



Sorghum Supply Chain Sierra Leone – A sustainable project?

Bachelor Thesis
Anne Deters



Stenden
university



Sorghum Supply Chain Sierra Leone – A sustainable project?

Author: Anne Deters
Student number: 20070090
Published: Amsterdam, 08.02.2011
On behalf of: EUCORD / Heineken International

Attended by: Dr. Hendrik Knipscheer (EUCORD)
Rob Marijnen (Heineken International)
Henk Roelofs (Stenden University)

Institution: Stenden University, Emmen
International Business and Languages

Note: All information can be disclosed to third parties
without further authorization requirements

Executive summary

The “West African Sorghum Value Chain Development” (WASCD) project has been developed by The European Cooperative for Rural Development (EUCORD) together with the Common Fund for Commodities (CFC) as donor agency and was implemented between 2005 and 2011. Its overall objective of supporting smallholder farmers in Ghana and Sierra Leone by creating new income sources through the implementation of a new supply chain marked a completely new approach of development projects. Farmers in both countries started cultivating sorghum which is used for the production of different beverages by the Guinness Ghana Brewery Ltd. (GGBL) and the Sierra Leone Brewery Ltd. (SLBL) as purchasers. Main targets of the project were set to be the increase of the sorghum farmers’ net income as well as the establishment of a fully sustainable supply chain within five years. The purpose of this study is to investigate whether these objectives have been achieved.

Sorghum is one of the most important cereal crops in the world. Its distinct tolerance to drought and other adverse agro-climatic conditions makes sorghum a favored substitute on marginal land, where maize and wheat do not perform or carry high production risk. With its neutral flavor and high contents of energy, protein, vitamins and minerals, sorghum is well suited for a variety of dishes and beverages. Mostly consumed by low income population groups, it is often referred to as a “coarse grain” or “poor people’s crop”.

The utilization of sorghum for production of alcoholic beverages has a long history. Traditional sorghum beers have been brewed for wedding ceremonials and other major social events for hundreds of years. However, only in the 1980s did the import restriction of malted barley by the Federal Government of Nigeria provide the foundation of using local grains as a substitute for commercial beer brewing. At that time, also Nigerian Breweries Plc, member of the Heineken N.V. group started to use sorghum. After the ban was lifted in 1999, the brewery continued to work on its sorghum development, also for poverty alleviation purposes among farmers to demonstrate Corporate Social Responsibility.

To investigate whether the targets have been achieved after the WASCD project’s planned termination in March 2011, first of all, the financial impact has been investigated by conducting a household survey in Ghana and Sierra Leone. Primary outcome of this study is that

the net income of smallholder farmers has statistically significantly increased by 117.3% in Ghana and by 100.2% in Sierra Leone. The first research question whether the net income of the smallholder farmers increased by participating in the WASCD project can clearly be answered with “yes”. Furthermore, investigation on the farmers’ satisfaction shows that in Ghana out of 213 farmers, 189 stated to be satisfied or completely satisfied with the project. In Sierra Leone, even all 80 respondents stated the same.

In a second step, the sorghum supply chain in Sierra Leone was analyzed. The analysis revealed the crucial role of an intermediary involved in the chain which serves the facilitation and coordination of all activities along the chain. This task is currently conducted by Vancil Consultancy; a supporting non-profit organization based in Freetown, Sierra Leone, but will now be incorporated within SLBL in form of a Sorghum Procurement Manager. For that reason, a 3-years-plan for the transition has been established in consultation with SLBL’s Managing Director. In view of all stakeholders involved in the project, the contribution of an intermediary has turned out to be inevitable. In case any difficulties regarding this position should come up, alternatives in form of another non-profit organization or the establishment of a new organization will have to be taken into consideration.

In a third step, the future market potential of sorghum as raw material for the food industry was analyzed. Sorghum production in Sierra Leone has increased enormously since the start of the WASCD project in 2006. While 100 farm families produced 20 metric tons (MT) in 2006, a total of approximately 1,600 farm families delivered 607 MT of sorghum to the brewery in 2010. Consultations with SLBL’s Managing Director showed that the sorghum demand could be increased to 570 MT/year only through beverages’ recipe adaptations. Based on the forecasted growth of SLBL’s sales volume by 37%, the demand for sorghum would yield 730 MT/year. In addition to the increment within SLBL, alternative markets for sorghum will have to be identified. Presently, effort by SLBL and Vancil Consultancy is made to involve a new local purchaser which would be able to absorb 30 MT of sorghum annually. Another option is represented by the local market which has been unattractive so far and could be improved by the provision of a milling machine.

