

## Value Chain Analysis of cow pea, groundnut & soy bean in Sierra Leone



**Thesis submitted in partial fulfilment of the requirements of the Degree of Master in  
Agricultural Production Chain Management, specialisation Horticulture Chains  
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**Dedicated**

**To**

**Nassim (8) and Modou (7)**

**My adopted son and nephew both died by drowning on**

**The 7<sup>th</sup> August 2012.**

**We love you and miss you.**

**R.I.P**

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## **ABBREVIATIONS**

<b>ABC</b>	Agricultural Business Centres
<b>AEO</b>	African Economic Outlook
<b>AHTS</b>	Agricultural Household Tracking Survey
<b>CAADP</b>	Comprehensive Africa Agriculture Development Programme
<b>CARE</b>	Cooperative for American Relief Everywhere
<b>DAO</b>	District Agricultural Officer
<b>FBO</b>	Farmer Based Organisation
<b>FINIC</b>	Fomel Industry and National Industrialisation Centre
<b>ICRISAT</b>	International Crops Research Institute for the Semi-Arid Tropics
<b>IITA</b>	International Institute of Tropical Agriculture
<b>MAFFS</b>	Ministry of Agriculture Forestry and Food Security
<b>MOE</b>	Ministry of Education
<b>NSADP</b>	National Sustainable Agriculture Development Plan
<b>NGO</b>	Non-Governmental Organisation
<b>PEMSD</b>	Planning, Evaluation, Monitoring and Statistics Division
<b>PPB</b>	Project Peanut Butter
<b>RPSDP</b>	Rural Private Sector Development Project
<b>RUTF</b>	Ready-To-Us Therapeutic Food
<b>SLARI</b>	Sierra Leone Agricultural Research Institute
<b>SLL</b>	Leone
<b>USAID</b>	United States Agency for International Development
<b>WAAPP</b>	West Africa Agricultural Productivity Program
<b>WHH</b>	Welt Hunger Hilfe

## **Currencies**

1.00 EUR = 5.300 Leone (SLL)

1.00 USD = 4.150 Leone (SLL)

## ABSTRACT

Dissemination of legume technologies to Sub-Saharan farmers by NGOs and research institutes has stimulated farmers to grow grain legumes, thereby providing farmers with substantial harvest and income. During the second quarter of 2012, N2AFRICA a project that provides farmers in Africa with technologies to grow grain legumes extended their project activities to Sierra Leone. N2AFRICA provided Sierra Leonean small scale farmers with the following grain legumes; groundnuts, cowpeas and soybeans, because these legumes are rich in protein and have the ability to fix nitrogen to the soil. After production some of these legumes are consumed by the farmers and the rest is sold. Therefore N2AFRICA decided to research the value chains of the mentioned legumes from inputs to the final consumer. This research investigates the value chains of the groundnut, cowpea and soybean in Sierra Leone.

The research identifies the functions, actors, supporters and influencers in the above mentioned chains. The roles of the various actors and their relationship were also taken into consideration and the identification of market opportunities of these crops was also considered. The study was carried out in Freetown, Makeni, Kambia, Kabala, Bo and Njala. These are the areas associated with the cultivation of the mentioned crops. The duration of the research was six weeks. The chosen methodology was the use of key informants, experts in Sierra Leone, supported with literature and a checklist used in semi structured interviews. The tools used during the research were the Rapid Market Appraisal, Value Chain Map and Estimating Cost and Margins. The rapid market appraisal aids in designing a market model within a limited time frame, however prior knowledge of the sector is required. The value chain map aids in visualizing the sector, by identifying the different core processes, the actors, the supporters and enablers in the sector. The estimation of cost and margins gives an overview of the cost secured by the actors in the chain. It was found that the Ministry of Agriculture Ministry of Agriculture Forestry and Food Security (MAFFS) and Non Governmental Organisations(NGOs) donated inputs such as seeds, tools and agro processing equipment as gifts to farmers and research institutes provided farmers with improved seeds.

It was found that the producers of groundnuts can be divided into three groups; independent small scale farmers, Farmer Based Organisation (FBOs) and a commercial farmer, of which, the major producers are small scale farmers. The results indicated that groundnut production contributes the most to the agricultural sector followed by cowpea; the current contribution of soybean is zero as there is no soybean production in the country outside the research trials and seed multiplication.

After harvesting, value addition of the mentioned legumes is minimal. In the case of groundnuts, most of the farmers prefer to sell the unshelled groundnuts at the farm as seeds to seed dealers and as grains to merchant traders because of the following factors; inaccessible roads to the farms and the farmers lack the funds to purchase groundnut shelling equipment from agro –dealers. However the MAFFS and NGOs are in the process of providing farmers with value addition equipment. However the merchant traders, market women and small scale processors are involved in the value addition. In the groundnut chain the market trader adds 45% value to the crop, by grinding it into a paste and in the cowpea chain the farm adds 43% value to the crop by cultivating, drying and packaging the beans.

It was found out that there are no standardized processors in the country. This can be considered an opportunity for FBOs and others interested in the agricultural sector, as these grain legumes need to be processed into semi-finished products for the food producing companies and poultry farms in the country. However there was a difference between farmers the food producing companies and poultry farmers with regards to production and market opportunities, the farmers stated their willingness to produce provided they are granted the inputs and that the food producing companies and poultry farmers are willing to buy their produce. The food producing companies and poultry farmers stated that they are in need of farmers to produce large volumes with required quality standards but unable to come in contact with farmers. This gap can be corrected by value chain experts assigned to NGOs and the MAFFS linking farmers with the food producing companies and poultry farmers interested in the mentioned grain legumes. Thereby providing farmers with market opportunities and fulfilling the wishes of the food producers and poultry farmers.

# 1. INTRODUCTION

This chapter describes the research, the problem, the objective of the research, questions that would serve as a guide throughout the research. The expected outcome, the conceptual framework, limitation of the research and the methodology applied to conduct the research.

## 1.1. Justification

*“Grain legumes are a key source of nitrogen-rich edible seeds, providing a wide variety of high-protein products and constituting the major source of dietary protein in the diets of the poor in most parts of sub-Saharan Africa. Legumes such as groundnut and soybean are also major sources of edible oil and other industrial by-products. The ability to fix atmospheric nitrogen makes legumes excellent components within the various farming systems because they provide residual nitrogen and reduce the needs for mineral nitrogen fertilizers by associated non-legumes.”*(N2AFRICA, 2012)

N2AFRICA a project that provides farmers in Africa with grain legumes, decided to extend this project to Sierra Leone. Sierra Leone is a country on the West Coast of Africa with an area of 72,300 Km<sup>2</sup> of which 5,400,000 Ha is arable land that is cultivated predominantly by small holder farmers. As in all cases with subsistence farming, the crops cultivated are consumed by the farmers and the rest sold. Therefore N2AFRICA decided to research on the value chains of the mentioned legumes from inputs to the final consumer because subsistence farmers are entangled in chains with little prospects of development. Support from NGOs, research institutes will provide them the opportunities to explore new market opportunities.

## 1.2. Research problem

In order to be efficient, with regards to the product and services N2AFRICA has to offer and also gain better insight into the agricultural sector of Sierra Leone, knowledge on the value chains of the following grain legumes; groundnut, cowpea and soybean are of vital importance.

## 1.3. Research objectives

To provide an overview on the value chains of the following grain legumes; groundnut, cowpea and soybean for the Sierra Leonean market

## 1.4. Research questions

- 1 What are the existing chains of the following grain legumes: groundnut, cowpea and soybean in Sierra Leone?
- What are the functions in the groundnut, cowpea and soybean chains?
  - Who are the actors, supporters and influencers in the groundnut, cowpea and soybean chains?
  - What are the roles of the various actors and supporters in the groundnut, cowpea and soybean chains?
  - Is there are relationship between the various actors in the groundnut, cowpea and soybean chains?
  - Is there coordination in the groundnut, cowpea and soybean chains?

- Who are the coordinators of the groundnut, cowpea and soybean chains?
  - What are the costs along the groundnut, cowpea and soybean chains?
  - Where the most value is added in the groundnut, cowpea and soybean chains?
- 2 *What are the market opportunities for groundnut, cowpea and soybean chains in Sierra Leone?*
- Are these crops, producers driven or consumer driven?
  - What are the constraints in the groundnut, cowpea and soybean chains in Sierra Leone?
  - What are the opportunities in the groundnut, cowpea and soybean chains in Sierra Leone?

## 1.5. Research conceptual framework

A value chain consist of actors and supporters in an enabling environment coming together to produce a product that fulfills the demand of a certain market. The actors may include input suppliers, producers, traders, processors, transporters, wholesaler, retailers and final consumer. As depicted in Figure 1

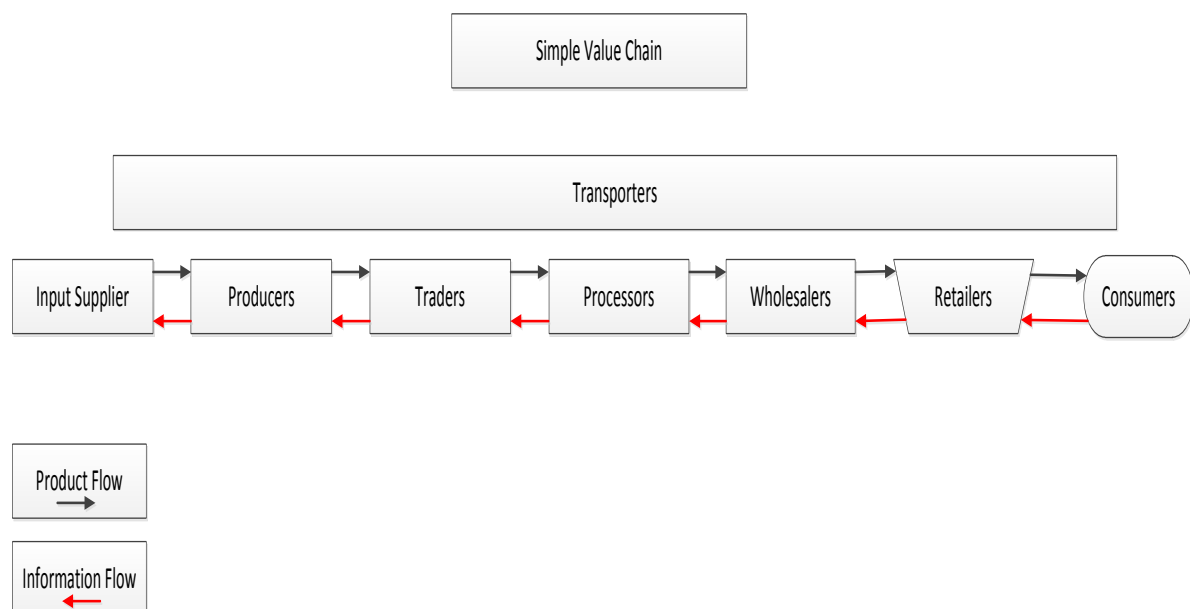


Figure1: Simple Value Chain

Source: Illustrated by Mike Johnson 2012

The research will also focus on the actors, supporters, and the enablers or influencing environment of the mentioned grain legumes in Sierra Leone, indicating the relationship between the various actors, economics with regards to production and value addition of the various actors. Constrains and solutions in providing market opportunities for the mentioned grain legumes in Sierra Leone.

## 1.6. Limitation of the research

The research addressed the questions pertaining to the value chain and market opportunities of grain legumes in Sierra Leone. However there were limitations and constrains. First and foremost,

the six weeks period allocated for the research was not enough to conduct a value chain analysis on three crops. Secondly the timing was not appropriate as it was during the rainy season, resulting in limited access to some of the stakeholders, also during the period of 23<sup>RD</sup> July –3<sup>RD</sup> August 2012 the DAOs other members of the MAFFS and other stakeholders in the agricultural sector were involved in series of workshops and evaluations pertaining to the sector. Thirdly there has been limited research done on the mentioned legumes with regards to market opportunities because they are not amongst the staple foods, with the exception of groundnuts. Fourthly some of the stakeholders were unable to provide the necessary information with regards to quantitative data, because they lacked the data due to poor record keeping, not knowledgeable or unwilling to give the right answers. Therefore the data that cannot be considered credible but provides an overview of the sector and the level of value addition in the chains. Therefore more information on quantitative data pertaining measurements, prices and cost would help to establish a greater degree of accuracy on this matter.

## **1.7. Methodology**

First and foremost the relevant literature was reviewed based on the research question, this was done by going through; journals, scientific books ,reports of existing groundnut, cowpea and soybean value chains in Africa, information on the statues of agriculture in Sierra Leone and other information relevant to the research. The research was carried out in Freetown, Makeni, Kambia, Kabala, Bo and Njala. These are the area associated with the cultivation of the mentioned crops. During the six weeks period, commencing from the 17<sup>th</sup> July-23<sup>rd</sup> August 2012, semi structured interviews were conducted with the following stakeholders; two seed dealers, one agro dealer, heads of three FBOs, one commercial farmer, one merchant trader, one small scale processor, two market traders, two petit traders, two food processing companies, two poultry farmers, one DAO, four extension workers of NGOs involved in the groundnut and cowpea sectors and the extension director and staffs of the MAFFS. The topics covered were, input supply, production, post-harvest handling, transportation, trade, information exchange and challenges involved in the groundnut, cowpea and soybean chains. A checklist (appendix) served as a guide for the discussions with the key informants. The tools used during the research were the rapid market appraisal, value chain map and estimating cost and margins.

- Rapid Market Appraisal

This tool aids in designing a market model within a limited time frame, but requires prior knowledge of the sector, based on information provided by stakeholder in the sector, potential stakeholders or other organisations active in the sector. This tool segments the market into three levels: The market chain, (dis) enabling environment and market services as depicted in Figure 2. This tool is divided into two parts;

Building the Market Model consists of the following;

- Identification of all the stakeholders in the present market chain, beginning from production and ends with the consumer.
- Identification of external factors impacting the chain.
- Identification of market services that would assist in the development of the chain

Using the Model to Develop a Market- Based Programme consists of the following;

- Identification of the beneficiaries
- Identification of potential intervention strategies
- Identification of facilitator for the intervention strategies.

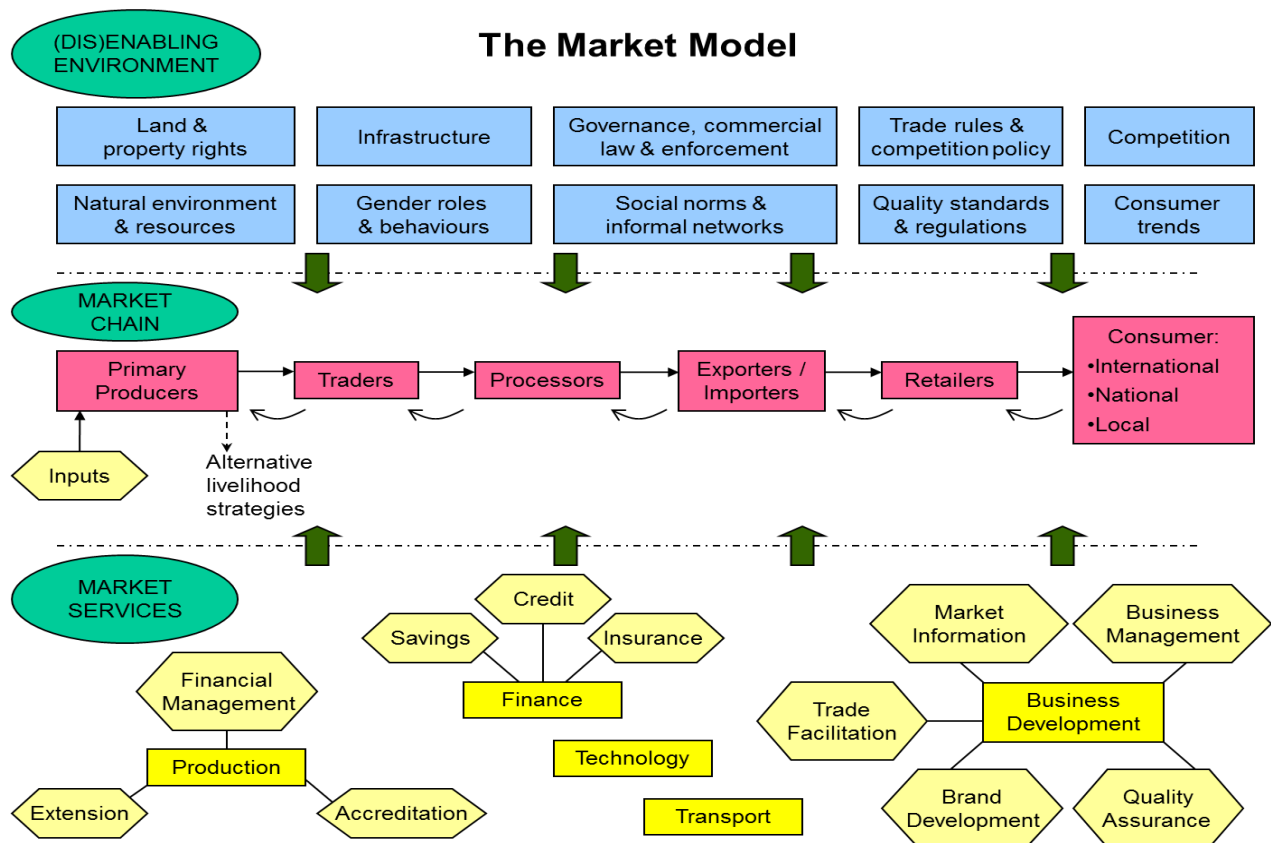


Figure 2: The Market Model

Source: Lecture notes Value Chain Development, VHL 2011

- Value Chain Map

The value chain map is a tool that aids in visualizing the sector, by identifying the different core processes, the actors, the supporters and enablers in the sector. The map also identifies the processes and the roles of the actors. E.g. input suppliers are seed dealers, agro processors, the producers are farmers of different categories such as small scale farmer, medium and commercial farmers. It also indicates the flow of products, information and knowledge in the chain, the volume of products, its origin and end destination, and the number of actors involved. It goes on further to indicate where value is added and the relationship that exist between the actors, supporters and enabling environment.

- Estimating Cost and Margins

The estimation of cost and margins gives an overview of the cost secured by the actors in the chain. Such as the operational cost, this can be divided into the actor's variable costs and fixed costs. The cost and prices mentioned in the research were provided by a formal seed dealer, three farmers in Kambia, Kabala and Bo an extension officer, a merchant trader, two market traders and food sellers. This tool goes on further to indicate the monetary flow and the added value contributed by the various actors in the chain, their selling price, cost, profits and margins, as previously mentioned in the limitations of the research the data on price cannot be considered credible but provides an overview on the level of value addition in the chains.

## **1.8. Outline of report**

This report contains nine chapters, the first of which is presented here; inclusive of the research setting, the approach, the research objectives, questions, limitations, methodology and tools used in the research.

The report continues in chapter two with the literature review and the country overview and the significance of the agricultural sector in Sierra Leone. Chapters three, four, five and six presents the results and constraints on the groundnut, cowpea and soybean chains with regards to market opportunities.

Chapter seven discusses issues of concern in the mentioned chains. Chapter eight concludes with an overview of the research and chapter nine provides information on market opportunities, potential uses and some recommendations for the development of the value chains of the mentioned grain legumes.



## **2. LITERATURE REVIEW**

This chapter gives an insight into the relevant literature pertaining to the research problem. Such as literature on value chains and markets in Africa, the country overview, explain the significance of the agricultural sector, production areas, yield of the mentioned legumes in Sierra Leone and last but not the least background information on the mentioned legumes in the international market.

