourable weather conditions, limited access to improved cassava varieties for planting and high labour costs. While in animal and bird production, the notorious hindrances include low animal productivity due to low genetic potential, poor feeding and animal health; low adoption of improved management practices and technologies; inadequate infrastructure for the collection, storage and chilling of milk. Other constraints include limited incentives for smallholders and loose milk traders to participate in the formal segment; unavailability of and inaccessibility to essential services including extension services, financial services, input supply, and business development services; and, inadequate specialized animal breeders.

In response to constraints faced in crop growing the opportunities include provision of improved farm inputs and agrochemicals to farmers at a reduced or subsidized rate, linking of farmers to reliable markets, supporting farmers to enable them access improved farm tools and equipment's and linking of farmers to financial or credit institutions in order to meet the necessary costs of production. Whereas in livestock production, the prevalent short and long-term opportunities include investment in Milk Collection Centres, investment in the supply of milk tankers, investment in unpackaged pasteurized milk distribution systems. Other opportunities include upgrading of Informal Actors into Mini Dairies and existing dairy plants, investment in integrated farming/processing dairy business and investment in transportation tanker cleaning facility

For the part of formulated policies and programs, the agriculture policy framework has been formulated against the backdrop of the Plan for Modernizing Agriculture (PMA), which is a multi-sectoral policy framework for agriculture and rural development. Before the formulation of the PMA, agricultural interventions were scattered and there was no comprehensive policy framework to guide the sector. Between the late 1980s to mid-1990s, dismantling state-controlled marketing boards was the most significant policy reform. This created opportunities for the private sector to perform the marketing function much more efficiently than government parastatals.

9. Recommendations

The interventions in the agriculture sector should focus on improving agricultural productivity.. In this regard, the following interventions are imperative

a) Support and promote proven technological and institutional innovations that provide an incentive for private and public-sector investments in agricultural research and development in order to unlock smallholder potential.
b) Formulate and operationalize a multi-disciplinary platform to facilitate harmonisation of various activities within the agriculture sector.
c) Build an inventory/database of qualified experts in the country. This will enable examination of available expertise within Uganda's crop and livestock sub-sectors. This database will serve as an informative decision support tool in designing the requisite capacity building programme.
d) Develop a strategy for up-scaling best practices from islands of success to the entire agriculture landscape.
e) Enhance traceability, quality and marketability across all the three agriculture sub-sectors by supporting formulation and enforcement of by-laws at all levels of the value chains. This should be augmented by advocating for better enforcement of available seed regulations.
f) Organizing farmers in groups/cooperatives are more likely to improve their bargaining power for better prices, which would translate into better income levels and reduced poverty.
g) Livestock-related innovations, such as milk preservation and cross-breeding with the indigenous breeds, are more likely to increase production and also to get animals that are resilient to the changing climate and diseases capable to sustainably supply the households with food and income needs.
h) This can presently be illustrated by the rising numbers of roadside markets selling roasted goats meat along the major highways, where a number of job opportunities have been created. In this situation, because goat rearing is not capital intensive, it offers an opportunity for the smallholder farmers to enhance their income levels through the sale of this clearly valuable agricultural animal. In addition, care must be taken by the potential farmers to understand the goat variability in body measurements across sex, age and breed/ecotype and that these measurements can be exploited in predicting live body weight and hence the economic value of goats. The country has a tremendous potential and better future prospects for chicken production and development if the sub-sector can be well structured. Transforming existing production system to semi-intensive and market-led production could save many households from poverty. Subsequently, the poultry sub-sector will be one of the major sources of money and nutrition.
i) Smallholder farmers should be trained and supported to incorporate integrated nutrient management practices in their farmlands to reclaim degraded soils and improve yields that will realize their food security
j) Strengthen the policy and legal framework for coordinating, planning and monitoring nutrition activities in the country. Strengthening is most likely to lead to enactment of the Food and Nutrition Bill and establishment of food and nutrition monitoring and evaluation system for tracking the performance of nutrition indicators and for timely decision-making

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