The foregoing analyses highlight one aspect as the main risk of guaranteeing a sustainable supply chain in the future – monopsony. The fact that SLBL is currently the only sorghum purchaser in the supply chain poses the danger of unwarranted pricing regulations since no price definition takes place by the market itself. The conducted PEST and SWOT analyses of the supply chain as well as the derived confrontation matrix emphasize this aspect.

The project targets have been achieved. Although effort from all stakeholders of the supply chain is required to guarantee a successful continuation of the supply chain, the household survey's positive outcome and the analyses of the other components have shown that the project has been very successful and has all required potential to maintain its positive development.

Table of content

Preface	I
Acronyms and abbreviations	III
1. Introduction.....	1
2. Background of the “West African Sorghum Value Chain Development” project.....	3
2.1 Sorghum.....	3
2.2 Sorghum and beverage production.....	4
3. The “West African Sorghum Value Chain Development” project.....	6
3.1 Project objectives	6
4. Problem definition and research methods	8
4.1 Problem definition.....	8
4.2 Study assignment and research questions	9
4.3 Research methods	10
4.4 Limitations	10
PART I - The project’s financial impact	11
5. Household survey in Ghana and Sierra Leone	11
5.1 Introduction.....	11
5.2 Results.....	12
5.3 Discussion	22
PART II - The sorghum supply chain and its intermediary	27
6. The sorghum supply chain in Sierra Leone	27
6.1 The current supply chain structure	27
6.2 The prospective supply chain structure	31
6.3 SLBL as intermediary in the future	33
6.4 Alternative intermediaries.....	37
6.5 Recommendations.....	38
PART III - Sorghum as raw material for the food industry	40
7. The opportunities of sorghum	40

7.1	Sorghum production development since 2006	40
7.2	Sorghum processing within SLBL	41
7.3	Two prospective scenarios	42
7.4	Alternative markets for sorghum	44
7.5	Recommendations to create opportunities	45
8.	The risk of only one sorghum purchaser	46
	Conclusion and recommendations	49
	Bibliography	53
	Appendix 1: Country profiles Ghana & Sierra Leone	57
	Appendix 2: Additional information on sorghum	60
	Appendix 3: Main project stakeholders	61
	Appendix 4: Household survey - Methods	65
	Appendix 5: Questionnaire Sierra Leone & Ghana	70
	Appendix 6: Graphics	76
	Appendix 7: Additional tables	81
	Appendix 8: Set of answers to Question 29	82
	Appendix 9: Stakeholders supply chain Sierra Leone	95
	Appendix 10: Generic worksheet, basic map and detailed maps	99
	Appendix 11: PEST, SWOT and confrontation matrix	103
	Appendix 12: Geert Hofstede's five dimensions of culture – West Africa	113

Preface

“(...) but in all likelihood would send you to both countries for about one week in order to test the questionnaire.”

E-mail from Henk Knipscheer, April 13th 2010

To combine the Bachelor thesis with a stay abroad for a couple of weeks is probably the dream of every IBL student which was often confirmed by fellow students' statements like “Oh, you lucky b****! I'm so jealous.” And justifiably so.

With the topic of my Bachelor thesis I was given the chance to dive into a field, rather untypically for IBL students – the nonprofit sector. With this assignment, **Henk Knipscheer**, Managing Director at EUCORD, gave me the possibility to make whole new experiences in this field and to learn a lot about the meaning of setting up a project in developing countries. He supported me during the whole process with all necessary information, food for thoughts, answers to questions and finally gave me the possibility to travel to Ghana and Sierra Leone. Thank you very much, Mr. Knipscheer for enabling this special chance of graduation to me and of course for all your help!

Furthermore my gratitude goes to my tutor **Henk Roelofs**, who applied the proper amount of support to me from my university. The feedback and tips were always very helpful, so that I got useful guidelines to successfully finish this assignment.

For the pre-test of the questionnaire I spent two and a half weeks in Ghana and Sierra Leone. This stay belongs to one of my most engrained experiences and I would like to say special thanks to **Marie, Ivan, Steve and his teams** to support me before, during and after this time and to have made it so special.

During the whole graduation period I was given the possibility to work in the A&ME (Africa & Middle East) department at the Heineken International Headquarter in Amsterdam. I would like to say special thanks to my mentor **Rob Marijnen**, Business Development & Export Director, for supporting me throughout the whole process by giving me important and thorough advice and information whenever needed. In addition several other people within the company also supported me by sharing their knowledge and experience; thank you Paul, Robert and Ted, experts and genii in the supply chain area. Special thanks go to **Christiane** and **David** for

supporting me five months with ideas, feedback, motivation, laughter (with me, not about me) and of course...Mentos[®]. Not to forget **Erna, Henriëtte, Sanja, Michelle, Pascale, Lisa, Chandra, Marleen** and the whole A&ME department!