### **2.1. Value chain and markets in Africa**

The cultivation of grain legumes will aid in the possible replacement of expensive chemical fertilizers to improve soil fertility and a perfect start to combat food insecurity, however knowledge is needed on what to cultivate, when, where and how in order to feed the six million Sierra Leonean inhabitants. . Emphasis must be placed on the market opportunities as it will serve as the motivating factor for production. In order to be efficient and sustainable in Sierra Leone there is the need for a value chain marketing system; farmers should be able to produce what they like to eat and sell, and at the same time keep in mind the consumer preferences. This can be considered as an agricultural market pull. In Northern Uganda some farmers cultivating, rice, groundnuts and maize are engaged in the opposite of the market pull, they produced what they wanted or perceived as being easy in contrast to what the market demands resulting into low financial returns (USAID, 2008). This is very similar to the production pattern of most farmers in Sub-Saharan Africa. It is important to note that the demand for agricultural products must come from the consumer. As in most African countries, consumers will buy more if the price is low, as the price of the product determines the purchase due to their earning power, but consumers might be willing to pay a higher price when the product quality is good or desired by them. This can be explained in the consumer preference of cowpea. Cowpea varieties; are based on seed size, colour and texture of seed coat. Ghanaians are willing to pay a premium for black-eyed peas, while Cameroonians would pay less for them (IITA, 2009). This indicates that, though their earning power might be low, however their preference with regards to the type of product is much more appreciated.

The West African cowpea value chain begins at production by small scale farmers, who sell their marketable surplus grains to rural assemblers, who then sell to urban wholesalers directly or through commission agents (Mishili, et al., 2009) In a study done by the IITA in five West African countries Benin, Burkina Faso, Ghana, Mali and Sierra Leone on the development, diffusion and adoption of cowpea technology for poverty reduction and sustainable livelihoods in West Africa (IITA, 2011) described a good relationship between producers and agricultural extension officers. The agricultural extension officers assisted the producers in gaining access to markets and giving them advice on the management of their crops. The report also mentioned that the relationship between producers and buyers was cordial; a few producers had contracts with buyers. It went on further to mention that these buyers, who are wholesalers, then sell the cowpeas in the big cities but in the case of Ghana, some of these wholesalers export their cowpeas to neighbouring countries like Burkina Faso, Ivory Coast and Togo. (IITA, 2011) A report on the consumer preferences for quality characteristics along the cowpea value chain in Nigeria, Ghana and Mali stated that Dawanau market in Kano in Northern Nigeria is the largest cowpea market in the world, cowpea storage capacity in Dawanau market is estimated to exceed 200,000 Mt, and the merchants from this market finance a network of cowpea buyers throughout Niger and the neighbouring countries. (Mishili, et

al., 2009) Not all chains are lucky to benefit financially from certain chain actors; access to finance is an issue for most farmers and other actors in Sub-Saharan Africa, as banks seldom grant them loans because they lack collateral, that can be used in the case of defaulting on payment of the loans. Report on the value chain analysis of rice, groundnut and maize in Northern Uganda mentioned that some NGOs offer grants to banks and micro-finance institutions that can be used for guaranteeing on-lending to farmer groups., in order for them to be able to buy farming inputs or processing equipment. (USAID, 2008) After gaining access to finance, farmers need to be certain on the crop that would yield a better return on investment. In another report on value chain analysis of soybeans in Malawi, improved seeds are provided to smallholder farmers by research institutes; the local NGOs then motivate the farmers to produce these crops, sometime at the cost of their existing crops with the intension of providing them with markets that will improve their financial statues, some of these crops are high value crops but a sensitive to rainfall or other climatic variables. These farmers were faced with the dilemma of guessing on the crop that might earn them a better return annually. (Tinsley, 2009) Value chain experts must be certain about the growth potential and prospect of the market. The market demand and criteria's of the consumer/ costumer cannot be over emphasised, as explained in (Figure3)

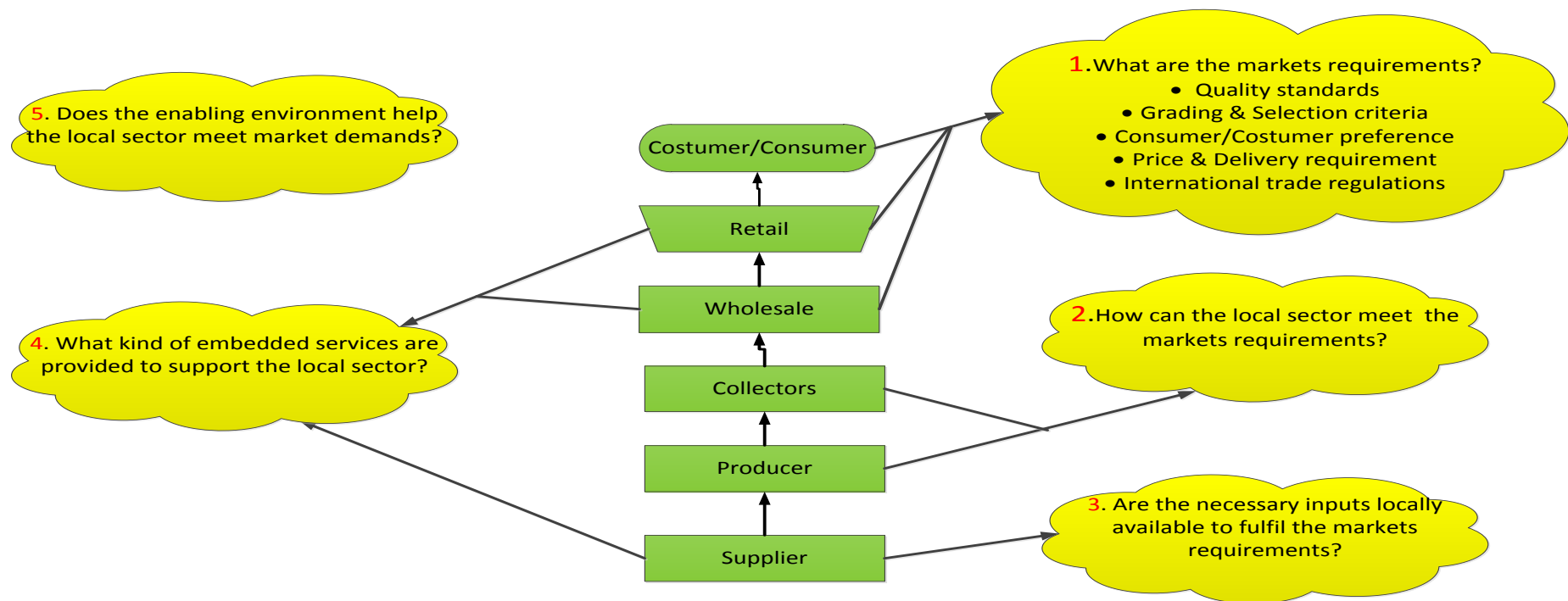


Figure 3: Value Chain and Market Requirements

Source: (Herr, 2007)

Actors and supporters must be knowledgeable in the consumer demand as they are crucial to the success of any value chain. Another misconception in the present development of the agricultural sector in Sub-Saharan Africa is the term “Value Chains” NGOs and experts working for Ministries of Agriculture are encouraging farmers to add value to their crops, however value addition of a product or crop does not justify the chain to be called a value chain.

“A value chain is understood as a strategic network between a numbers of independent business organisations and they shared commitment to control product quality and consistency” (Hobbs, et al., 2000)

A value chain must have a strategic link between the various actors. The prevailing chains in most Sub-Saharan countries can be related to production chain. In a production chain the product is transformed, value is added but there is no strategic network between the actors, as illustrated in (Table 1). To conclude a value chain entails the collaboration between the actors in a sector supported with a long term strategic vision of the chain.

Table 1: Production chain versus Supply Chain

<b>Factors</b>	<b>Production chain</b>	<b>Value chain</b>
<b>Information flow</b>	Little or none	Extensive
<b>Principal focus</b>	Cost / price	Value / quality
<b>Strategy</b>	Basic product (commodity)	Differentiated product
<b>Orientation</b>	Led by supply	Led by demand
<b>Organizational structure</b>	Independent actors	Interdependent actors
<b>Philosophy</b>	Competitiveness of the enterprise	Competitiveness of the market chain

Source: (Hobbs, et al., 2000)

## 2.3. Country overview

Sierra Leone happens to be one of the smallest countries in Africa. This tiny diamond shaped country on the West Coast of Africa has an area of 72,300 km<sup>2</sup> of which 5,400,000 ha is arable land (MAFFS & MFMR, 2004) the country can be divided into 4 vegetative zones (Figure 4) namely; the upland agro-ecology (80%) and the rest are lowlands. The lowlands comprise 690,000 ha of inland swamps, 145,000 ha of naturally grassy drainage depressions (bolilands), 130,000 Ha of riverine grassland and 20,000 ha of mangrove swamps (MAFFS & MFMR, 2004). Sierra Leone is rebranding her image, after the brutal civil war of the 90s. According to the 2012 report of the African Economic Outlook, Sierra Leone has experienced economic growth, the GDP growth accelerated in 2011 and the outlook seems positive for 2012 and 2013. The report further explained that this growth is associated with activities in the mining sector however inflation rose to 18% in 2011 due to the

following factors; high international oil and agricultural prices and the depreciating Leone. The report also mentioned that in 2012 the inflation rate is expected to decrease to 9.4% in 2013, due to foreseen improvements in domestic agricultural production, the introduction of the new goods and services tax (GST) and the slower rate of currency depreciation. (African Economic Outlook, 2012)

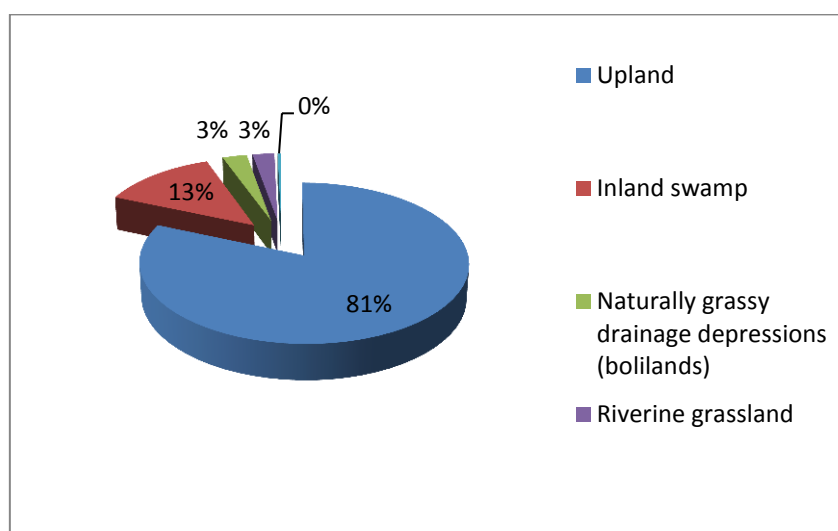


Figure 4: Vegetative zones of Sierra Leone

Source: 2004 Sierra Leone Agriculture Sector Review

## 2.4. Significance of the agricultural sector in Sierra Leone

The agricultural sector is predominant of smallholder farmers. The agricultural sector has been and continues to be the largest contributor to the country's GDP. According to the 2012 African Economic Outlook report, in 2006 the agricultural sector contributed 54.2% of total output an increase of about 7% in 2010. Rice being the staple food of Sierra Leoneans has received much attention with regards to cultivation in order to attain food sufficiency. The report also mentioned that the World Bank is involved in several agricultural projects in Sierra Leone such as the West Africa Agricultural Productivity Program (WAPP) worth USD 22 million and an additional financing of the Rural Private Sector Development Project (RPSDP) worth USD 20 million. The WAPP is expected to help increase domestic rice production and the RPSDP is seeking to rehabilitate around 1,500 km of feeder roads, this is expected to increase household incomes and create local jobs by increasing yields, production and exports. (African Economic Outlook, 2012)

## 2.5. Dynamics of growth in the agricultural sector.

According to the 2012 Ministry of Agriculture, Forestry and Food Security (MAFFS) Agricultural Statistics Bulletin, The agricultural output has increased in the past years rice production in particular has increased dramatically. As of 2001, 310,620 Mt of rice was produced, the milled equivalent was 186,372 Mt, and this amount was 305,031 Mt less than the national milled equivalent. As of 2010, 1,026,671 Mt of rice was produced; the milled equivalent 616,003 Mt exceeded the national mill equivalent of 597,667 Mt. This indicates Sierra Leone attained self-sufficiency in rice production. As depicted in Table 2.

Table 2: National Rice Production and Self-Sufficiency for Period 2001 - 2010

Year	Area (Ha)	Yield (Mt/Ha)	Production (Mt)	Milled Equivalent (Mt)	Population	National Requirement (Mt Milled)	Self-Sufficiency (%)
2001	258,850	1.20	310,620	186,372	4,725,033	491,403	37.93
2002	343,142	1.23	422,065	253,239	4,814,808	500,740	50.57
2003	356,506	1.25	445,633	267,380	4,906,290	510,254	52.40
2004	426,772	1.27	542,000	325,200	4,999,509	519,949	62.54
2005	427,907	1.29	552,000	331,200	5,094,500	529,828	62.51
2006	422,556	1.33	562,000	337,200	5,216,890	542,557	62.15
2007	432,356	1.36	588,004	352,802	5,343,200	555,693	63.49
2008	475,592	1.43	680,097	408,058	5,473,530	569,247	71.68
2009	499,111	1.78	888,417	533,050	5,607,930	583,225	91.40
2010	549,022	1.87	1,026,671	616,003	5,746,800	597,667	103.07

Source: 2012 MAFFS Agricultural Statistics Bulletin (PEMSD)

In 2010 paddy rice was the most cultivated crop (1026670Mt) seconded by cassava (361300Mt) fresh vegetables (305700 Mt) citrus fruits (108400 Mt) and shelled groundnuts (94366 Mt) (FAOSTAT, 2010), the detailed list is depicted in Figure 4. The agricultural sector is still highly dominated by a few food and cash crops.

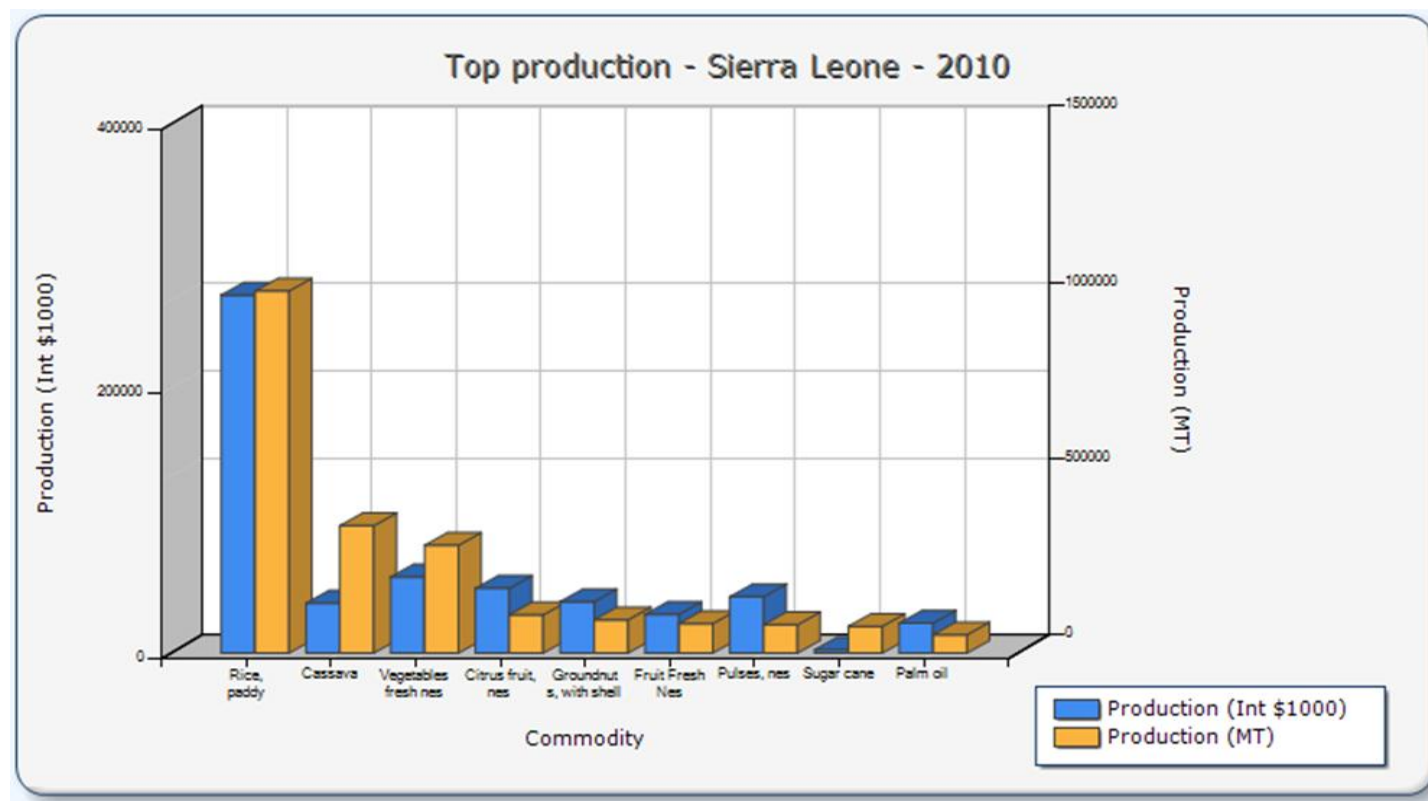


Figure 5: Top production-Sierra Leone

Source:FAOSTAT 2010

## 2.6. Groundnut

### 2.6.1. General feature

Groundnut (*Arachis hypogaea*) is an annual grain legume. Groundnuts seeds have a protein content of about 23% and oil contents of about 40-45% by weight (MAFFS & FAO, 2005). Groundnut play an important role in cropping systems, as they contribute to maintenance of soil fertility by fixing nitrogen in the soil which can be useful for subsequent crops.

### 2.6.2. Global environment

Groundnuts are cultivated on nearly 23.95 million ha of land worldwide with the total production of 36.45Mt and an average yield of 1520 kg/ha in 2009 of which developing countries in Asia, Africa and South America accounted for over 97% of world groundnut area and 95% of total production. Production is concentrated in Asia (50% of global area and 64% of global production) and Africa (46% of global area and 28% of global production), where the crop is grown mostly by smallholder farmers under rain fed conditions with limited inputs. (ICRISAT, 2012) The major producing countries are China (15709036 Mt), India (5640000 Mt), Nigeria (2636230 Mt), USA (1885510 Mt), Myanmar (1341000 Mt) and Senegal (1286860 Mt). Sierra Leone is ranked the 33<sup>rd</sup> largest producer (94366 Mt) (FAOSTAT, 2010). The major exporters are China (62290 Mt), USA (27704 Mt) and Egypt (17388 Mt) and the top three major importers are Indonesia (61933 Mt), Philippines (34296 Mt), Germany (25272 Mt) (FAOSTAT, 2009).

### 2.6.3. Sierra Leone

The MAFFS and other stakeholders in the agricultural sector do consider groundnut as one of the most important and widely cultivated grain legumes in Sierra Leone. Groundnuts are a source of protein and the crop fits well into the farming system. In 1961 the production of groundnuts was 22,000 Mt (FAOSTAT, 1961). Ten years onwards there was a decline in production, the production was 15,100 Mt (FAOSTAT, 1971) in the early 80s the production was 10,000 Mt (FAOSTAT, 1981) during the early 90s there was an increase in production 39,800 Mt (FAOSTAT, 1994) and another decline in production at the beginning of the 21st century, production was then 14,704 Mt (FAOSTAT, 2000). In 2010 the production of groundnuts was 94,366 Mt (FAOSTAT, 2010). However there are no data explaining this increase. (Figure 5) Groundnut production in Sierra Leone is predominantly for the domestic market and it is cultivated by smallholder farmers. Cultivation is mostly done by women but in the recent past, male farmers have shown interest in groundnuts cultivation, as 0.25 kg retails at (SLL 1300) compared to that of rice the staple crop, which retails at (SLL 900).