Other people and not less important I would like to thank are **Mieke, Tom, Nadine, Ruben** and especially **Nico** and **Anna** for their contribution of support, motivation and fun during the past half year!

Anne Deters

Amsterdam, 28.01.2011



Acronyms and abbreviations

CDDCs	Commodity Dependent Developing Countries
CFC	Common Fund for Commodities
EUCORD	European Cooperative for Rural Development
FAO	Food and Agricultural Organization
FIGG	Intergovernmental Group on Grains
GGBL	Guinness Ghana Brewery Limited
GHC	Ghana Cedi
HDI	Human Development Index
IPC	Internationale Projekt Consult
LDCs	Least Developed Countries
MT	Metric Tons
NGO	Non-Governmental Organization
SD	Standard Deviation
SLARI	Sierra Leone Agricultural Institute
SLBL	Sierra Leone Brewery Limited
SLL	Sierra Leonean Leone
USD	United States Dollar
UTB	Union Trust Bank
WASCD	West African Sorghum Value Chain Development
WBD	World Business and Development Award
WFP	World Food Program

1. Introduction

In 2006, The European Cooperative for Rural Development (EUCORD) based in Brussels, together with the Common Fund for Commodities (CFC) as donor agency, set the “West African Sorghum Value Chain Development” (WASCD) project in motion, which presents the basis and core of this research study. The overall objective of the WASCD project is generating new income sources for smallholder farmers through the establishment of a new supply chain in Sierra Leone and Ghana. Farmers are supported and taught in the process of cultivating sorghum, a grass similar in appearance to maize and one of the most important cereal crops in the world.

In addition to the core funding of the CFC, Heineken International BV and Diageo plc provide the co-financing for the project. Guinness Ghana Brewery Ltd. (GGBL), owned by Diageo with Heineken holding a stake of 20% and Sierra Leone Brewery Ltd. (SLBL), member of the Heineken group are the main and/or only purchasers of the sorghum. The two companies use sorghum as a substitute for malted barley to utilize it as an adjunct for the production of some of their beverages. As for the development aspect of the project, it was assumed that by providing farmers access to inputs, like for example fertilizer, processing technologies and marketing options, their productivity and especially their net incomes would sustainably increase. This market-oriented development project marked a new approach of providing help in developing countries in contrary to many social projects which aim to provide help through direct money or different kinds of handouts.

Setting up a supply chain successfully in very poor countries as Sierra Leone and Ghana is complex and requires a lot of effort by all participating stakeholders. During the project’s process and especially afterwards, it is inevitable to monitor and investigate whether the prior set goals have been achieved. The WASCD project’s main targets were an increase of the sorghum farmers’ net income by 40 - 60% as well as the establishment of a fully sustainable supply chain within five years.

This study serves the examination whether these goals have been achieved and what important lessons learnt can be derived from the outcome to serve as a foundation for prospective projects. Therefore the main research questions answered in this report are:

- ⇒ *“Did the project have the positive impact as expected concerning the farmers in Sierra Leone and Ghana by increasing their net income by 40 - 60%?”*
- ⇒ *“Is the local supply chain in Sierra Leone sustainable enough to proceed without the support of the “West African Sorghum Value Chain Development” project?”*

To examine the set research questions, three different elements have been analyzed: The project’s financial impact (Part I), the sorghum supply chain with its involved intermediary (Part II) and sorghum as raw material for the food industry (Part III). While the first component investigates the situation in Sierra Leone *and* Ghana, the remaining elements concentrate on Sierra Leone *only*. Anyhow, results of the whole study will provide outcomes and recommendations which can also be transferred to similar projects in other countries. To provide contextual background information, section 2 deals with sorghum and its history in connection with beverage production. Furthermore, appendix 1 provides country profiles of Sierra Leone and Ghana with information on country specific sociocultural and economic situations. Section 3 outlines the WASCD project’s objectives while appendix 2 contains the presentation of its main stakeholders. The problem definition and research questions, also containing research methods and limitations are presented in section 4. Section 5 (Part I) deals with the project’s financial impact on level of the smallholder farmers. The establishment, results and derivations of the household survey in Ghana and Sierra Leone are examined in this segment. Section 6 (Part II) analyses the supply chain by describing the stakeholders, the current and prospective supply chain as well as the role of the involved intermediary now and in the future. Section 7 (Part III) deals with the third component, sorghum as raw material for the food industry. The opportunities of sorghum are described, concerning SLBL as well as for alternative markets. Additionally, a PEST and SWOT analysis of the sorghum supply chain together with a confrontation matrix are presented in section 8. Hence, resulting outcomes describe the risk of only one purchaser in section 9. Finally, section 10 reflects on all named components to subsequently draw a conclusion.

2. Background of the “West African Sorghum Value Chain Development” project

The “West African Sorghum Value Chain Development” project centers on sorghum, the grain the whole supply chain starts and ends with. In the following, the characteristics of sorghum are presented in section 2.1 and a short description of the grain’s history in connection with beverage production is given in section 2.2. In addition, appendix 1 shows country profiles of Sierra Leone and Ghana to reflect its sociocultural and economic situations.

2.1 Sorghum



Grain sorghum is an annual grass similar in appearance to maize (corn), although it can develop multiple stems and has a finer root system. Wild sorghum is a tall plant with a maximum height between 1.5 - 2 meters. Through breeding efforts, today dwarf varieties and hybrids are available that only reach 0.6 - 1.2 meters and are easier to manage.¹ Probably originated in Ethiopia, the plant has historically spread to other parts of Africa, India, Southeast Asia, Australia and the United States.²

Sorghum is one of the five most important cereal crops in the world after wheat, oats, corn, and barley. In difference to the other mentioned crops, it is extremely drought tolerant and hardy, making it an excellent choice for arid or otherwise marginal areas where other crops do not grow well. Especially in areas too dry for maize cultivation, which requires a high degree of agronomic management and inputs, sorghum presents a favored substitute.³ It has adapted to a wide range of soils and has special adaptations to weather extremes which make it a very stable source of nutrition for human consumption or as animal feed. Sorghum is usually cultivated without application of any fertilizers and provides a principal source of energy, protein, vitamins and minerals. The grain itself is neutral in flavor and sometimes slightly sweet. Like tofu, sorghum absorbs flavors well and can therefore be used as a nutritious basis for a variety of dishes. In many parts of the world, sorghum has traditionally been used in food products and various food items like porridge, unleavened bread, cookies, cakes, couscous and

¹ Nigerian Breweries Plc, *Special Supplement on Sorghum*

² <http://www.fao.org/ag/agp/agpc/doc/gbase/data/pf000319.htm>, 20.08.2010

³ <http://www.wisegeek.com/what-is-sorghum.htm>

malted beverages while it is also an important animal feed, especially in developed countries with a large livestock sector such as the US and Australia.⁴ It is often referred to as a “coarse grain” or “poor people’s crop” because it is mostly consumed by disadvantaged groups in subsistence farming systems.⁵ Appendix 2 gives a deeper insight by relating sorghum to its status worldwide, in Africa, in Ghana and in Sierra Leone.

2.2 Sorghum and beverage production



For hundreds of years sorghum has been used for traditional beer type beverages in parts of Africa that are too hot and dry for other grains to grow. Until today these beers are a traditional value and form center part of wedding ceremonies and other major social events.⁶ In contrast to these local beers made as artisanal homebrews, today sorghum is developing into a common ingredient of commercial pilsner type of beers.

A first notable attempt to enhance domestic production and to commercialize the trade was commenced in the 1980s when the Federal Government of Nigeria started to restrict importation of certain goods to conserve foreign exchange earnings. In 1988, also *malted barley* importation was banned within the government’s policy of Backward Integration, which required manufacturers to substitute some imported raw and packaging materials with local alternatives. Breweries were thus forced to brew entirely with locally available grains. For Nigerian Breweries Plc, member of the Heineken N.V. group, such a local grain was sorghum. The big advantage of sorghum is its ability to be malted which made it suitable for the beer brewage as a substitute for malted barley.

In 1999, the ban on malted barley importation was lifted, but the brewery continued to work on its sorghum development, because the company wanted to encourage the sustainability of their business and help in poverty alleviation among farmers.⁷ Nigeria served as an example for many African countries⁸ and today within the Heineken N.V. group, breweries in Rwanda, Nigeria and Sierra Leone use sorghum for the production of their beverages, either

⁴ <http://www.grains.org/sorghum>, 26.08.2010

⁵ <http://www.fao.org/ag/agp/agpc/doc/gbase/data/pf000319.htm>, 26.08.2010

⁶ http://www.ehow.com/list_6875324_uses-sorghum-brewing-industry.html, 26.08.2010

⁷ Mr. Ageni Yusuf, *Sustainable development through sorghum production*, Document of Heineken International BV

⁸ <http://www.afripro.org.uk/papers/Paper01Taylor.pdf>, 26.08.2010

to produce a 100% sorghum beer or as an adjunct⁹ for their beverages. In case of Guinness Ghana Breweries Ltd. and Sierra Leone Breweries Ltd. sorghum is not used as a substitute for malted barley, but as an adjunct.