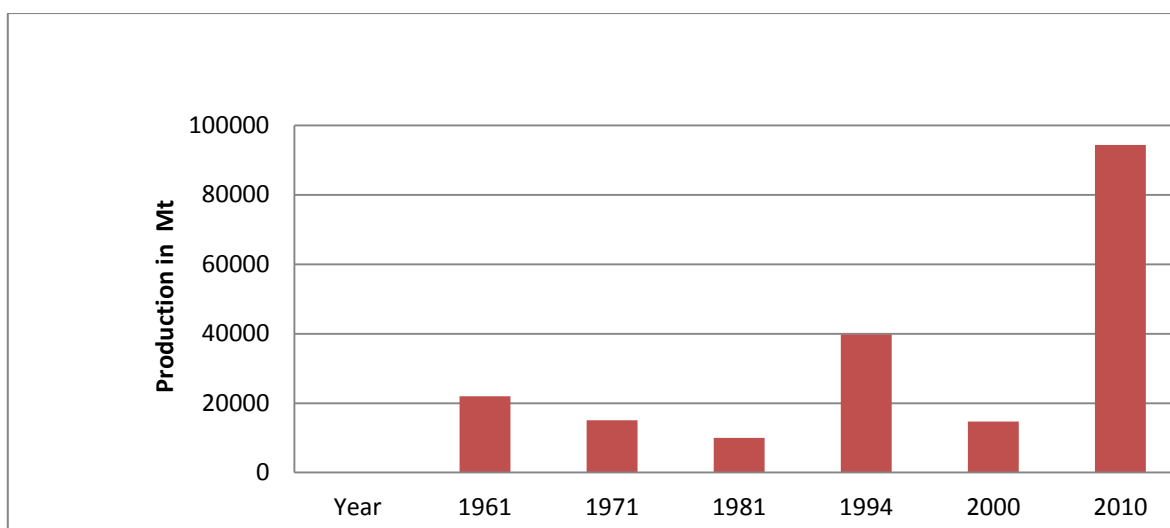


Figure 6: Trends in Groundnut production in Sierra Leone

Source: FAOSTAT (Top production in Sierra Leone)

### Varieties cultivated in Sierra Leone

The local varieties cultivated in Sierra Leone are Mares and Gambay. The improved varieties are SLINUT 1(JL24) (MAFFS & FAO, 2005) and SAMNUT 22 &23. (Johnny, 2012).The crop production guidelines states the yield potential of SLINUT 1 is 2.5 t/ha that of Mares is 2.0 t/ha (MAFFS & FAO, 2005). There are no data on the yields for SAMNUT 22 &23 as they are in the trials phase. The characteristics of SLINUT 1 and Mares are depicted in Table 3

Table 3: Characteristics of SLINUT 1 and Mares

Characteristics	SLINUT 1	MARES
50% Flowering (days)	26-30	30-35
Maturity (days)	80-85	90-100
Growth habit	Erect	Semi-erect
Filled pod per plant	15	19
Seeds per pod	2	2
Seed size	Medium	Small
Seed coat colour	Pale tan	Creamy white
Reaction to early leaf spot	Slight	Slight
Reaction to late leaf spot	Slight	Slight
Reaction to rust	None	Moderate
Reaction to rosette virus	None	Moderate
Yield potential (t/ha)	2.5	2

Source: Crop Production Guidelines for Sierra Leone

## Production areas

Groundnuts are cultivated throughout Sierra Leone. According to a PEMSD survey of the 1986/87 cropping season, about 80% of the crop is grown in the Northern Province, 13% in the Southern Province and 7 % in the Eastern Province. The trend is similar to the present-day situation which is depicted in the 2010 Agricultural Household Tracking Survey<sup>1</sup>; there has been less cultivation in the Southern Provinces and an increase in the Eastern Provinces. The districts with the highest proportion of groundnut cultivating farmers are Bombali, Koinadugu, Port Loko, and Tonkolili. The fewest are in Bonthe, Pujehun and Bo depicted in (Figure 6). The Agricultural Household Tracking Survey (ATHS) also mentioned that 47% of farmers used sole cropping as their main cropping practice. Sole cropping is practiced by most farmers in Sierra Leone but common amongst groundnut farmers in Kenema and Pujehun Districts.

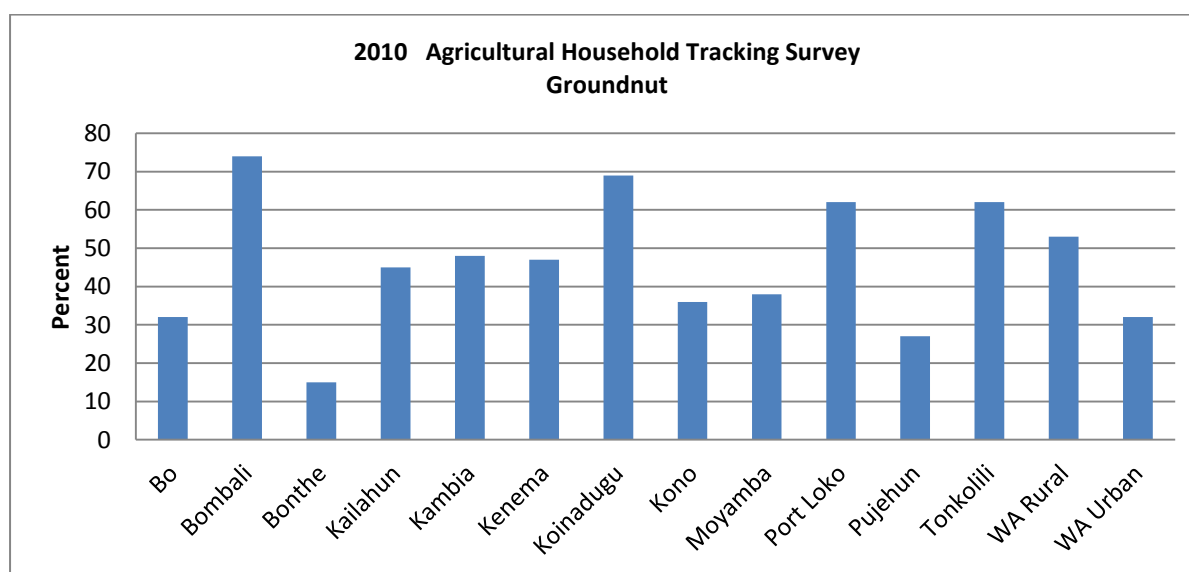


Figure 7: 2010 groundnut cultivating farmers per District.

Source: Agricultural Household Tracking Survey 2011

In 2003 the total area of groundnut cultivation was estimated at 150,000 ha with yields of 0.2 t/ha and the total production was 34,486 mt. (MAFFS & FAO, 2005). In 2010 the yield of groundnut production in Sierra Leone were 0.82 t/ha (FAOSTAT, 2010) far below the expected yield potential of SLINUT 1 (2.5 t/ha) and Mares (2.0 t/ha). (MAFFS & FAO, 2005). However the AHTS states that households in Koinadugu had a much higher harvest (275kg) compared to the national average (144.4kg). (Figure 7) The other districts produced close to the national average but harvest in Pujehun, Bo, Bonthe and Western Area Urban yields were lower than the national average (MAFFS, et al., 2011).

<sup>1</sup>Assessment of agricultural activities by smallholder farmers in Sierra Leone, Number of observations: 8394

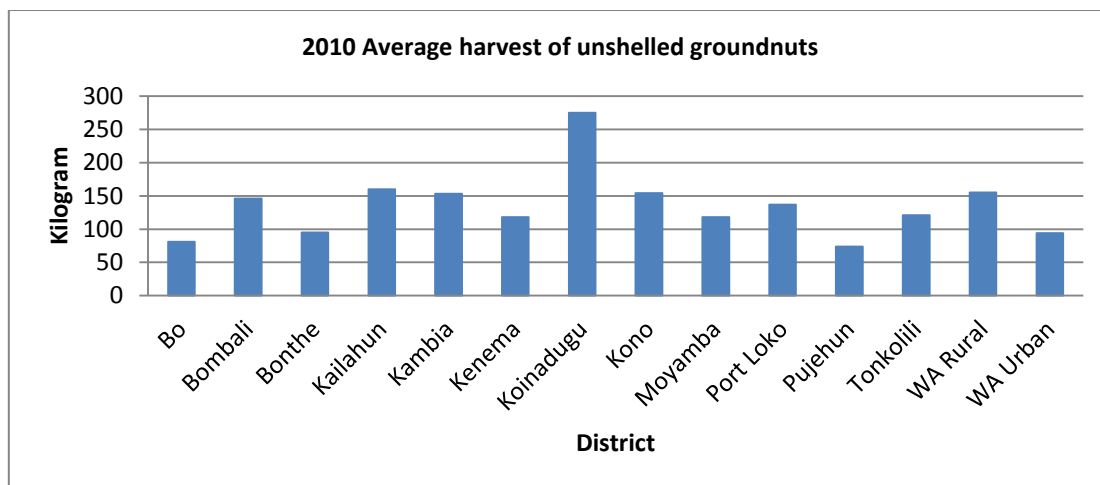


Figure 8: 2010 Average harvests of unshelled groundnuts by Districts

Source: Agricultural Household Tracking Survey 2011

### Cultivation

The growing period of groundnut ranges between 90-140 days. The crop production guidelines mentioned that three crops can be cultivated in a year. The first crops are cultivated in May-June as early as possible by the 15<sup>th</sup> May with the first rain. The second crop is cultivated in September and the third crop is cultivated in the lowlands after harvesting of rice. This is depicted in (Table 4)

Table 4: Cultivation cycle of groundnuts in Sierra Leone

Area/Crop	Operation	Time
Groundnut upland	Brushing/burning/clearing	22 <sup>nd</sup> April-7 <sup>th</sup> May
	Hoeing/Planting	22 <sup>nd</sup> May-7 <sup>th</sup> June
	Harvesting	15 <sup>th</sup> August- 15 <sup>th</sup> September
Groundnut lowland	Hoeing/harrowing	1 <sup>st</sup> -31 <sup>st</sup> October
	Planting	1 <sup>st</sup> -31 <sup>st</sup> November
	Harvesting	1 <sup>st</sup> -28 <sup>th</sup> February

Source: Crop Production Guideline for Sierra Leone

## **2.7. Cowpea**

### **2.7.1. General features**

Cowpea (*Vigna unguiculata*) is a legume grown by small scale farmers in semi-arid tropics of Africa, Asia, Europe, United States and Central South America. (IITA, 2009). It is assumed that the name cowpea is derived from American farmers who used it as feed for their cows (IITA, 2009). Cowpea is drought tolerant, can be used as a cover crop to prevent erosion and grows well in other soils; thereby playing an important role in cropping systems, as they contribute to maintenance of soil fertility by fixing of nitrogen in the soil. The grains contain 25% protein, and several vitamins and minerals. (IITA, 2009) Harvesting can be done in three stages, when the pods are young and green, mature and green and when the pods are dry.

### **2.7.2. Global environment**

Four of the five major producers of cowpea are from the African continent and one from Asia. In 2010, Nigeria produced 2,242,800 Mt, Niger produced 1,774,460 Mt, Burkina Faso produced 626,113 Mt, Myanmar produced 169,900 Mt and Cameroon produced 135,000 Mt. (FAOSTAT, 2010). 52% of Africa's production is used for food, 13% as animal feed, 10% for seeds, 9% for other uses, and 16% is wasted. (IITA, 2009). The major importers of cowpeas are the United States of America (6292 Mt) and Egypt (5 Mt). (FAOSTAT, 2009)

### **2.7.3. Sierra Leone**

Cowpea is not a popular crop in Sierra Leone but can be considered an important grain legume, as it is used primarily as a food grain because of its protein concentration by weight (23%) (MAFFS & FAO, 2005) It is mostly consumed by small scale farmers and inhabitants in rural communities of Sierra Leone. The major producing regions are Kambia, Kabala and Koinadugu Districts in the North, the Western area and Bo, Moyamba and Pujehun Districts in the South. According to the crop production guideline for Sierra Leone, a white seed variety known as Tabe is named after a village in the Southern region of Sierra Leone. The varieties mostly cultivated by the farmers are Tabe and Hundweh (IITA, 2011) both local varieties are preferred by the consumers because of their good taste. SLIPEA 1, SLIPEA 2 & SLIPEA 3 are improved varieties that are on trial. The estimated yields of these improved varieties are 1.5t/ha and that of the local variety is 1t/ha.

## **2.8. Soybean**

### **2.8.1. General features**

Soybean (*Glycine max*) is a legume grown in tropical, subtropical, and temperate climates. It is a crop that adds nitrogen to the soils, replenishing those lost in exhausted soils. The beans contain 36% protein, 30% carbohydrates, fibre several vitamins and minerals. It also consists of 20% oil, which makes it the most important crop for producing edible oil.

### **2.8.2. Global environment**

In 2007 it was estimated that  $\pm 216,000,000$  t of soybeans was produced worldwide, of which 1.5 million were from Africa. (IITA, 2009). Production is dominated by the United States of America (90,605,500Mt) Brazil (68,756,300Mt) Argentina (52,675,500Mt) China (15,083,204Mt) and India (12,736,000Mt) while consumption is dominated by China, the United States of America and Europe, the reason for consumption in these countries could be linked to the increase in demand of protein in the food industry and biodiesel in the United States of America (Opperman & Varia, 2011) South Africa (566,000Mt) and Nigeria (393,860Mt) are the largest producers in Africa. (FAOSTAT, 2010). In Nigeria the soybean meal and haulm are used as feed in the poultry industry. The rapid growth in global soybean production and demand is expected to continue as Asian markets, like China continue to increase their demand for soybean and the United States of America continues to increase their demand for soybean for biodiesel production (Opperman & Varia, 2011).

### **2.8.3. Sierra Leone**

Soybean is not a major crop in Sierra Leone, the crop was introduced to farmers in the 80s by the Adaptive Crop Research and Extension (ACRE) project but it did not gain the interest of farmers. (MAFFS & FAO, 2005) But due to its nutritional and economic benefits the MAFFS, considers it as one of emerging cash crops that can improve the status of farmers and also assist in the nation's food sufficiency. The current contribution of soybean is zero, as there is no soybean production in the country, outside the research trials and seed multiplication sites. However it has been proven important in other countries in areas of improving soil fertility by replenishes lost nitrogen and a good source of protein for human consumption.

### **3. RESULTS GROUNDNUT CHAIN**

This chapter describes the groundnut sector of Sierra Leone. The tools used are the rapid market appraisal, the value chain map and the estimation of profit margins and market share within the chain. The rapid market appraisal tools aids in identifying the stakeholders, their roles and relationships. It also describes the environment and the role of supporters within the chain. The information provided by the actors with regards to production cost and prices are questionable, however the tool estimation of profit margins and market share within the chain gives an overview of the value addition within the chain. The chain map aids in visualizing the data found during the rapid market appraisal.

#### **3.1. The groundnut chain in Sierra Leone.**

The core processes in the groundnut chain are, input supply, production, wholesaling, processing, retailing and consumption. The chain actors are, seed dealers, agro- machine dealers, small scale farmers, FBOs consisting of small scale farmers, a commercial farmer, merchant traders, small scale millers, market women, petit traders, food sellers, a food processing organisation and the local inhabitants that are the consumers. It was found that the merchant trader are the chain coordinators, they source for groundnuts throughout the country and the West African sub region. The merchant traders sell to seed dealers, market women and food production companies. It was found that the supporters in the groundnut chain are NGOs, research institutes and family and friends that provide financial services to some of the actors. The chain also depicts the enabling environment that creates the laws, regulation, policies and infrastructure for the sector. As illustrated in the chain map (Figure 8)

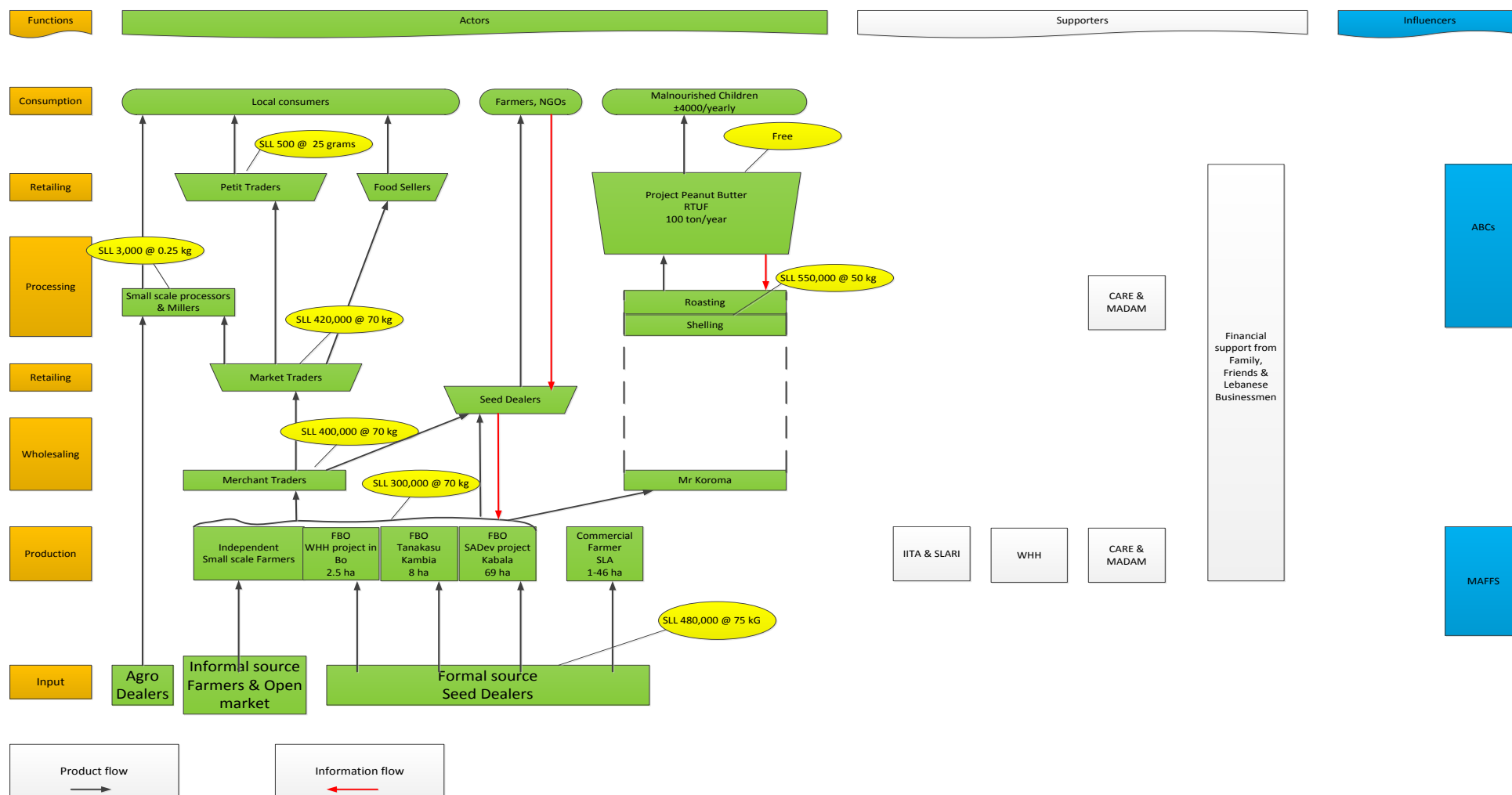


Figure 9: Groundnut chain map of Sierra Leone

Source: Illustrated by Mike Johnson 2012

### 3.1.1. Input supply

Farming inputs such as seeds, tools, fertilizers and agro-processing equipment's are purchased through agro dealers and the local markets. The MAFFS and NGOs donate the mentioned inputs as gifts. It was found that the research institutes provide seeds to farmers for trial purposes. Farmers and extension workers of NGOs involved in groundnut cultivation mentioned that seeds are the most important input for production. The source of seeds can be classified into formal and informal sources. The formal sources are via "certified seeds" issued to the farmers by NGO's such as CARE, WWH and reputable agro dealers, such as SEED TECH INTERNATIONAL and HOLLAND SEEDS. The research institutes are SLARI AND IITA. Some seed dealers have contracts with farmers to grow seeds. The informal sources are saved seeds from farmers and the open markets. It was found that the informal source is the most common source of groundnut seeds in Sierra Leone. The sources of other inputs used in the cultivation of groundnuts are mostly accessed through the local markets or donated by NGOs. They are hoes and cutlasses; this indicates that the cultivation of groundnut is labour intensive. The research indicated that the supply of inputs goes beyond cultivation of groundnuts, the MAFFS and the following NGOs, CARE and WWH are encouraging farmers to add value to the groundnuts produced. They provide the farmers with agro- processing machines that can be used in the shelling, roasting and grinding of groundnuts. This value addition equipment's are manufactured locally, bought from agro dealers in Sierra Leone and imported from China and India. One of the prominent agro processors/ dealer in Sierra Leone is the Fomel Industry and National Industrialisation Centre (FINIC).