⁹ "Adjuncts are nothing more than unmalted grains such as corn, rice, rye, oats, barley, and wheat. Adjuncts are used mainly because they provide extract at a lower cost (a cheaper form of carbohydrate) than is available from malted barley or to modify the flavor of the beer. Adjuncts are used to produce light-tasting, light-colored beers that have the alcoholic strength of most beers."
(http://www.beerbrewing.com/beerbrewing/beer_chapters/ch06_beer_adjuncts.htm), 27.08.2010

3. The “West African Sorghum Value Chain Development” project

Hundreds of Non-Governmental Organizations (NGOs) operate in various African countries.

Their aims range from providing relief services, conserving the environment and contributing to development projects.¹⁰ Googling “non-profit projects in West Africa” generates about 1,140,000 hits. Many NGOs initiate projects to help and support people in developing countries in this area. Civil Wars, low education, bad infrastructure and high unemployment rates are only few factors, which make it so difficult for these countries to recover without help.

One of these NGO’s is The European Cooperative for Rural Development (EUCORD). Together with the Common Fund for Commodities (CFC) as donor agency, EUCORD initiated the “West African Sorghum Value Chain Development” (WASCD) project for Sierra Leone and Ghana. Further initiators are Heineken International BV and Diageo plc who provide the co-financing. EUCORD acts as the implementing NGO with its partners TechnoServe in Ghana and Vancil Consultancy in Sierra Leone. The realization of the WASCD project started in 2006 and will be completed in March 2011.

In the following, the project objectives are described while appendix 3 contains the presentation of its main stakeholders. Referring to section 6, further stakeholders within the supply chain in Sierra Leone are presented in appendix 9.

3.1 Project objectives

The overall objective of the WASCD project is the development of a local high quality sorghum supply chain in Ghana and Sierra Leone that will allow the national beverage industry to substitute imported grains by locally produced sorghum. In Ghana, Guinness Ghana Brewery Limited (GGBL) will be the sorghum purchaser while in Sierra Leone the grain will be bought by Sierra Leone Brewery Limited (SLBL). Whereas SLBL is member of the Heineken group with stakes of 83.1%, GGBL is owned by Diageo plc with Heineken holding a stake of 20%.¹¹ The purchasing companies will benefit from the project through diversifying its sources of raw materials, thereby reducing the risks of interruptions in their supply chain. Different supporters in form of credit providers and a research institution amongst others will be implied to

¹⁰ <http://news.bbc.co.uk/2/hi/africa/3502733.stm>, 30.08.2010

¹¹ Annual Report 2009, Heineken NV

guarantee a successful course of actions and people who are usually excluded from any commercial activity will participate and benefit.

The target beneficiaries of the project are smallholder farmers in the poorer areas of the countries, for which new income opportunities shall be generated by cultivating sorghum. During the course of the project, sorghum farmers will receive greater access to improved inputs, processing technologies and marketing options, which will improve their productivity and increase their net income. Lessons learned from the project will be replicable in other sorghum producing countries in Africa as well as in the enhancement of supply chains of other commodities.¹²

¹² Common Fund for Commodities, 01.12.2005, WASCD project, Appraisal report (CFC/FIGG/34)

4. Problem definition and research methods

The previous presented WASCD project marks the subject of this study. The aim is to investigate, analyze and evaluate the project's outcomes by exploring different components. This section gives an overview about the problem definition, the deriving study assignment and research questions as well as the research methods and limitations.

4.1 Problem definition

Numerous projects have been set up in Ghana and Sierra Leone by international governmental institutions and non-profit-organizations to improve people's living standard and well-being. The countries' histories and the poor economic situation combined with sociocultural aspects make it impossible for the people to rebound on their own. The fact that help is needed is indisputable - but how?

Development aid has caused a lot of discussions in former years. Various articles and internet forums are dealing with this topic. Many social projects aim to provide help to the people in monetary form or by offering all different kinds of handouts to improve their lives. The idea behind seems obvious – improving their livelihoods by supplying goods and chattels - but many arguments question this approach of helping. James Shikwati, Kenyan economic expert, for example stated during an interview with the German magazine “Spiegel” in 2005 that countries, who received most development assistance, are doing worst. To support his statement he names a loss of entrepreneurial spirit and encouragement of corruption and self-approval amongst others.¹³

Considering these discussions, EUCORD established a new approach of providing help and set up the WASCD project. This market-oriented project aimed to implement a sustainable solution for supporting farmers in Sierra Leone and Ghana. During the course of the WASCD project EUCORD has opened a new source of income through the cultivation of sorghum. Precondition for this was the development of a market for sorghum, which includes the establishment of a reliable supply chain for their new customers, involving the private sector. At the same time micro credit was granted to the farmers, which enabled them to start cultivating sorghum.