### 3.1.2. Production

The extension workers and literature indicated that small-scale farmers are the major producers of groundnuts in Sierra Leone. However the producers of groundnuts can be divided into three groups, independent small scale farmers, FBOs<sup>2</sup> and commercial farmer. The extension workers estimated that the independent small scale farmer cultivates an average of 0.5 ha. The head of a FBOs in Kambia District mentioned that farmers in there group cultivate on 8 ha. The extension officers of WWH in Bo (Figure 10) and CARE in Kabala mentioned that farmers cultivate on 2.5 ha and 69 ha respectively.



Figure 10: WWH groundnut project in Bo

Source: Photo by Mike Johnson 28.07.2012

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<sup>2</sup> FBO is an organisation for small holder farmers, it aids in strengthening their bargaining power.



It was found that the commercial grower, Sierra Leone Agriculture which is part of the Siva Group acquired about 46,000 ha to cultivate palm oil, due to the duration involved in palm oil cultivation from seedling to maturity they decided to cultivate groundnuts on 1 ha at their nursery in Kontafari (Figure 11).



Figure 11: SLAs 1 ha nursery in Kontafari

Source: Photo by Mike Johnson 21.07.2012

A constraint mentioned by the farmers and extension officers is the attack from pest and diseases. The most common disease that affects groundnuts cultivated in Sierra Leone is the rosette disease and the pests are insects, rodents and livestock. After harvest the farmers sell their surpluses to NGOs, seed dealers, merchant traders and other farmers as seeds and to traders as grains. An extension officer mentioned that harvesting commences when about 80% of the groundnuts are mature and it is a communal activity wherein farmers take turns in helping each other. It was found that during the rainy season most farmers prefer to sell the raw unshelled nuts because drying is impossible and also this is the period termed as the hunger period.<sup>3</sup> The extension worker and some farmers in Bo mentioned that groundnuts that are not sold are placed in sacks, these sacks are then smoked in special huts, the smoke and heat then preserves the groundnuts for about 3 months. During the dry season the groundnuts are dried on drying floors<sup>4</sup> provided by the MAFFS, NGOs and in front of the houses of farmers. It was found that some farmers dry the nuts directly on the concrete floors, providing a perfect medium for debris and micro-organisms that limit the shell life and quality of the groundnuts. Also it was found that after harvesting, value addition is minimal, most of the farmers prefer to sell the unshelled groundnuts at the farm as seeds to seed dealers and as grains to merchant traders because of the following factors; inaccessible roads to the farms and the farmers lack the funds to purchase groundnut shelling equipment from agro-dealers.

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<sup>3</sup> The period when the farmers need cash to purchase other staples as rice and palm oil

<sup>4</sup> Drying floors are concrete floors constructed in front of their houses or at the Agricultural Business Centres (ABC).

However the MAFFS and NGOs are in the process of providing farmers with value addition equipment. (Figure 12)



Figure 12: Value addition equipment for farmers by CARE

Source: Photo by Mike Johnson 21.08.2012

It was found that the unit of measurement used by the farmers in the trading of groundnuts are bushel<sup>5</sup>, cup<sup>6</sup> and 70 kg sacks (Figure 13).



Figure 13: A 70 kg sack of groundnuts

Source: Photo by Mike Johnson 15.08.2012

A bushel contains between  $\pm$  65 cups. The farmers and extension officers interviewed mentioned that the price of a cup is SLL 1300 at farm gate. An extension officer of WHH described the trading process between the farmer and merchant traders. "The merchant trader haggles with the farmer

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<sup>5</sup> Bushel is equivalent to 18 kg or between 60-70 cups.

<sup>6</sup> Cup is equivalent to  $\pm$  0.25 kg of unshelled peanuts

on the price of a bushel of groundnuts; farmer prefers to sell a bushel at SLL 85,000 but as the merchant trader buys large volumes, at least 50 bushels, the farmers are obliged to sell a bushel between  $\pm$ SLL 75,000. When the farmer brings a 70 Kg sack of groundnuts to the market, they are then retailed at SLL 380,000. In cases when farmers are short of cash, e.g. when a family member is sick, they will then call the merchant farmer, who will then buy the groundnuts at a cheaper price per bushel e.g. SLL 50,000”.

### 3.1.3. Wholesale

Wholesaling of the groundnuts is done by the merchant traders. The merchant traders scout the villages in search of groundnuts and other crops. The merchant are from the various district, but mainly from the provincial headquarters where they own stores. They buy from farmers at farm gate ( $\pm$  SLL 75,000/ bushel); at weekly village markets in Sierra Leone and in some case they also purchase groundnuts from Guinea, Senegal, Gambia and Mali. After purchase some stock (Figure 14) the groundnuts and sell during the planting season (April-May) when there is a high demand for groundnuts. A merchant trader mentioned that during the planting season, a 70 kg sack can be sold for about SLL 500,000. It was found that a sack is estimated to contain a maximum of 4 bushels. The merchant trader further mentioned that the groundnuts are packed in sacks and transportation cost of a sack is SLL 10,000 from Kambia to Freetown<sup>7</sup> and the frequency of purchase depends on sales. An extension officer and a merchant trader mentioned that the merchant traders are self-financed or granted loans from family members. It was found that the following are the costumers of the merchant traders; seed dealers and market traders. The seed dealers buy large quantities or the entire stock at SLL 100,000 a bushel. The market traders purchase 70kg sack of unshelled groundnuts at SLL 400,000. A merchant trader mentioned that value addition in the form of shelling and roasting is done on the request of certain costumers; these groundnuts are then sold in 50Kg sack at SLL 550,000.



Figure 14: Store of a Merchant Trader in Freetown

Source: Photo by Mike Johnson 18.08.2012

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<sup>7</sup> Distance between Kambia and Freetown 86 km

### 3.1.4. Retail

It was found that retailing of groundnuts are done by the following; market traders, petit traders and food sellers. The market traders are women who purchase sacks of 70 Kg of unshelled groundnuts at SLL 400,000(Figure 15) and retail a cup of 0.25 kg groundnuts at SLL 1500 to the small scale processors, women petit traders and food sellers. Some market traders purchase 50 Kg of shelled groundnuts at SLL 550,000 from merchant traders. They then process it at the cost of SLL 100,000 by millers, which is explained in the processing part of the chain and then retail 25 grams sachets of groundnut paste at SLL 500(Figure 16). The petit traders are women who sell groundnut paste, pepper, onions and other cooking ingredients in the market to the locals. The food sellers are women and young girls who hawk roasted and boiled groundnuts. In the dry season these women and young girls purchase cups of 0.25 kg groundnuts at SLL 1500, they roast the groundnuts and sell with the aid of a small sweet milk tins at SLL 500, it is estimated that 10-15 sweet milk cups can be derived from a cup. During the rainy season these women and young girls then boil the groundnuts and sell them with the aid of a tomato puree tins at SLL 1000, it is estimated that 5-10 tins are derived from a cup. It was found that the source of funding of the market traders are self-financed or sponsored by family and friends or loans from women groups. That of the petit traders and food sellers is also from family and friends and loans from women groups.

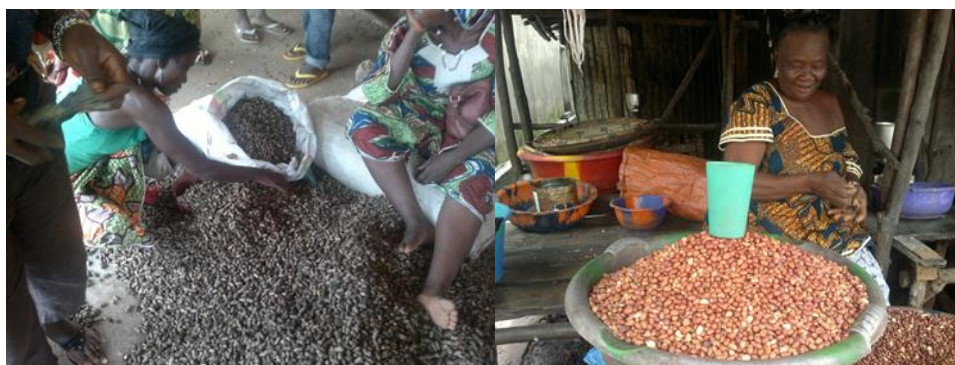


Figure 15: Market Traders

Source: Photos by Mike Johnson 15.08.2012 and 18.08.2012



Figure 16: 25 grams sachets of groundnut paste

Source: Photos by Mike Johnson 15.08.2012

### 3.1.5. Processing

It was found that the processing of groundnuts is done by small scale processors, who make use of hand mills to process groundnuts. They purchase cups of groundnut at SLL 1500/cup, grind it at SLL 300 and retail at SLL 3000. Also millers at the various markets make use of grinding machines powered by diesel motor (Figure 17). The cost of grinding a 50 Kg shelled groundnuts is SLL 100,000, these millers grind on the request of the customer.



Figure 17: Miller with diesel powered motor in Freetown

Source: Photos by Mike Johnson 15.08.2012

### 3.1.6. Consumer

The customers of the producers in the groundnut chain are seed dealers, NGOs, food producers and local consumers. Some of these customers have special demands, a seed dealer that contracts farmers for production mentioned that they expect the farmers to supply the quantity required and the seeds are of the variety provided to them. The NGOs expect that farmers produce enough seeds that would be given to other farmers for production. The findings from the research indicated a new customer. Project Peanut Butter. Project Peanut Butter (PPB) is a non-profit international organization, who produces and provides ready-to-use therapeutic food (RUTF) to severely malnourished children. Annually the project requires about 100 Mt roasted groundnut or groundnut paste with low aflatoxin. Their major concern is quality and quantity of groundnuts in Sierra Leone, with regards to quality, the aflatoxin specification for the roasted groundnuts or groundnut paste must be less than 20 parts per billion ( $\leq 20\text{ppb}$ ) (Beasley, 2012). The end consumer pays for all the cost added to the groundnuts. It was found that the local consumers of groundnuts have no special demands; their major concern is the availability and price. The malnourished children, who are the consumers of the RUTF, are provided with free RUTFs that are produced under strict hygienic conditions and with aflatoxin contents of  $\leq 20\text{ppb}$ .

### 3.2. Product and information flow

As illustrated in the chain map the product flow begins from the farm and ends with the costumer. The information flow occurs between the farmers with contracts to grow seeds for the seed dealer and that of PPB, the merchant farmer and the farmers. The local consumers are not involved in the process of determining the end product, whiles the seed dealers expect the seeds to be viable, free from diseases and that they are true to type. In the case of the Project Peanut Butter they communicate with the supplier on the type and quality of groundnut that is to be delivered. The quality manager determines the specification, quantity required, origin of the groundnuts, aflatoxin level and quality standards as outlined in the Codex alimentarius for groundnuts with the merchant trader or processors. The general quality factors of groundnuts according to the Codex Alimentarius is mentioned in box 1.

#### Box 1: Codex Alimentarius for groundnuts

Groundnuts shall be safe and suitable for processing for human consumption.

Groundnuts shall be free from abnormal flavours, odours, living insects and mites.

#### Quality factors – specific

Moisture contents	Maximum levels
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Groundnut in –pods	10%
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Groundnut kernels	9.0%
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Lower moisture limits should be required for certain destinations in relation to the climate, duration of transport and storage. Governments accepting the Standard are requested to indicate and justify the requirements in force in their country.

Mouldy, rancid or decayed kernels 0.2% m/m max.

Organic and inorganic extraneous matter: is defined as organic or inorganic components other than peanuts and includes stones, dust, seeds, stems, etc.

Filth: Impurities of animal origin (including dead insects) 0.1% m/m max

Other organic and inorganic extraneous matter

Groundnuts in-pod 0.5% m/m max

Groundnuts kernels 0.5% m/m max

\* Source: (Codex Alimentarius Commission, 1997)



### 3.3. Estimating profit margins and value share

The cost used in this analysis are mainly variable cost, information on fixed cost were not available, due to lack of record keeping and knowledge in farm economics. As mentioned in the limitations of the research the quantitative data used with regards to cost are meant to provide an overview of cost secured by the actors in the chain

Table 5: Market Margin for Seed Dealer

Product	Cost	Value
70 Kg unshelled Groundnuts	Purchase	SLL 300,000
	Transport	SLL 5,000
	Loading/ Unloading	SLL 3,000
Total		SLL 308,000
	Retail	SLL 480,000
	Margin	SLL 172,000

The profitability of groundnut production for smallholder farmers depends on the volume of output, price of output, and total cost of production (USAID, 2008) (Table 5). It was found that most farmers use seeds saved from previous harvests or donated by NGOs, research institutes or the MAFFS. In case of purchase, seeds are bought from seed dealers and the local market. The crop production guidelines for Sierra Leone, states 75 kg<sup>8</sup> of unshelled groundnuts are required for the cultivation of 1ha. Based on the information from a seed dealer, the seeds are retailed at SLL 120,000 a bushel. Therefore a hectare requires SLL 480,000 worth of seeds. Farmers, extension workers and the seed dealer mentioned that, the use of chemical input in groundnut production is seldom. During the semi structured interviews with informants from the MAFFS, it was found out that 45 person day per hectare were needed to prepare the land for groundnut cultivation, the farmers were unable to give the required number because preparation and cultivation is communal. However it was found that the cultivation of groundnuts are done on less dense vegetation, one can assume that less labour is needed as groundnut cultivation cannot be compared to the cultivation of oil palm in Sierra Leone of which an average of 14 person days per hectare is needed to prepare land (Spencer, 2009). One can assume that an average of 7 person days per hectare is needed to prepare the land for groundnut production. As depicted in Table 6.

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<sup>8</sup> Equivalent to 4 bushels, I estimated a bushel to be 18 Kg.

Table 6: Economics of groundnut production/hectare (Mares)

	Quantity	Total (SLL)
Seeds per ha	75 kg (1 bushels = 18 kg seeds = 120,000)	480,000
Fertilizers		
Equipment	7 Cutlasses	105,000
	7 Hoes	70,000
Land clearing	7 person day	70,000
Ploughing(twice)	7 person day(x2)	140,000
Weeding(twice)	7 person day(x2)	140,000
Harvesting	15 person day	150,000
Bags	12	60,000
Total production cost (per Ha)	SLL 101,250	1,215,000
Productivity	0.82 t/ha (820 kg/Ha)	
Revenue	12 bags (70kg per bag)	3,600,000
Margin		2,385,000

Table 7: Market margin of merchant trader retailing to seed dealer and market trader

Product	Cost	Value
70 Kg unshelled Groundnuts	Purchase	SLL 300,000
	Transport	SLL 10,000
	Loading/ Unloading	SLL 6,000
	Sack	SLL 5,000
Total	Production	SLL 321,000
Seed Dealer/Market Trader	Retail	SLL 400,000
	Margin	SLL 79,000

Table 8: Market margin of merchant trader (Value addition)

Product	Cost	Value
70 Kg unshelled Groundnuts	Purchase	SLL 300,000
	Transport	SLL 10,000
	Loading/ Unloading	SLL 6,000
	Shelling & roasting	SLL 25,000
	Sack	SLL 5,000
Total	Production	SLL 346,000
Market Trader	Retail 50 Kg	SLL 550,000
	Margin	SLL 204,000



The merchant trader adds value, by shelling and roasting, thereby earning SLL 204,000 compared to SLL 79,000 without value addition. As depicted in Tables 7& 8

Table 9: Market margin of Market Trader

Product	Cost	Value
70 Kg unshelled Groundnuts	Purchase	SLL 400,000
	Loading/ Unloading	SLL 2,000
Total		SLL 402,000
280 cups of 0,25 kg @ SLL 1500	Retail	SLL 420,000
	Margin	SLL 18,000

Table 10: Market margin of market trader (value addition)

Product	Cost	Value
50 Kg shelled Groundnuts	Purchase	SLL 550,000
	Loading/ Unloading	SLL 2,000
	Grinding	SLL 100,000
	Packaging	SLL 20,000
Total		SLL 672,000
2000 sachets of 0,25 g @ SLL 500	Retail	SLL 1,000,000
	Margin	SLL 328,000

When the market trader adds value by grinding, the margin is SLL 328,000 compared to that of SLL 18,000 without value addition. This margin reflects their cost involved in the transformation process. As depicted in Table 9 & 10

To calculate the profit margin and the value share of the groundnut sector in Sierra Leone following information is of vital importance; the costs of production, net income, the added value and the margin secured by the different actors in the chain. In order to provide an overview of value addition within the chains, the following chains were chosen;

- The chain that comprises the farmers, the merchant traders and seed dealers
- The value addition chain that comprises the farmers, the merchant traders and market traders.

The reasons for choosing these chains are, because they depict the basic uses of groundnuts and provide a view of the value share of the actors within the chains

Table 11: The chain that comprises the small farmers, the merchant traders and seed dealers

Value chain Actor	Total costs	Selling price(SLL)	Gross margin(SLL)	Added value	Gross margin %	Value share %
Farmer	101,250	300,000	198,750	300,000	66%	62%
Merchant Traders	321,000	400,000	79,000	100,000	20%	21%
Seed Dealer	308,000	480,000	172,000	80,000	36%	17%

In this chain (Table 11) it can be seen that the farmer has the highest gross margin of 66% and value addition of 62%. The value addition of the farmer can be considered minimal as it involves the cultivation of seeds, packaging and in some cases transportation. That of the merchant trader is 21% added value. The merchant traders cost are the groundnuts and transportation. This reflects the amount of labour; expenses and risks involved in transporting groundnuts from the remote farms to the markets. The seed dealer's value addition is 17%, reflects the cost of transportation and the risk involved in buying from the farmers as the groundnuts are to be screened for viability and diseases.

Table 12: The chain that comprises the small farmers, the merchant traders and market traders

Value chain Actor	Total costs	Selling price(SLL)	Gross margin(SLL)	Added value	Gross margin %	Value share %
Farmer	101,250	300,000	198,750	300,000	66%	30%
Merchant Traders	341,000	550,000	209,000	250,000	38%	25%
Market Traders	652,000	1,000,000	348,000	450,000	35%	45%

In this chain (Figure12) it can be seen that the farmer has the highest gross margin of 66% and added value of 30%. The added values of the merchant trader in this chain are transportation, packaging, shelling and roasting and the value share is 25%. The added value of the market trader is 45% which involves the transformation of groundnuts into paste and packaging.