¹³ <http://www.spiegel.de/spiegel/print/d-40952573.html>, 19/01/2011

Setting up a supply chain in very poor countries like Sierra Leone and Ghana is a challenging project. Many factors have to act together to achieve targets and expectations. Stakeholders have to work together and must be willing to participate in the project with a positive attitude. A steadily flow of information, inputs, feedback and money has to be guaranteed. To be able to measure whether targets have been achieved after the WASCD project's withdrawal, previously measurable success factors have been defined by the initiators:

- ✓ "The sorghum farmers' net income will increase by 40 - 60%".
- ✓ "Due to economic incentives for all stakeholders, it is expected that the project will become fully sustainable within five years."¹⁴

4.2 Study assignment and research questions

Subsequently, the following research questions are investigated by this study:

- ⇒ "Did the project have the positive impact as expected concerning the farmers in Sierra Leone and Ghana by increasing their net income by 40 - 60%?"
- ⇒ "Is the local supply chain in Sierra Leone sustainable enough to proceed without the support of the "West African Sorghum Value Chain Development" project?"

For the examination, the study assignment agreed upon with Dr. Hendrik Knipscheer from EUCORD comprises three components. First of all, the increase in net income will be investigated on the basis of a household survey in *Sierra Leone and Ghana*. While this research focuses on both countries, the proximate study parts will focus on Sierra Leone only. The second component is an analysis of the sorghum supply chain in Sierra Leone, connected with Sierra Leone Brewery Limited's (SLBL) ability to control this chain after the termination of the project. In a final step, the future of sorghum will be explored by examining possibilities within SLBL, as well as beyond to ensure a successful continuation of the project. The combination of all parts will lead to a conclusion and thereby answer the formulated research questions.

It has to be highlighted, that the second goal of a sustainable supply chain cannot be achieved without a positive implementation of the first goal, the increase in farmers' income.

¹⁴ Common Fund for Commodities, 01.12.2005, WASCD project, Appraisal report (CFC/FIGG/34)

Therefore, the main focus of this study is the household survey, exploring the first research question.

4.3 Research methods

To gather the required information for the investigation, different research methods have been used to collect primary as well as secondary data. For the household survey a questionnaire has been designed and been pre-tested in Ghana and Sierra Leone. A detailed approach of its set-up is presented in appendix 4. Unstructured and half-structured in-depth interviews with stakeholders in Sierra Leone as well as experts within Heineken International BV, EUCORD and the CFC have been held. Additionally these experts were contacted by e-mail and/or phone.

Furthermore quantitative desk research has been executed. External secondary data, books, articles and the internet have been analyzed.

4.4 Limitations

A few limitations concerning the scope of this study have to be taken into consideration:

As agreed upon with Dr. Hendrik Knipscheer, the household survey in Ghana and Sierra Leone determines the main component of this research. This part serves to answer the first research question but at the same also lays the foundation for the second question. While the conduction of the household survey is related to both Ghana and Sierra Leone, the other components concentrate on Sierra Leone only, but will provide important 'lessons learned' for Ghana as well.

Conducting the household survey called for a lot of time with regard to preparation, pre-testing, conduction, analysis and post processing. Limitations of those kinds of studies in developing countries are reviewed in section '5.3 Discussion'.

A significant amount of information for the remaining investigation was gathered by interviews. Various stakeholders presented their opinions and provided useful and important information during those interrogations. Nevertheless, sometimes ambiguous information was brought forward which made its evaluation difficult. Very slow internet connections in both countries made communication sometimes complicated since needed data could not be uploaded and periods of answer receiving could drag on.

PART I - The project's financial impact

PART I of this study serves to investigate the financial impact the project has provided for the smallholder farmers in Ghana and Sierra Leone. Thereby it answers the first research question of this study and provides important contribution for the second.

5. Household survey in Ghana and Sierra Leone

A short introduction given in section 5.1 contains the main research question investigated by this household survey. Appendix 4 describes methods including the development of the questionnaire, assumptions on which the estimation of the farmer's income is based, sampling methods and an explanation of the conducted analysis. The questionnaire itself is illustrated in appendix 5. Afterwards, the survey's outcomes are presented in '5.2 Results', divided into demographics, production, costs, income, and satisfaction. In the final paragraph '5.3 Discussion', next to a brief summary of the results, strengths and weaknesses of the survey are discussed. Noticeable aspects in results are explained and recommendations for further research are given.