### 3.4. Enabling environment

The MAFFS creates the laws, regulation, policies and infrastructure for the agricultural sector in Sierra Leone.

- Ministry of Agriculture, Forestry and Food Security

The vision of the present government is *“to make agriculture the engine of socio-economic growth and development in Sierra Leone through commercialization of the sector”* (MAFFS, 2009). The MAFFS is involved in the strengthening of Farmer Groups and Farmer Based Organizations (FBOs) by means of capacity building through training in agro-enterprise development and management, provision of rural facilities, such as the Agricultural Business Centres (ABC's) and input supply to farmers. The MAFFS focus is geared towards value addition and efficiency within the various agricultural chains.

- Farmer Based Organisations

FBO is an organisation for small holder farmers that assist in strengthening their bargaining power in the market place. The farmers are provided with improved seed varieties, fertilizers and labour saving machinery, such as power tillers to prepare the land for cultivation by the MAFFS. A DAO mentioned that these farmers receive training in good agricultural practices from extension officers of the MAFFS.

- Agricultural Business Centres

ABCs provide services via the MAFFS to FBOs in terms of input supply, processing and value addition, storage and marketing. The ABCs are buildings equipped with meeting and recreational rooms, drying floors, storage facilities and processing equipment such as rice mills, cassava graters and shelling machines. The extension officer at the MAFFS mentioned that the ABCs are meant to become private farming enterprise that should be owned by FBOs.

### 3.5. Supporters

The supporters are important in the development of the value chains. Supporters are financial institutions, banks, micro credit schemes and the research institutes. These supporters provide seeds and extension services to farmers. The research indicated that the most prominent service providers in the Sierra Leonean groundnut chain are the NGOs. The NGOs provide these farmers with seeds and other agricultural service such as extension. Some of these NGOs are now working with other actors within the chain with regards to value addition. The NGOs that are active in the groundnut value chain of Sierra Leone are CARE and WHH.

- Cooperative for American Relief Everywhere

CARE is one of the many international NGO operating in Koinadugu District in the North of Sierra Leone. CARE is involved in the Sierra Leone's Sustainable Agriculture Development (SADev) project which is funded by the European Union. The aim of the project is sustainable food security for the inhabitants of Koinadugu District. The project has 4 components; one of the components is the development of the groundnut value chain, based on a survey done by CARE groundnut was chosen, as it is a major crop in Koinadugu District. CARE provides support in terms of input such as seeds and extension service is provided by Mankind's Activities for Development Accreditation Movement (MADAM) and capacity building support provided by Voluntary Service Overseas (VSO) another partner NGO. CARE and MADAM are providing support to 60 FBOs with 30 members who are divided into clusters. The total farm size of the FBOs is 68.9Ha. The seeds given to the farmers are sourced from the Koinadugu Women Vegetable Cooperative, the local seed dealer. (Katta, 2012). As mentioned the farmers are provided with seeds, the farmers pay 50% of the cost to CARE and it is expected of the farmers to provided seeds for other farmers. CARE also provided the farmers with labour saving equipment's such as the groundnut shelling machine, roaster and grinding machine to assist them in harvesting and value addition.

- Welt Hunger Hilfe

WHH is an international NGO in Bo, Sierra Leone. One of their projects is Food Security and Economic Development (FoSED) in Bo, Kenema and Pujehun. They issue inputs such as seeds and tools through their voucher for work program by engaging the poorest and vulnerable in Bo, Kenema and Pujehun Districts, who are interested in agriculture to be involved in sustainable agricultural practices. WHH supports local farmer groups working on the inland valley swamp with legumes seeds such as groundnut seeds, cowpea, and pigeon pea. Of these legumes, groundnut has an economic value for the communities, however, the major concern of the WHH is the high yield variation among the cultivated areas, sometimes the yields equal the amount of seed cultivated.

- Finance

It was found that in Sierra Leone finance is not easily accessible to the most actors in the chain; because they lack collateral that can be used in default of payments. This service is then provided by Lebanese business men, family members and friends of the actors, the Lebanese business men provide them with the necessary materials or cash on credit bases, which is paid on terms of convenience between the parties involved. The access to finance or materials from these businessmen is due to the long business relationship that exists between. Others are supported by

family members who normally grant a one-time loan to the actor. These loans can vary from SLL 50,000 to SLL 5,000,000.

- International Institute of Tropical Agriculture/Sierra Leone

The IITA institutes provides farmers with improved seeds of soybean, cowpea and groundnuts to improve their nutrition status, attain better yields and a source for cultivating crops that have higher market value. Being a research institute, trials of the seeds are conducted throughout the country before issued to the farmers. The groundnut varieties on trial are Samnut 10, 11, 21 23, 22 and JL24 which are conducted in Sumbuya, Old Mosongo and the Njala University while that of cowpea and soybean trials are conducted at Makonde at the Njala University. The cowpea varieties on trial are; IT99K-573-1-1, IT99K-573-2-1, IT89KD-288, IT89KD-391 and IT97K277-2 and the soy bean varieties on trial are: TGX 19046F, TGX 1951-4F, TGX 14482E and TGX1955-4F.

- Sierra Leone Agricultural Research Institute

SLARI is the principal agricultural research institute in Sierra Leone. It was established by an act of parliament in 2007. The institute conducts adaptive and applied research on crops, livestock, forestry and fisheries, to provide technological solutions for producers, other actors and policymakers in the various agricultural chains. SLARI has four operating centres; the Rokupr Agricultural Research Centre, the Njala Agricultural Research Centre, the Teko Livestock Research Centre and the Kenema Forestry and Tree Crops Research Centre. SLARI is engaged in seed multiplication of groundnuts, soybeans and cowpea at the Njala University.

### **3.6. Present uses of groundnuts in Sierra Leone**

Groundnuts are used for two main purposes as seeds and grains. In the rainy season, women from Lungi, boil groundnuts “buwel granaat” and sell to the travelling ferry passengers and consumers in the cities. In the dry season women throughout the country roast and sell groundnuts “patch granaat” as snacks, this can also be consumed with bread and garri. It was found that groundnuts are also roasted, peeled and mixed with caramelised sugar to form groundnut cake “granaat cake” which is a flat crunchy biscuit. The most usable form of groundnuts in Sierra Leone is paste. The paste is used as ingredient in most of the nation’s favourite dishes, such as groundnut soup, cassava leaves and potato leaves. The paste is also the main ingredient for one of the countries favourite snack “Kanya”. (Figure 18) The quality manager of PPB mentioned that groundnuts make up 27% of the ingredient in the RUTF that is given to server acute malnutrition children from 6 months to 5 years of age. Yearly the project feeds about 4,000 Sierra Leonean children.

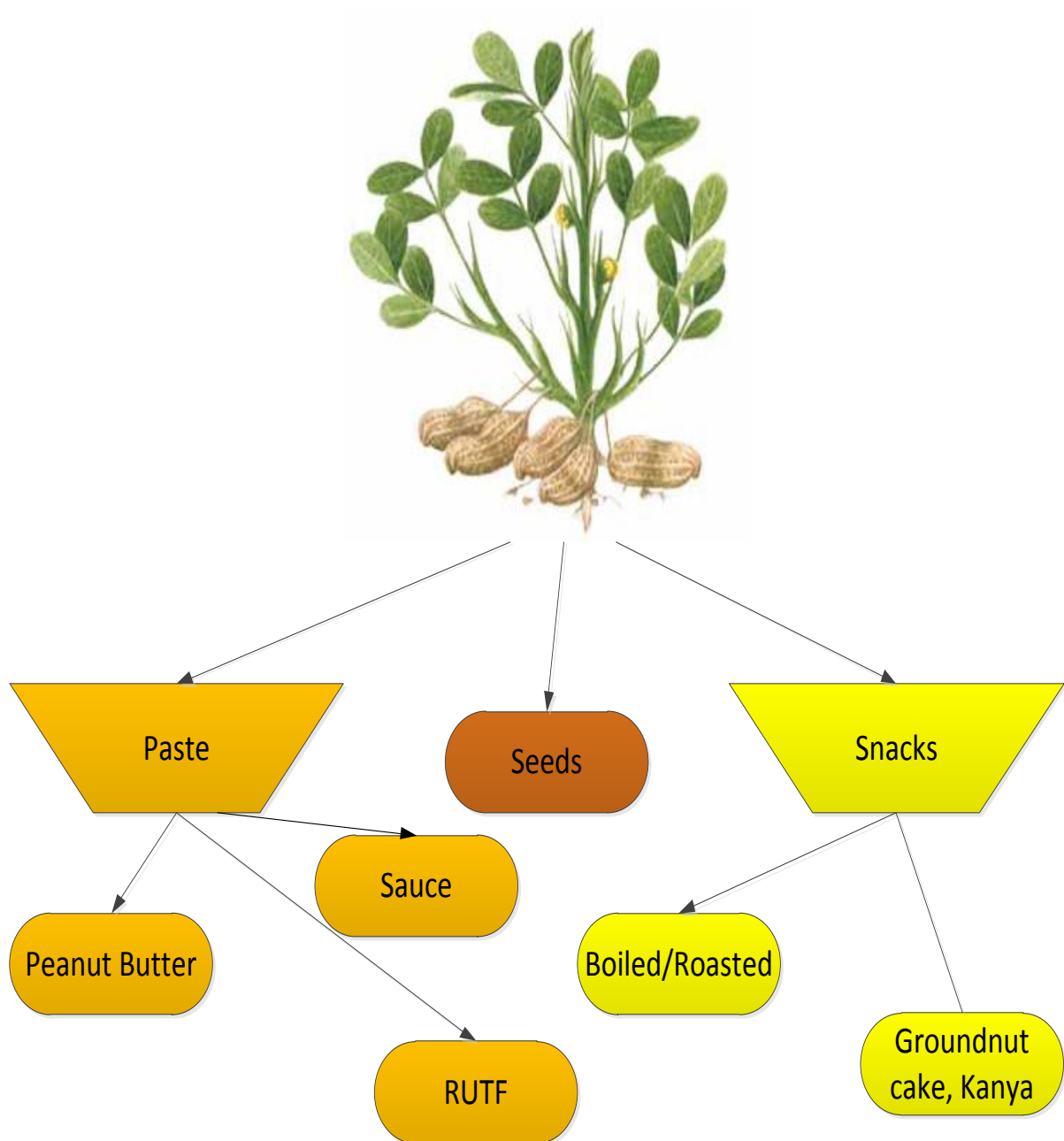


Figure 18: Present uses of groundnuts in Sierra Leone

Source: Photo ICRISAT, 2012 re illustrated by Mike Johnson 2012

## **4. RESULT COWPEA CHAIN**

This chapter describes the cowpea sector of Sierra Leone. The tools used are the rapid market appraisal, the value chain map and the estimation of profit margins and market share within the chain. The rapid market appraisal tools aids in identifying the stakeholders, their roles and relationships. However the enabling environment and the role of supporters within the chain are excluded because they are similar to that of the groundnut chain. The information provided by the actors with regards to production cost and prices are questionable, however the tool estimation of profit margins and market share within the chain gives an overview of the value addition within the chain. The chain map aids in visualizing the data found during the rapid market appraisal.

### **4.1. The cowpea chain in Sierra Leone**

The core processes in the cowpea chain are, input supply, production, wholesaling, retailing and consumption. The chain actors are, seed dealers, FBOs consisting of small scale farmers, merchant traders, market women and food sellers, a food processing organisation and the local inhabitants that are the consumers. It was found that the merchant trader are the chain coordinators, they source for cowpeas throughout the country. The merchant traders sell to seed dealers and market women. It was found that the supporters in the cowpea chain are NGOs, research institutes and family and friends that provide financial services to some of the actors. The chain also depicts the enabling environment that creates the laws, regulation, policies and infrastructure for the sector. As illustrated in the chain map (Figure 19)

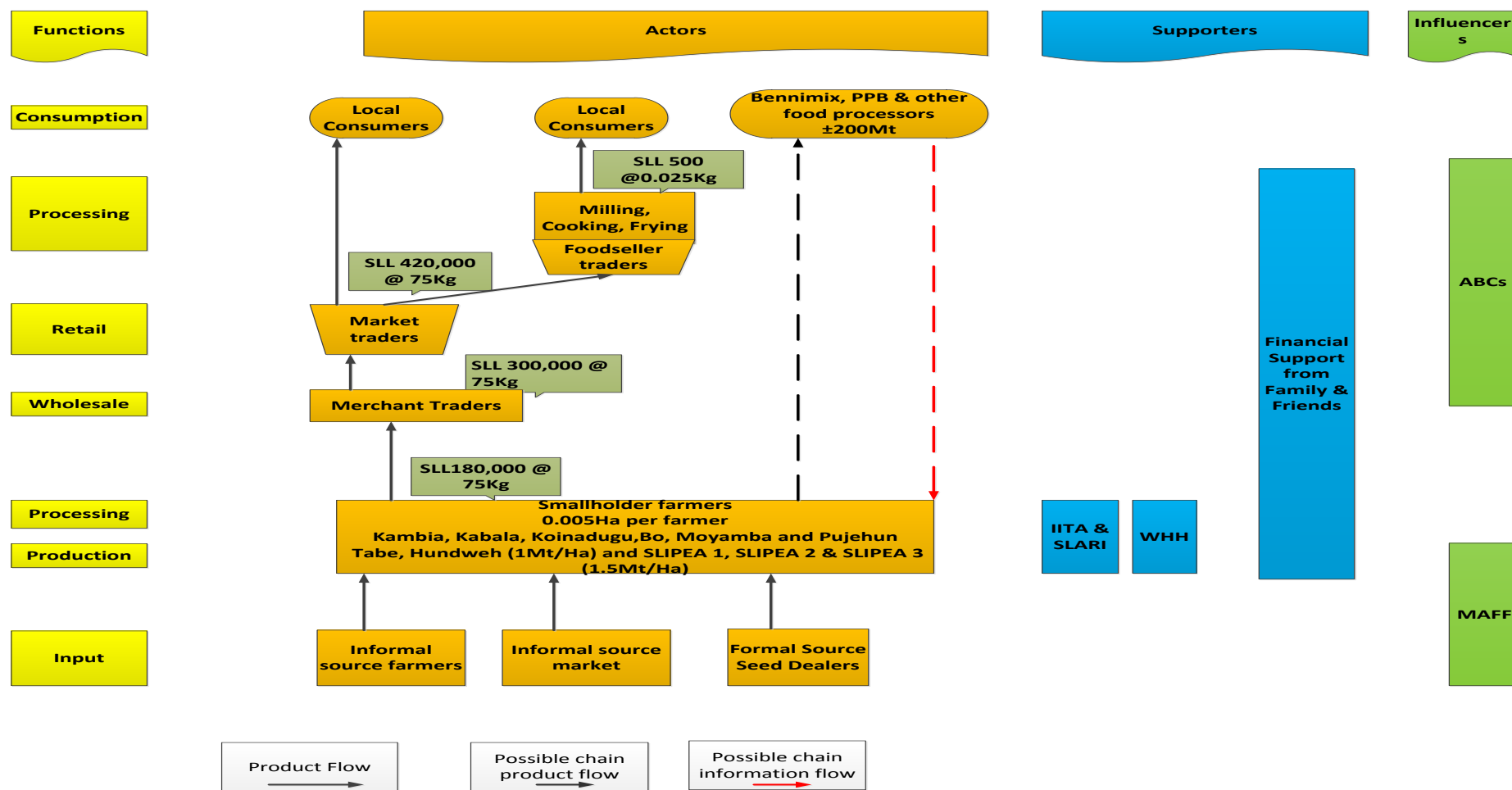


Figure 19: The Cowpea chain

Source: Illustrated by Mike Johnson 2012



#### **4.1.1. Input supply**

Farming inputs such as seeds, tools, fertilizers and agro-processing equipment's are purchased through agro dealers and the local markets. The MAFFS and NGOs donate the mentioned inputs as gifts, the research institutes are the providers of seeds to farmers for trial purposes. In the cultivation of cowpeas in Sierra Leone seeds are the most important input for farmers. The source of seeds can be classified into formal and informal sources. The formal sources are "certified seeds" issued to the farmers by NGO's such as WWH and reputable agro dealers, such as SEED TECH INTERNATIONAL and HOLLAND SEEDS, the research institutes are SLARI and IITA. The informal sources are saved seeds from farmers and the open markets. The sources of other inputs used in the cultivation of cowpeas are mostly accessed via the local markets or donated by NGOs. These input are hoes and cutlasses, this indicates that the cultivation is labour intensive.

#### **4.1.2. Production**

It was found that the producers of cowpea are mostly women small holder farmers engaged in subsistent farming. Due to the limited interest on the crop, cowpeas are mostly cultivated on small patches of land in front or at the back of their houses (Figure 20)



Figure 20: Back yard cowpea cultivation in Kambia

Source: Photo by Mike Johnson 15.08.2012

Farmers make use of seeds saved from previous harvest or donated by NGOs and research institutes. Cowpeas are harvested when the pods are fully mature and dry. A farmer mentioned that harvesting is done 2 or 3 times as all of the pods do not mature at the same time. After harvest, the value addition processes begins as the farmers, trash the pods and separates the chaff from the seeds. This is done by the women who use flat cylindrical disc for winnowing. The seeds meant for consumption are placed briefly in boiling water and then dried on the drying floors for about a week(Figure 21) after which they are stored in sacks or plastic barrels. The seeds for planting are also dried on the floor and later stored in sacks or plastic barrels. Cowpea weevil and rats are pests that attack cowpeas during storage, farmers use dried pepper as a means of prevention of the weevil and plastic barrels for the prevention of rats.



Figure 21: Drying cowpeas

Source: Photo by Mike Johnson 17.08.2012

As in the case of cowpea and other crops cultivated in Sierra Leone, roads and transport facilities are a big constraint to farmers in accessing markets. The head farmer of a FBO mentioned that a sack of cowpea estimated to contain 75 kg<sup>9</sup> is retailed at SLL 180,000 on the farm and SLL 240,000 at the market.

#### **4.1.3. Wholesale**

Similar to the groundnut chain, the merchant traders are involved in the wholesaling of cowpeas. They can be considered the chain coordinators. The merchant traders scout the villages in search of cowpeas and other crops. Sacks of 75Kg are purchased from the farmers at SLL 180,000. The other costs involved are SLL 10,000 transportation cost per sack, and SLL 6000 for loading and unloading. The cowpeas are then brought and stored in the headquarter towns and cities where they are retailed at SLL 300,000 to market traders and other buyers. Similar to the farmers, access to the farmers is a constraint for these merchant traders because of poor roads and inadequate transport.

#### **4.1.4. Retail**

It was found that retailing of cowpeas is done by market traders and food sellers. The market traders are self-sponsored women in big cities who buy sacks of cowpeas and retail cups of 0, 25 Kg at SLL 1400 to the local consumers and food sellers (Figure 22).

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<sup>9</sup> The unit of measurement is a cup which contains about  $\pm 0,25$ kg.



Figure 22: Market Trader selling cowpea

Source: Photo by Mike Johnson 21.08.2012

The food sellers are mostly women and girls who process cowpeas into various products. The products are mentioned in chapter 4.3 the present uses of cowpea in Sierra Leone.

#### **4.1.5. Consumer**

The research depicts that cowpea is mostly consumed in rural communities of Southern Provinces and is considered a luxury grain in Freetown. In Freetown cowpea is mostly prepared during naming ceremonies, funerals and other religious ceremonies. The local consumers have no special demand but the Tabe variety is appreciated. As in all products sold in Sierra Leone, price is a concern to consumers. It was found that Bennimix Food Factory and PPB in Freetown are interested in the crop. Cowpea is one of the ingredients used in the production of mixes for babies, school children and adults by the Bennimix Food Factory. The company is unable to get a supplier, who can deliver about 10 tons per month. The PPB is also interested in the crop, as it would be used in the replacement of powdered milk in the RUTF for malnourished children. For these food companies quality is a major concern, farmers and other actors intending to supply these consumers must adhere to the quality criteria of the Codex Alimentarius because the end consumers are expecting products that are safe for human consumption.