5.1 Introduction

To investigate the sustainability of the sorghum supply chain on the level of the smallholder farmers, a household survey in Ghana and Sierra Leone was conducted from October 21st 2010 until November 26th 2010. "Household sample surveys have become a key source of data on social phenomena in the last 60-70 years. They are among the most flexible methods of data collection. In theory almost any population-based subject can be investigated through household surveys."¹⁵ The main research question to be answered by the survey is:

"Has the net income of the smallholder farmers increased by participating in the WASCD project?"

Only the achievement of the project's goal to improve the farmers' livelihoods by increasing their net income can ensure a successful continuation of the supply chain in the future. Farmers would not be willing to participate in the sorghum production if they were not benefiting from it.

¹⁵ <http://unstats.un.org/unsd/demographic/sources/surveys/Handbook23June05.pdf>, 04.11.2010

The target set by the project's initiators was a 40 - 60% increase in household income. Former investigation on this development during the project was based on rough estimations. Having a look on progress reports, regularly published by EUCORD and CFC, income increases were estimated at 15-20% in Sierra Leone in 2007/2008 and at 40-45% in Ghana in the first quarter of 2010.¹⁶

5.2 Results¹⁷

As mentioned in appendix 4, due to the high number of outliers generated by calculating the mean (average), only the median is used to describe the results of metric variables which are based on estimations. In those cases, the mean and standard deviation are still presented in the tables and can be observed if desired. In case of table a.4, d.1 and d.2 only the mean has been calculated and will be described due to a factual basis.

Demographics

Table a.1: Distribution of respondents' sex per country (Graphic in appendix 6)

	Sex				Total	
	Male		Female			
Country	#	%	#	%	#	%
Ghana	194	91.1	19	8.9	213	100
Sierra Leone	46	57.5	34	42.5	80	100

Table a.1 shows the respondent's sex in Ghana and Sierra Leone. Of 213 respondents in **Ghana**, 194 (91.1%) are male and 19 (8.9%) female. In **Sierra Leone**, 46 (57.5%) out of 80 interviewees are male while 34 (42.5%) are female. Detailed information about respondent's sex in the districts of Ghana and Sierra Leone is shown in table a.2 and a.4 in appendix 7.

Table a.4: Mean people per household

	Mean (\pm SD)
Ghana	10.2 (\pm 5.2)
Sierra Leone	11.4 (\pm 2.9)

¹⁶ Project Report #7, 31.03. 2010, West African Sorghum Value Chain Development (Sierra Leone & Ghana), CFC/FIGG/34

¹⁷ For Ghana, seven questionnaires had to be sorted out as a result of incomplete and insufficient data. For Sierra Leone, all questionnaires could be used for the analysis.

Table a.4 shows the mean of people living in a farmer's household. In **Ghana** this figure is 10.2 with a standard deviation (SD) of 5.2. In **Sierra Leone** 11.4 people are living in a household on average with an SD of 2.9.

Production

Table b.1: Produced bags of sorghum (50kg) per household and per acre before the project and in 2009/2010 **Ghana** (Graphic in appendix 6)

Country	Bags before		Bags after		Increase in bags % N=104	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Ghana	3.1 (\pm 3.8)	0.0	11.9 (\pm 4.5)	12.0	152.9 (\pm 145.0)	106.25

Table b.1 shows the increase in produced sorghum in **Ghana** before the project in comparison with the outcome of the last harvest. Before the start of the sorghum project on average 3.1 (\pm 3.8 SD) bags (50kg) had been produced. The last harvest generated an outcome of 11.9 (\pm 4.59 SD) bags. This is an increase of 152.9% with an SD of 145.0. The increase is based on 104 answers. In 109 cases it was impossible to calculate the percentage because farmers stated not to have produced sorghum before the project.

Table b.2: Produced bags of sorghum (50kg) per household and per acre before the project and in 2009/2010 **Sierra Leone** (Graphic in appendix 6)

Country	Bags before		Bags after		Increase in bags % N=78	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Sierra Leone	0.8 (\pm 0.7)	0.5	5.9 (\pm 0.8)	6.0	1131.1 (\pm 953.3)	900.0

Table b.2 shows the increase in produced sorghum in **Sierra Leone** before the project in comparison with the outcome of the last harvest. Before the start of the sorghum project, 0.8 (\pm 0.7 SD) bags (50kg) had been produced. The last harvest generated an outcome of 5.9 (\pm 0.8 SD) bags. This is an increase of 1131.1% with an SD of 953.3. The increase is based on 78 answers. Two farmers stated not to have produced sorghum before the project why in those cases the percentage of increase could not be calculated.