## Box 2: Codex Alimentarius for cowpea

### General quality factors

Cowpeas shall be safe and suitable for human consumption

Cowpeas shall be free from abnormal flavour, odours, and living insects.

Cowpeas shall be free from filth (impurities of animal origin, including dead insects) in amounts which may represent a hazard to human health.

### Quality factors – specific

Moisture content 15%

Extraneous matter is mineral or organic matter (dust, twigs, seed coats, and seeds of other species, dead insects, fragments, or remains of insects, other impurities of animal origin). Cowpea shall have not more than 1% extraneous matter of which not more than 0.25% shall be mineral matter and not more than 0.10% shall be dead insects, fragments or remains of insects, and/or other impurities of animal origin.

Toxic or noxious seeds: Cowpea shall be free from the following toxic or noxious seeds in amounts which may represent a hazard to human health. – *Crotalaria* (*Crotalaria* spp.), Corn cockle (*Agrostemma githago* L.), Castor bean (*Ricinus communis* L.), Jimson weed (*Datura* spp.), and other seeds that are commonly recognized as harmful to health.

Source: (Codex Alimentarius Commission, 2007)

## 4.2. Estimating profit margin and value shares

The cost used in this analysis are mainly variable cost, information on fixed cost were not available, due to lack of record keeping and knowledge in farm economics. As mentioned in the limitations of the research the quantitative data used with regards to cost are meant to provide an overview of cost secured by the actors in the chain.

The profitability of production for smallholder farmers depends on the volume of output, price of output, and total cost of production (USAID, 2008) (Table12). This can also be applied to cowpea, according to the Farmers' Guide to Cowpea Production in West Africa between 12–25 kg/ha of seeds are need for cultivation. (Dugje, et al., 2009). Therefore one can estimate that  $\pm 18.5$  kg of seeds is required, from the previous harvest. In the event of purchase from a seed dealer a kg of seed will cost SLL 12,600. Cowpea farmers do not make use of chemical inputs in cowpea production. The cultivation of cowpea is similar to that of groundnut cultivation as they are cultivated on less dense vegetation. Therefore, as in the case of groundnut cultivation,  $\pm 7$  person days per hectare are needed to prepare the land for cowpea production.

Table 13: Economics of production cowpea (local variety)

	Quantity	Total (SLL)
Seeds per Ha	$\pm 18.5\text{kg}$	233,100
Fertilizers		
Equipment	7 Cutlasses	105,000
	7 Hoes	70,000
Land clearing	7 person day	70,000
Ploughing(twice)	7 person day(x2)	140,000
Weeding(twice)	7 person day(x2)	140,000
Harvesting	15 person day	150,000
Bags	13	65,000
Total production cost (per Ha)	74,853	973,100
Productivity	1mt/ha (1000 kg/ha)	
Revenue (75kg per bag)	SLL 180,000	2,340,000
Margin		1,366,900

Table 14: Economics of cowpea production merchant trader

Product	Cost	Value
75 Kg of Cowpea	Purchase	SLL 180,000
	Transport	SLL 10,000
	Loading/ Unloading	SLL 6,000
Total	Production	SLL 196,000
	Retail	SLL 300,000
	Margin	SLL 104,000

Table 15: Economics of cowpea production market trader

Product	Cost	Value
75 Kg of Cowpea	Purchase	SLL 300,000
	Loading/ Unloading	SLL 2,000
Total	Production	SLL 302,000
	Retail	SLL 420,000
	Margin	SLL 118,000

To calculate the profit margin and the value share of the cowpea sector in Sierra Leone following information were of vital importance; the costs of production, revenues, net income, the added value and gross margin secured by the different actors in the chain, with this information, one will have a view of the value share of the actors within the chain. The value share of the actors in the chain that comprises the farmers, the merchant traders and market traders who retail to the local consumers was calculated. The reasons for choosing this chain is, it depicts the basic use of cowpea and provide a view on the value share of the actors within the chains

Table 16: The chain that comprises the small farmers, the merchant traders and market trader (75Kg)

Value chain Actor	Total costs	Selling price(SLL)	Gross margin(SLL)	Added value	Gross margin %	Value share %
Farmer	74,853	180,000	105,147	180,000	58%	43%
Merchant Traders	196,000	300,000	104,000	120,000	35%	28.5%
Market Traders	302,000	420,000	118,000	120,000	28%	28.5%

In this chain (Table 16) it can be seen that the farmer has the highest gross margin of 58% and value addition of 43%. This is due to the fact that the costs of production are low compared to the other actors. Most farmers use seeds from previous harvest and no chemical inputs.

### 4.3. Present uses of cowpea in Sierra Leone

Cowpea is a good source of protein for farmers and inhabitants of rural communities in Sierra Leone. In urban communities it can be considered a luxury product, used for the preparation of special dishes on certain ceremonial and festival occasions. Cowpeas are processed into various products Akara (spicy fritters baked in palm oil or groundnut oil), Arborbor (cowpea sauce eaten with bread or garri) Oleleh (a spicy pudding made with dried fish, palm oil or groundnut oil), Toortangue (boiled cowpea eaten with cassava), and Tohakpe (cowpea sauce). (Moseray, 2012) Cow pea is also one of the ingredients used in the production of mixes produced by the Bennimix Food Factory in Bo.

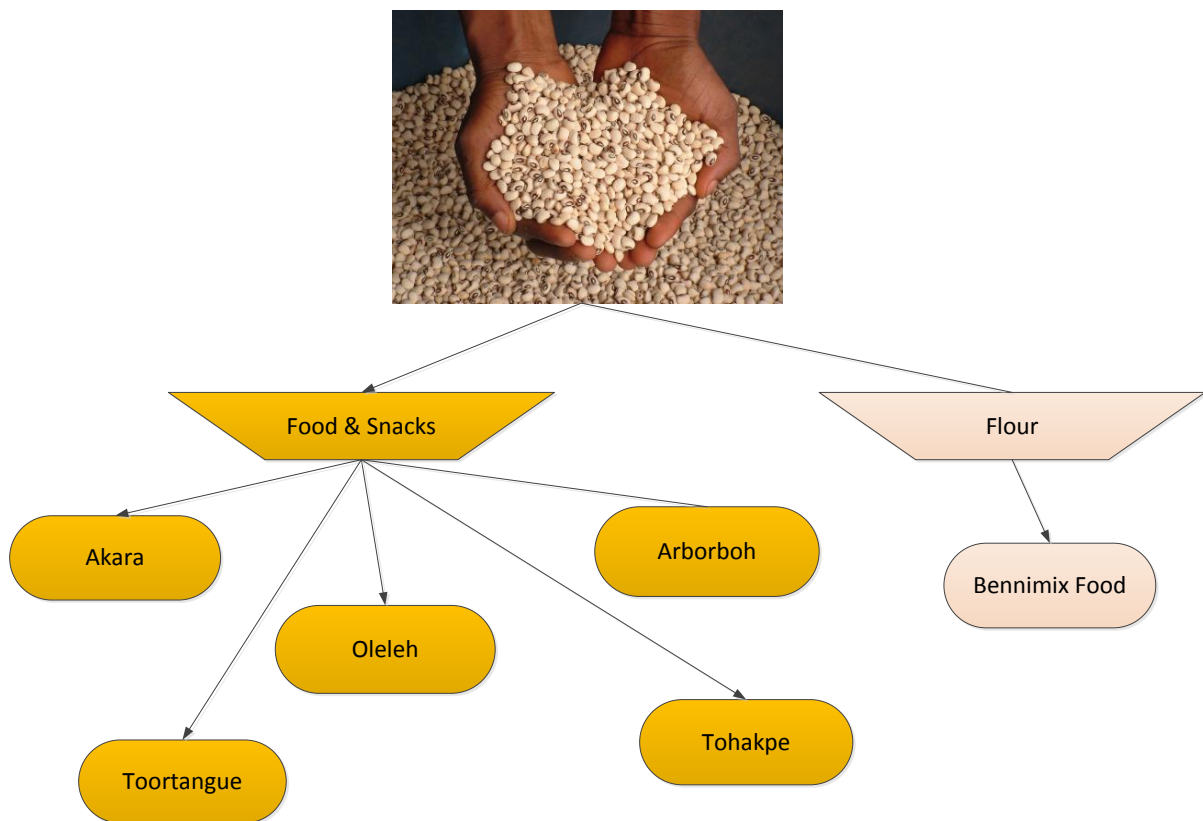


Figure 23: Present uses of cowpea

Source: Photo Corporate Disaster Resource Network, 2012 re illustrated by Mike Johnson 2012

## **5. RESULT SOYBEAN CHAIN**

The present chain comprises of two actors; the input suppliers and costumer. The suppliers of inputs are mainly research institutes such as IITA, SLARI and the Njala University. They have trial sites throughout the country, as in the case of groundnuts, the IITA issued the following varieties of soybeans seeds to the SLA; TGX 19046F and TGX 14482E (James, et al., 2012). The seeds are cultivated at the nursery in Kontafari in Kambia District. It was found that these crops are not meant for the consumer market but for multiplication purposes. The seeds from these crops will then be cultivated as provisional crops on the 46,000 ha plantation in Bureh, Kassek and Makontheh villages in the Kambia district. The costumers for soybeans are food processors and entrepreneurs in the poultry sector. Sierra Akker Agricultural Company poultry imports 120 tons soybeans annually from the Netherlands; others have to make use of substitutes for their products. It was found that Paja Poultry might demand 100 tons/year.



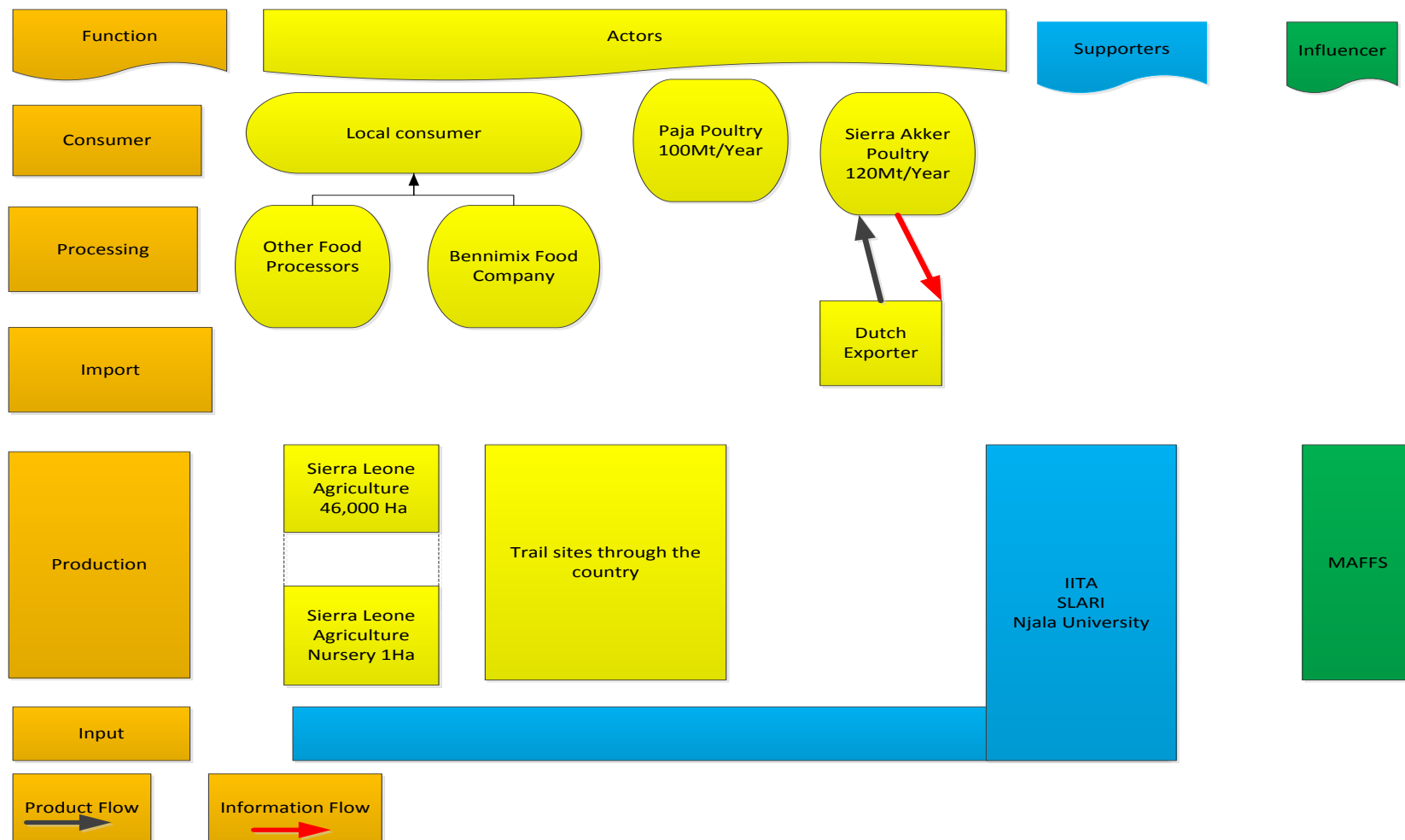


Figure 24: Present soybean chain in Sierra Leone

Source: Illustrated by Mike Johnson 2012

## **6. RESULTS OF CONSTRAINTS IN THE VARIOUS CHAINS**

This chapter describes the generic constraints mentioned by the actors in the various chains. The generic constraints are listed in 6.1-6.6 and constraints observed that might affect the mentioned chains and the agricultural sector are mentioned in 6.7-6.8

### **6.1. Pest and Diseases**

The cultivation of groundnuts and cowpeas are done on the fields there by making them susceptible to insects, rodents, livestock and diseases. The head farmer of the FBO in Kambia said

***“We burn clothes and certain grasses to drive the flies away. There is a certain worm that curls up in the leaves of the groundnut plant if left then we loss all our crops”***

The burning of the clothes and grasses according to the head farmer serves as a pesticide, that repels the flies and worms that attach the groundnuts. The most common disease that affects groundnuts cultivated in Sierra Leone is the rosette disease which is transmitted by an aphid. This aphid infests the plant by attaching on the leaves of the plant, resulting in stunted growth and poor harvest. That of cowpea is the cowpea mosaic virus.

### **6.2. Post-Harvest and Storage**

Another constraint is the lack of proper storage facilities that will prolong the shelf life of the groundnuts and also limit the rate of aflatoxin. Farmers have difficult in storing their crops after harvest and especially during the rainy season. An extension worker of WHH said

***“In the rainy season farmers prefer to sell their groundnuts, the nuts that are not sold are placed in sacks, these sacks are then smoked in special huts, the smoke and heat then preserves the groundnuts for about 3 months”***

Some privileged farmers have the opportunity to store their groundnut at the ABCs provided by the MAFFS. However these storage facilities lack some of the requirements for storage as outline in codex alimentarius for groundnuts and other grain legumes. The buildings lack sufficient ventilation thereby increasing the accumulation of moisture which is conducive for moulds. Moulds can reduce the shelf life of these legumes, resulting in low volumes reaching the markets. With regards to the storage of cowpeas, cowpea weevil and rats are pests associated with cowpeas during post-harvest and storage. The means of storage varies; some farmers store them in plastic barrels which are expensive, other have to store them in sacks, which are easily accesible to rats and the cowpea weevil. The head farmer of a FBO in Kambia said

***“The plastic containers are the best means of persevering, our crops but they are expensive, and therefore we have to store them in rice bags. To drive the pest away we put dried pepper into the sacks, the strong smell deters them from eating the cowpeas”***

### **6.3. Poor road access to farms**

It was found out that farmers have difficulty in reaching their farms, due to the poor roads especially during the rainy season. A farmer in Kabala said

***“I cannot carry my groundnuts from the farm; I have no choice but to sell at a lower price to the merchant trader”***

Farmers and extension workers mentioned that the inaccessibility to the farms worsens during and immediately after the rainy season. However merchant traders make use of old Lorries to access the remote farms.

### **6.4. Finance**

Finance is not easily accessible by the most actors in the various chains; because these actors lack the collateral to access loans from the bank or other financial institutions. Those who have access are confronted with the problem of cash flow. These factors reduces the potential of the actors to invest in their businesses, buy labour saving machines for cultivation and equipment that can help them in the value addition process.

### **6.5. Unavailability of crops**

The food producing companies and poultry farmers complain of the limited volumes and low quality crops produced. PPB and the Sierra Akker Poultry farm had to import groundnuts and soybeans respectively from the USA, the Netherlands and other West African countries. These are some of their comments;

***“Can you imagine we had to import groundnuts from the States, as we cannot receive the required volume and quality for the production of our RUTF in Sierra Leone?”***

***“I have searched the length and breadth of the country in search of farmers willing to cultivate soybeans and maize but to no avail, therefore I resulted in the importation of soybeans from the Netherlands for my poultry”***

### **6.6. Lack of standardized processing facilities/companies.**

It was found that the processing of groundnuts and cowpeas are done by small scale millers at the market. The volumes are low and the quality standard of production cannot be considered hygienic. This is a hindrance to food processing companies as some of them are in need of semi processed products that will be used in the manufacture of their final product. The quality manager of the PPB said

***“For the production of our RUTF we are in need of groundnut paste with aflatoxin contents of  $\leq 20\text{ppb}$  and produced under strict hygienic condition, at the moment there are no processor in Sierra Leone that can attain the mentioned standard, therefore we have to produce our own paste”***

### **6.7. Sustainability of the chains.**

It was found that most of the farmers are middle age or elderly, the youths and young adults do not seem to be interested in the agricultural sector, with the life expectancy of  $\pm 40$  years. The production capacity of the country will diminish in the coming years, due to the lack of young adults in the agricultural sector. There is a need to stimulate these young adults into the sector, in order for them to envisage the importance of the agricultural sector. Failing to do so will result in the collapse of any value chain and market potentials, as production is an important aspect in value chain development.

### **6.8. Communication gap between farmers, food producers and poultry farmers.**

There is a communication gap between farmers and companies that produce food and poultry farmers. The farmers mentioned that they are willing to cultivate provided they are granted the inputs and a market to offset their production. While the food and feed production companies mentioned that they are in need of farmers to produce large volumes with required quality standard. This issue needs to be addressed, if not it will result in entrepreneurs becoming less interested in the agricultural sector.

## 7. DISCUSSION

This chapter describes some of the issues of concern in the various chains, with regards to the constraints and questions pertaining to the research.

### 7.1. Pest and Diseases.

Pest and diseases are problems associated with crops; the research institutes provide improved varieties to the farmers for the minimization of these pest and diseases. However it was found that some farmers and extension officers have little knowledge on other varieties that are resistance to diseases. During the group discussions, groundnut farmers and extension officers only mentioned the Mares variety in all topics discussed. However the SLINUT 1 has a greater resistance to the rosetta virus compared to Mares. (MAFFS & FAO, 2005) The use of improved variety will increase the resistance of pest and diseases, resulting in better yields of the crop.

### 7.2. Production chain or Value chain

According to findings from the research, there are similarities in two of the three chains, namely the groundnut chain and the cowpea chain. The processes and actors are similar. However the term “value chain” should be considered with regards to the mentioned grain legumes. According to Huub

**“A value chain is understood as a strategic network between a numbers of independent business organisations and they shared commitment to control product quality and consistency”**

In the groundnut and cowpea chains in Sierra Leone there is value addition but the strategic link between the various actors are missing. The actors are interested in the availability and price of the crop, quality can be considered a secondary requirement. In a production chain the product is transformed, value is added but there is no strategic network between the actors. The actors are not interested in what the other actor does with the crop. Therefore one will conclude by saying the present groundnut and cowpea chains are production chains, the addition of value in a product does not automatically classify the chain to be called a value chain, when there is collaboration between the actors supported with a long term strategic vision of the chain, then the chain can be considered a value chain.

### 7.3. Producer driven or Consumer driven.

Based on observation and findings, the groundnut and cowpea retailed by market women, petit traders and food sellers and can be classified as producer driven chains because the farmers produce these crops basically for their consumption and the rest sold, the local consumers however have no special demands, their main concern is availability and price. Whiles in a consumer driven supply chain, the request of the end user determines the activities of the actors within the chain, which involves collaboration and information sharing between them. The PPB chain is a consumer driven value chain because there is extensive communication and information flow between them and the other actors in the chain with regards to the quality of groundnuts purchased. The groundnut must fulfil the aflatoxin criteria of  $\leq 20$  ppb. This has been an obstacle for producers, resulting in PPB importing groundnuts from the USA. Therefore PPB decided to assist a merchant trader by providing him with the required information with regards to the groundnut needed, the merchant trader also passes this information to the farmer. To conclude in a costumer driven value chain, the actors are knowledgeable on the end product and user. In Sierra Leone the producers, who are the farmers and

other actors in the groundnut and cowpea chains lack this knowledge, because for them groundnuts and cowpeas are common or basic products, that are consumed without any criteria or standards attached to them.

#### **7.4. Value addition**

In the groundnut and cowpea chain there is value addition. In both chains the farmers are involved in the basic forms value addition such as cultivating, packaging and transporting. The merchant traders, market women and small scale processors are also involved in the value addition. However in the groundnut chain the market trader adds 45% value to the crop, by grinding it into paste and in the cowpea chain the farmer adds 43% value to the crop. According to the findings, the trade of groundnuts with value addition contributed more to the actors as compared to groundnuts without value addition. In Sierra Leone the farmer adds value by transforming the seeds to grains, packaging into sacks and the merchant trader adds value by shelling and roasting of the groundnuts. However in a report by the USAID on the groundnut, rice and maize value chains in Northern Uganda the rural trader shells the nuts using manual appropriate technology style hand-operated device before selling to the town trader, the report also mentioned that 50 kg of unshelled groundnuts produces about 35 kg of shelled groundnuts (USAID, 2008). Comparing the Sierra Leonean groundnut chain to the Northern Ugandan groundnut chain, there are similarities in both chains. In Northern Uganda groundnuts are cultivated by small scale farmers, who sell to rural traders, the rural trader sell to the town traders and regional market, the town trader sells to the city trader and the city trader sells to the consumer processed and unprocessed groundnuts, in Sierra Leone groundnuts are also cultivated by small scale farmers and the merchant traders buy from these farmers in remote villages and then sells to seed dealer, market traders and NGOs in the big cities. In Sierra Leone the merchant trader plays the role of the rural trader and town trader in Northern Uganda. In both chains farmers are not involved in value addition of un-shelling the nuts or processing them into paste.

#### **7.5. The soybean chain**

Soybean was introduced to farmers in the 80s, but failed to gain the interest of farmers, the reasons are still unknown but one will assume that three factors might have contributed to their loss of interest in the crop. Lack of information on the uses and benefits of soybean, finance required for cultivation and the lack of suitable varieties.

It was found that there is lack of information on the uses and benefits of soybeans in Sierra Leone, some farmers and some educated consumers in the agricultural sector are knowledgeable on its uses but the majority of the consumers are not aware of the benefits and uses. During an interview with the head of an FBO she said

***“During training I was told not to eat this bean as it is meant for chicken”***

Subsistent farmers are motivated to grow when there is a market for their products or the product can be consumed by them, which cannot be said for soybean. She went on further by saying

***“If we are provided with the seeds, we will cultivate. We are doing it for the brewery, they gave us sorghum seeds and we cultivate for them”***

An extension officer in Kabala also mentioned that the World Health Organisation provided rice farmers in Kabala with seeds and other inputs for the school feeding projects in the country, the extension officer further mentioned that the project is a success as the farmers were able to cultivate the required volume and the WHO purchases all of the rice produced.

In Sub-Saharan Africa the majority of the small holder farmers lack finance. The cultivation of soybeans requires capital; farmers have to buy fertilizer to enable optimal growth. In a report on soybean cultivation in Southern African countries, the issue of finance is one of the constraints mentioned by farmers. Farmers had difficulties in obtaining finance to cultivate the land as they needed to invest in irrigation systems and modern mechanization. Those who had access to finance found it very expensive. (Opperman & Varia, 2011) In Sierra Leone smallholder farmers have difficulty in cultivating low risk crops, soy bean being a high value crop would be a burden to manage as small holder farmers lack the finance and knowledge in cultivation of such a high value crop. However this is an opportunity for commercial farmers and FBOs because they can have access to finance and due to their size, they can produce the volumes demanded.

## 8. CONCLUSION

The research was set out to provide an overview on the value chains of the following grain legumes; groundnut, cowpea and soybean for the Sierra Leonean market. The following conclusions can be drawn from the research, of the three crops; groundnut production contributes the most followed by cowpea and the current contribution of soybean is zero as there is no soybean production in the country outside the research trials and seed multiplication. The research indicates that small-scale farmers are the major producers of groundnuts and cowpeas in Sierra Leone. The research also indicated that the producers of groundnuts can be divided into three groups, independent small scale farmers, FBOs and a commercial farmer. However the cultivation of groundnut is mostly done by women but in the recent past, male farmers have shown interest in groundnuts cultivation, as 0.25 kg retails at (SLL 1300) compared to that of rice the staple crop, which retails at (SLL 900) that of cowpea can be classified into independent small scale farmers and FBOs. A 0, 25 kg cup retails at (SLL1400). Groundnuts are cultivated throughout the country however cultivation is predominant in the Northern Provinces. Cowpea cultivation is done in the Northern Provinces but cultivation is predominant in the Southern Provinces.

The results of the research showed further similarities in the groundnut and cowpea chains. They exhibited similar functions and chain actors. The functions identified in both chains are input, production, wholesaling, retailing, processing and consumption. The actors identified in both chains are seed dealers, farmers, merchant traders, market women, small scale food processors, petit traders, food sellers, food processor and local consumers. The functions identified in the soybean chain are production and consumption. The merchant traders are the chain coordinators; they source for both crops in remote villages and sell to seed dealers, market traders and food production companies in the major cities.

The research has shown that the MAFFS and NGOs are involved in supporting the various chains in value addition by providing them with seeds, tools and machines. The research institutes provide seeds that are of improved varieties but the yields of groundnuts and cowpeas remain low. In 2010 the yield of groundnut production was 0.82 t/ha (FAOSTAT, 2010) far below the expected yield potential of SLINUT 1 the improved variety (2.5 t/ha) and Mares (2.0 t/ha) the local variety. (MAFFS & FAO, 2005)

The findings of this research indicate both consumer and producer driven chains in the groundnut and cowpea sector. Groundnut and cowpea retailed by market women, petit traders and food sellers and can be classified as producer driven chains because the farmers produce these crops basically for their consumption and the rest sold, the local consumers however have no special demands, their main concern is availability and price. However the groundnut chain that includes PPB chain is a consumer driven value chain because there is extensive communication and information flow between them, the merchant trader and other actors in the chain with regards to the quality of groundnuts purchased because as food producers of RUTF, PPB is expected to deliver products that are safe for human consumption.



It was found that in the groundnut and cowpea chain there is value addition. In both chains the farmers are involved in the basic forms of value addition such as cultivating, packaging and transporting. The merchant traders, market women and small scale processors are also involved in the value addition. However in the groundnut chain the market trader adds 45% value to the crop, by grinding it into paste and in the cowpea chain the farmer adds 43% value to the crop. According to the findings, the trade of groundnuts with added value in the form of paste contributed more to the actors as compared to groundnuts with limited value addition.

The research also depicted the uses and potential uses of the mentioned grain legumes; they can be classified into three main uses, seeds, food and feed. This study has found that generally groundnuts are used as seeds and grains. The grains are processed into various forms, cooked, roasted and paste. Groundnut paste is used as an ingredient in the preparation of local dishes and constitutes about 27% of the RUTF for malnourished children. The potential uses are, the oil can be used in the cosmetic industry for soap making and massage oils and the shells and other by-products can be transformed into the following products; glue for wood, animal feed, fertilizer and antibiotics. The present use of cowpeas is basically for human consumption, in the form of snacks and also an ingredient used in the production of mixes produced by the Bennimix Food Factory in Bo. However large volumes can be cultivated for other food processing companies because of the high protein contents and also farmers can export cowpeas to other countries in West Africa that are in demand.

The main constrain observed during the research with regards to market opportunities for the mentioned legumes was the communication gap between the producers, the food production companies and poultry farmers. The farmers mentioned that they are willing to cultivate provided they are granted the inputs and a market to offset their production. Whiles the food and feed production companies mentioned that they are in need of farmers to produce large volumes with required quality standard.

To conclude by highlighting the main opportunities observed for FBOs and investors interested in agricultural sector with regards to market opportunities, were the lack of standardized processing facilities and the development of the soybean chain. The development of the soybean chain is a perfect opportunity for FBOs and commercial farmers to cultivate this crop for the food producing companies and poultry farmers. This is further described in the recommendations.

## 9. RECOMMENDATIONS

The findings of this research on the value chains of groundnut, cowpeas and soybeans have a number of important implications for the success of the mentioned value chains with regards to market opportunities in Sierra Leone. The recommendations are divided into three groups;

- Potential uses and market opportunities of soybeans, groundnuts and cowpeas in Sierra Leone
- Importance of standardized processing facilities.
- Generic recommendations for the success of the mentioned value chains in Sierra Leone

### 9.1. Potential uses and market opportunities for soybeans.

Soybean however is a crop that will contribute positively to the farmers and the national food basket, because soybean is a good source of protein, with an average protein content of 40% and oil content of 10% that contains 85% unsaturated and free cholesterol. (Dugje, et al., 2009). Given the amount of arable land in Sierra Leone, soybean cultivation will not compete with the cultivation of other crops. Soybean can be cultivated throughout the country, however according to the crop production guideline for Sierra Leone there is a better potential for cultivation in the Northern provinces of Kabala and Koinadugu District.

The potential uses of soybean can be classified into two groups namely; food and feed.

- Food  
As food soybean consumption will be beneficial to the population of the adults suffering from diseases associated with high levels of cholesterol and malnourished children suffering from lack of protein, as it can be processed by the locals into soy milk, yogurt, spicy fritters and porridge.
- Feed  
Feed is the second alternative use of soybean applicable to the local market in Sierra Leone. This is due to the high protein and fibre contents of the beans it can be fed to poultry and other livestock.

The by-products of soybean can be used in the production cosmetics, pesticides and herbicides as depicted in Figure 25

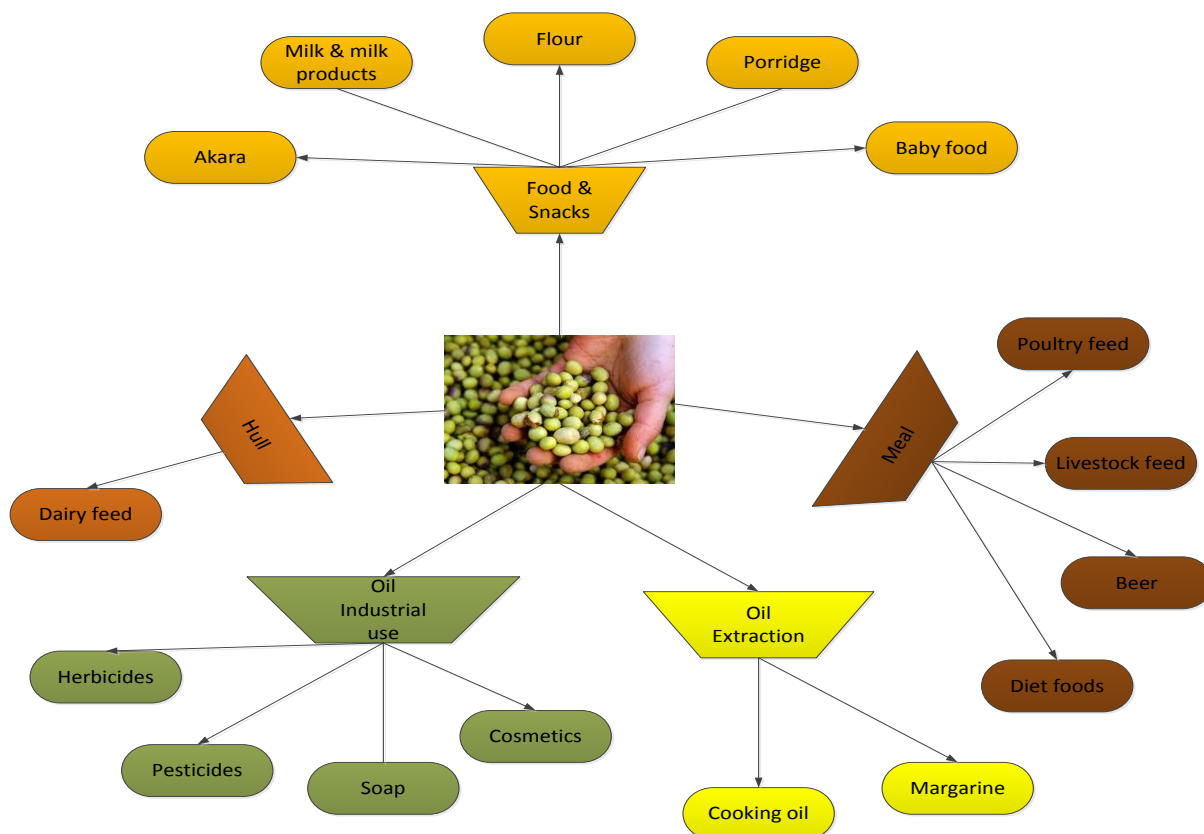


Figure 25: Soybean Value Chain Tree explaining its use and potentials

Source: Photo Green Earth Systems Commodities, 2012 re illustrated by Mike Johnson 2012

To ensure a successful chain the following points can be used to in the soybean chain

- It is advisable that cultivation be done by FBOs or commercial farmers as they can provide the required volumes demanded by food producing companies and poultry farms.
- The FBOs should be aware of the market demand and be able to provide the quantity and quality demanded.
- Food producing companies and poultry farmers can assist farmers by providing them with information on the expected quality standards and inputs for cultivation.
- The soybean value chain will consist of the following core processes; input supply, production, processing, retailing and consumption as illustrated in the chain map (Figure 26). This can be coordinated by the FBO or the commercial farmer.
- The financial institutions should provide loans to FBOs and commercial farmers so that they can purchase equipment and machines that will enable them to produce the required volumes and add value to the beans.
- The NGOs will provide inputs such as seeds, fertilizers, tools and extension services to the FBOs. During the inception phase the research institutes will provide seeds and extension services to the producers, which will later be done by seed dealers.
- The MAFFS will create the enabling environment for the actors and supporters which will include the laws, regulation and policies for the soybean sector of Sierra Leone. Such as dissemination programs on the uses and health benefits of soybeans to the inhabitants.

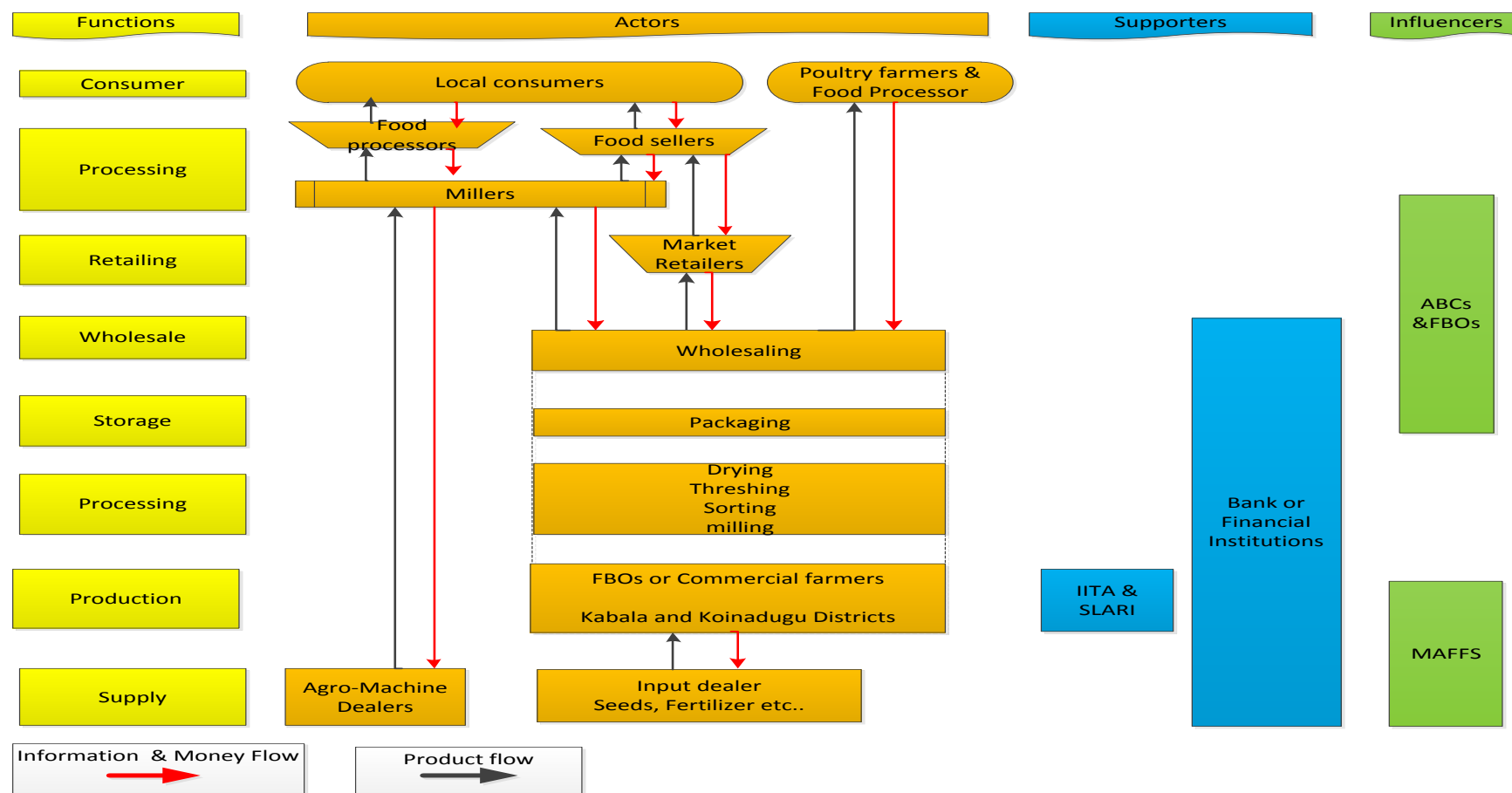


Figure 26: FBOs /Commercial farmers as chain coordinators of soybean chain

Source: Illustrated by Mike Johnson 2012

## 9.2. Potential uses and market opportunities for groundnuts.

Groundnut oil can be used as an important raw material in the cosmetic industry for soap making and massage oil. NGOs involved in groundnut sector can assist farmers and unemployed women in both rural and urban communities in the production of these cosmetic products, because there is a local consumer market for soaps and local cosmetics, also the shells and other by-products will not be wasted but transformed into the following products; glue for wood, animal feed, fertilizer and antibiotics (Department of Agriculture, 2011). The value addition process of groundnuts will create jobs for the farmers and unemployed women in Sierra Leone.

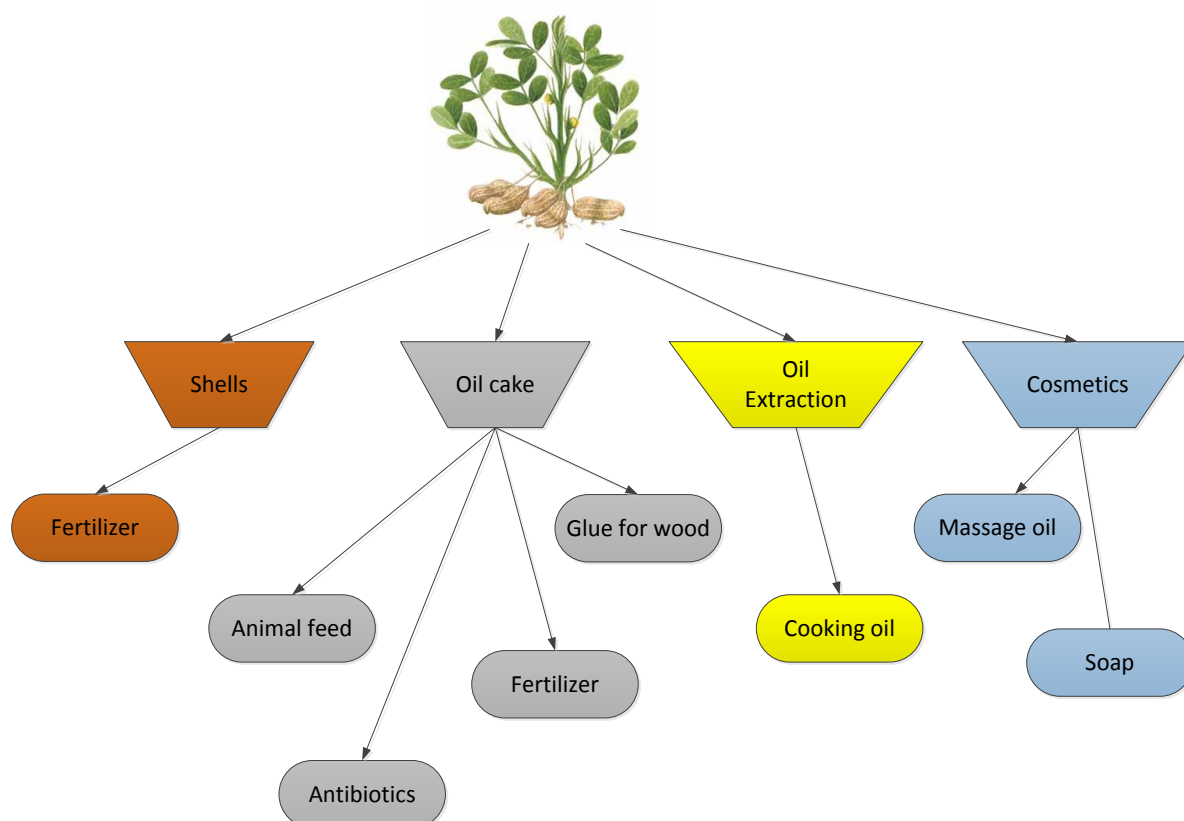


Figure 27: Groundnut value chain tree explaining its use and potentials

Source: Photo ICRISAT, 2012 re illustrated by Mike Johnson 2012

### 9.3. Potential uses and market opportunities for cowpeas.

FBOs can cultivate large volumes for the food processing companies like Bennimix and PPB because it is an important ingredient used by these companies due to the high protein contents of cowpeas, NGOs can assist farmers in gaining access to supermarket in the big cities, because imported cowpeas are sold in these supermarkets and finally with the aid of trade experts from the MAFFS farmers can export cowpeas to other countries in West Africa that are in demand.

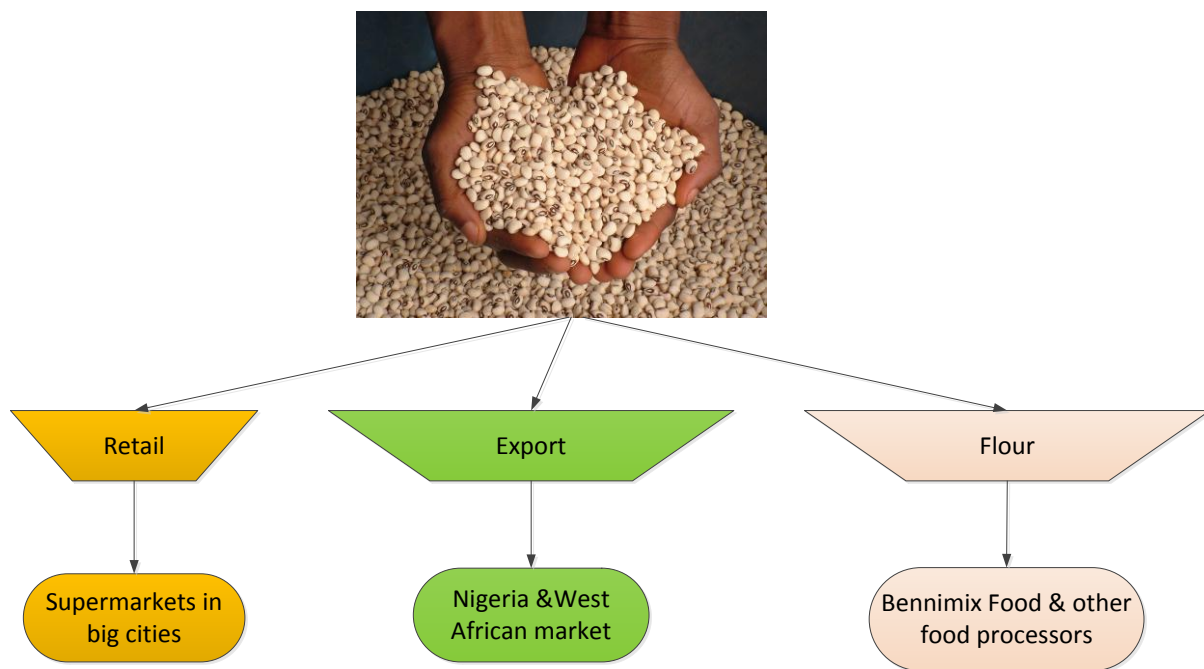


Figure 28: Cowpea value chain tree explaining its use and potentials

Source: Photo Corporate Disaster Resource Network, 2012 re illustrated by Mike Johnson 2012

#### **9.4. Importance of standardized processing facilities.**

Standardized processing facilities are missing in the agricultural sector of Sierra Leone. Food processing companies and poultry farmers are in need of semi processed product for their final products. The following semi-finished and finished products are in demand.

- The PPB requires 100t of groundnut with aflatoxin levels of  $\leq 100$  ppb; this cannot be achieved by a small scale processor.
- Extracted groundnut oil is the second most consumed cooking oil in Sierra Leone but there are no processors involved in extracting the oil in Sierra Leone.
- The estimated demand of cowpea is 200t for food processing companies like Bennimix Food Company and the PPB.
- That of soybean is estimated to be 210 tons, demanded by poultry farmers.

These are opportunities for entrepreneurs interested in processing of grains and other legumes, as done by millers in Malawi who process soybean that is used in animal feed mixtures and baby formulas. (Tinsley, 2009) NGOs can also assist FBOs in acquiring value additions processing machines, from companies such as FINIC by purchasing them or stand in as guarantors, in doing so the scope of the FBO would increase from production to processing, thereby creating better market opportunities for the FBOs.

#### **9.5. Generic recommendations.**

- Communication gap between farmers and food and feed production companies.

The DAOs should provide information of the farmers in their regions to food and feed production companies, with regards to their locations, size of farms and quantities produced. This will assist in the food and feed companies locating the farmers and providing them with the required support needed for cultivation.

- Development for ABCs and FBOs

##### **Storage**

The storage facilities in the ABCs for legumes need to be revised by the DAOs of the MAFFS, as the storage facilities of some of the ABCs fall short of certain attributes that will improve the shelf life of the legumes.

- Breaks and openings around doors, windows and eaves must be repaired or screened..
- Building with new concrete floors or walls should not be used for storage until it is absolutely certain that the new concrete is well-cured and free of excess water.
- The use of plastic cover spread over the entire new concrete floor or pallets can be used to protect the legumes from moisture.

Recommended for in-depth knowledge on this subject is the international code of hygiene practice for groundnuts and codex alimentarius for cereals, pulses, legumes and vegetable proteins.

## Training

The MAFFS and NGOs working in the mentioned chains should train FBO members on leaderships and management skills as it will improve the stability of the chains. Also training should be provided to the following actors, farmers, merchant traders, market women, small scale food processors and food sellers on standards pertaining to market requirements such as HACCP and other food safety standards. These training will assist the actors in producing and delivering products that are safe and hygienic thereby fulfilling the national and international requirements which will result to increasing their market opportunities.

- Sustainability of the chains

Sierra Leone is a country with a youthful work force, these youths must be encouraged to work in the agricultural sector, as this would aid in reducing youth unemployment, the replacement of elderly farmers and increase in the provision of food for the nations. This can be achieved by the MoE providing academic programmes in agricultural entrepreneurship at the various universities and tertiary institutions, these graduates will have acquired knowledge in cultivation and good agricultural practices, consumer demands, quality requirements and standards of these consumers, with the knowledge acquired the MAFFS can provide loans to these students to implement in various agricultural projects beneficial to the nation.

- Role of Supporters in accessing finance

Financial support has been a hindrance to farmers and other actors in accessing markets. In Uganda, NGOs offer grants to banks and micro finance institutions that are used for guaranteeing on lending to farmers. (USAID, 2008), NGOs in Sierra Leone can also emulate this example, as the actors will have access to finance, which they will use to buy value addition machines that will improved their chances in accessing markets.

- Dissemination on the importance and uses of groundnuts, cowpeas and soybeans.

NGOS and extension workers of the MAFFS must assist in the dissemination on the uses of the mentioned grain legumes. This can be done by providing information via, the print, electronic media and workshops. The benefits of dissemination are it will improve the local consumer's knowledge of the crops, with regards to the nutritional benefits and opportunities for the setting up of small scale industries in food, cosmetics fertilize and animal feed. The knowledge in the uses and benefits of these crops will stimulate purchase which will motivate the farmers to cultivate.

- Future study on value chains in Sierra Leone

Finally, the study on the groundnut, cowpea and soybean chain within the six week allocated time has provided insight on the chains of the mentioned grain legumes. However for further studies on the value chains of these crops, a minimum of six months is required to research the mentioned value chains. Future research must not be conducted during the months of July and August as some of the actors and officials from the MAFFS are engaged in workshops, seminars and the evaluation of the agricultural sector. Additional research on the quantitative data, pertaining to measurements, prices and costs would provide an authentic image of value addition and cost secured by actors in the various chains.



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## **APPENDIX**

### **Check list**

### **Input Suppliers**

#### **Background**

- Location
- Years in operation
- Type of inputs & other products traded.

#### **Procurement & sale of inputs**

- Volume of inputs traded. (Seedlings, fertilisers) per month/year.
- Types of seedlings & price.
- Seasonality in inputs sales.
- Suppliers of input and their location.
- Buyers of the input and their location.
- Current wholesale and retail prices for seedlings and fertilisers.

#### **Trends**

- Trends in sales of seedlings and fertiliser (past 3 years) and reason behind these trends.
- Perception of future demand trends for these inputs (next 3 years) and reason behind these trends.
- Trends in prices of these inputs (past 3 years) and reason behind these trends.
- Perception of future price trends (next 3 years) and key factors that is likely to drive these trends.
- Transactions
- Buying arrangements /conditions for inputs: e.g. purchases on credit prompt cash payment, etc...
- Selling arrangements/conditions for inputs: e.g. sales on credit prompt cash payment, paying in kind, etc...
- Policies & Regulations
- Key policies and regulations affecting the input trading business (subsidies policies) MAFFS

#### **Constraints & Opportunities**

- Key constraints to the development of the input trading business.
- Solutions to these problems.
- Key opportunities to develop the input trading business.
- Factors that could enable this development.
- Recommendations for improving access to inputs by farmers.

## **Producers (Farmers)**

### **Production & production cost**

- Recent changes in local production system over the past 5 years(cultivated areas, varieties, fertiliser use, yields, production volumes)
- Difference across household & ethnic group (cultivated areas, soil types, technologies, yields & production volumes.
- Type of soil & land these legumes are cultivated.
- Land use (mono-cropping, inter-cropping, sequencing of crops.
- Varieties planted.
- Assessment of different varieties (yield, resistance to pests and diseases, input requirements, taste, price, etc...
- Use of external inputs & cost for e.g. seedlings, inorganic fertiliser, labour (ex: 1 ha).
- Transportation cost.
- Seasonality in production (land preparation, planting, manure, fertilisation, harvest, etc...
- Gender division of labour in production.

### **Utilization**

- Share of production used within the household for food & feed.
- Share of production sold in the market.
- Changes in utilization past 5 years (food, feed, sold)

### **Post harvesting**

- Harvesting practices( equipment's, methods
- Storing practices
- Reasons for storing
- Post-harvest losses(share of production & reasons)

### **Marketing**

- Season
- Timing of farmer sales & reasons
- Type of buyers
- Place of sales (farm-gate, village market, commune market, district market, collection centre) and their relative importance.
- Incidence of group selling
- Negotiation process(who decides the price & why)
- Selling arrangements (cash or barter basis, prompt or delayed payments, contracts, etc...)
- Buyer requirements (product quality, size, maturity, volumes, place of delivery, homogenous of produce etc...)
- Embedded service provision by buyers (market information, credit, inputs, technical assistance, contracts, etc...)

- Major changes in the market over the past 3 years (buyers, place of sale, selling arrangements, etc...)

### **Prices**

- Current selling prices (farm-gate/village, commune and district level)
- Differences in price due to variety, out looking, other factors...
- Degree of price volatility within the seasons.
- Price trends over the past 3 years & key factors behind price trends.
- Perception of future price trends over the next 3 years & key driving factors.

### **Access to services**

- Input supply (sources, quality & affordability of inputs, problems, etc...)
- Market information (sources, reliability, problems, etc...)
- Technical advice on production, post –harvest & marketing (sources, reliability, problem, etc...)
- Transport availability, cost, problems, etc...
- Finance (sources, cost, problems, etc...)
- Other services

### **Problems & constraints**

- Key problems & constraints in production.
- Key problems & constraints in marketing.
- Proposed solution to address constraints.

## **Traders**

### **Background information**

- Location
- Years in operation
- Type of commodities traded.
- Other activities apart from trading.
- Seasonality in (his/her) trading activity.
- Number of employees (if any).

### **Volumes & sources**

- Volumes purchased per week & month (season & off season).
- Volumes purchased per annum.
- Area from where legumes are purchased.
- Relative importance (in terms of volumes) of different supplying areas.
- Differences between supplying areas with regards to quality.
- Types of legumes purchased (varieties).
- Major trends & changes in traded volumes & sourcing area over the past 3 years.

## **Suppliers**

- Suppliers e.g., farmers, collectors, etc...
- Relative importance of different suppliers according to volumes & regularity of supply.
- Differences between suppliers with regards to variety, quality, etc...

## **Buyers**

- Buyers of the legumes (traders, retailers, consumers...) & their location.
- Relative importance (in terms of volumes & regularity of purchase) of the different buyers.
- Product requirement of different buyers (volumes, quality, regularity of supply, etc...)

## **Prices**

- Current purchasing prices.
- Current selling prices.
- Factors influencing current legumes purchasing & selling prices (e.g. variety, maturity, out looking, size, etc.)
- Degree of price volatility for within the season, & reasons.
- Degree of price variation within the seasons & reasons.
- Price trends over the past 3 years and key factors behind these trends.
- Perception of future price trends over the next 3 years & key driving factors.

## **Transaction**

- Place of purchase (farm-gate, village, own store, etc...)
- Place of sale
- Use of buying agents
- Payment procedures, both when purchasing & selling (cash or barter basis, prompt or delayed payment, etc...)
- Other terms & condition for purchases & sales.
- Negotiation process with suppliers & buyers (who determines price & other conditions)
- Relationship with suppliers & buyers (regularity of transactions, contracts, credit, etc...)

## **Post- harvest**

- Packing practices (type of facility, capacity, etc...)
- Normal storage period & reason for storing.
- Sorting & grading practices & reason for sorting & grading.
- Loss ratio in harvesting & storage & reason.

## **Support services**

- Transport (means of transport used & capacity, ownership of transport vehicles, availability & cost of rented transport, etc...)
- Market information (sources, reliability, problems, etc...)

- Credit sources & their relative importance, frequency, cost, problems, etc...)
- Harvesting
- Other support services

### **Marketing cost & risk**

- Main marketing cost (labour, transport, credit, rent, communications, product losses, etc...)
- Marketing cost per unit of legumes (say 100 kg or 1 ton) handling, transport, cleaning, storage, packaging, product losses, interest on credit, taxes, etc...)
- Main marketing risks (product losses, availability & quality of produce, contract default, price fluctuations, etc...)
- Policy & regulations (macro & micro)
- Key policies & regulations affecting legume trading business (registration, taxation, credit, subsidies) MAFFS
- Impact of policies & regulation on the business.
- Recommended changes in policy & regulations.

### **Key constraints & opportunities**

- Key constraints to the development of the legume trading business.
- Possible solution to these problems.
- Key opportunities to develop the legumes trading business.
- Factors that could enable access to these opportunities.

## **Processors:**

### **Background**

- Location
- Years in operation
- Type of inputs & products processed.

### **Suppliers**

- Suppliers e.g., farmers, collectors, etc...
- Relative importance of different suppliers according to volumes & regularity of supply.
- Differences between suppliers with regards to variety, quality, etc...
- Trends in sales for (past 3 years) and reason behind these trends.
- Perception of future demand trends for these products (next 3 years) and reason behind these trends.
- Trends in prices of these product (past 3 years) and reason behind these trends.
- Perception of future price trends (next 3 years) and key factors that is likely to drive these trends.

### **Buyers**

- Buyers of the legumes (traders, retailers, consumers...) & their location.



- Relative importance (in terms of volumes & regularity of purchase) of the different buyers.
- Product requirement of different buyers (volumes, quality, regularity of supply, etc...)

### **Transactions**

- Buying arrangements: e.g. purchases on credit prompt cash payment, etc...
- Selling arrangements/conditions for product: e.g. sales on credit prompt cash payment, paying in kind, etc...

### **Policies & Regulations**

- Key policies and regulations affecting processing business (subsidies policies)

### **Constraints & Opportunities**

- Key constraints to the development of the processing business.
- Solutions to these problems.
- Key opportunities to develop the processing business.
- Factors that could enable this development.
- Recommendations

## **Consumers**

### **Domestic**

- Main use
- Price
- Volumes purchased per week & month (season & off season).
- Area from where legumes are purchased.
- Constraints & opportunities.

## **Supporters and Enablers**

- Role /function of the institution related to legume production, trading & processing
- Data for past 3 years.
- Number of households involved in production of legumes at commune/ district/ provincial levels.
- Area under legume at commune, district and province level.
- Types of legumes varieties planted within district & province.
- Production volumes.

### **Strategies, policies, regulation & programmes for the legumes sub-sector**

- On paper: objectives, responsible /implementing agencies, activities, etc...

- Quality of enforcement (policies & regulations) & implementation (programmes)
- Impact on production, trading & processing.

Key constraints to the development of the legume sub sector (production, trading & processing) in district & province.

Key opportunities regarding the development of the legume sub-sector (production, trading and processing) in the district & province.

Source Checklist: Analysis of the Dak Lak Avocado Chain, 2004, adapted by Mike Johnson 2012