Costs

Table c.1: Cash costs of sorghum production **Ghana** in Ghana Cedi (GHC)¹⁸ (Graphic in appendix 6)

	Sex				Total			
	Male		Female		GHC		US\$ ¹⁹	
	Mean (± SD)	Median	Mean (± SD)	Median	Mean (± SD)	Median	Mean (± SD)	Median
Payment for labor N=213	49.6 (± 33.7)	50.0	64.4 (± 34.0)	65.0	50.9 (± 33.9)	50.0	34.6 (± 23.1)	34.0
Payment for food N=213	21.6 (± 26.6)	18.0	33.0 (± 22.1)	35.0	22.6 (± 26.3)	19.0	15.4 (± 17.9)	12.9
Payment for inputs N=213	69.7 (± 27.8)	80.0	80.7 (± 20.1)	86.0	70.7 (± 27.3)	80.0	48.1 (± 18.6)	54.5
Payment for land leasing N=213	0.7 (± 2.6)	0.0	0.7 (± 2.2)	0.0	0.7 (± 2.6)	0.0	0.47 (± 1.8)	0
Total production costs N=213	141.6 (± 66.0)	140.0	178.9 (± 64.1)	183.9	144.9 (± 66.5)	146.0	98.6 (± 45.3)	99.4

Table c.1 illustrates the cash costs of sorghum production in **Ghana** separately for male and female farmers, as well as the total costs presented in Ghana Cedi (GHC) and US Dollar (US\$).

The payment for labor spent by male farmers is 50.0 GHC, by female 65.0 GHC. The total payment results in 50.0 GHC which are 34.0 US\$. For food male farmers pay 18.0 GHC, female farmers 35.0 GHC, in total 19.0 GHC (12.9 US\$) are paid. Inputs are bought by male farmers for 80.0 GHC, by female farmers for 86.0 GHC. In total, 80.0 GHC (54.5 US\$) are spent for inputs. In Ghana the median for payment for land leasing is 0.0 GHC regarding male, female and the total of farmers. Total costs of production amount 140.0 GHC for male farmers, 183.9 GHC for female farmers and 146.0 GHC (99.4 US\$) in total. All costs are based on N = 213 surveys.

¹⁸1 GHC = 0.62839 USD, <http://www.oanda.com/currency/converter/>,10.12.2010

¹⁹ <http://www.oanda.com/currency/converter/>,10.12.2010

Table c.2: Cash costs of sorghum production **Sierra Leone** in Sierra Leonean Leone (SLL)²⁰ (Graphic in appendix 6)

	Sex				Total			
	Male		Female		SLL		US\$	
	Mean (± SD)	Median	Mean (± SD)	Median	Mean (± SD)	Median	Mean (± SD)	Median
Payment for labor N=80	89,717.4 (±34794.4)	90,000.0	81,647.1 (±34,366.0)	90,000.0	86,287.5 (± 34627.6)	90,000.0	20.4 (± 8.2)	21.3
Payment for food N=80	84,065.2 (±22745.4)	85,500.0	81,088.2 (±23,443.5)	82,500.0	82,800.0 (± 22944.8)	85,000.0	19.6 (± 5.4)	20.1
Payment for inputs N=80	13,728.3 (± 4221.3)	14,000.0	12,058.8 (± 4,186.5)	12,000.0	13,018.8 (± 4261.6)	14,000.0	3.1 (± 1.0)	3.3
Payment for land leasing N=80	8,217.4 (± 8156.6)	10,000.0	11,764.7 (± 9,201.6)	12,500.0	9,725.0 (± 8739.5)	10,000.0	2.3 (± 2.1)	2.4
Total production costs N=80	195,728.3 (±39046.7)	193,500.0	186,558.8 (±32,490.0)	186,500.0	191,831.3 (± 36472.2)	191,500.0	45.4 (± 8.6)	45.3

Table c.2 illustrates the cash costs of sorghum production in **Sierra Leone** separately for male and female farmers, as well as the total costs presented in Sierra Leonean Leone (SLL) and US Dollar (US\$). The payment for labor spent by male, female and the total of farmers is 90,000.0 SLL (21.3 US\$). For food male farmers pay 85,500.0 SLL, female farmers 82,500.0 SLL, in total 85,000.0 SLL (20.1 US\$) are paid. Inputs are bought by male farmers for 14,000.0 SLL, by female farmers for 12,000.00 SLL. In total, 14,000.0 SLL (3.3US\$) are spent for inputs. In Sierra Leone the median for payment for land leasing is 10,000.0 SLL regarding male farmers, 12.500 SLL for female farmers and 10,000.0 SLL (2.4US\$) for the total of farmers. Total costs of production amount to 193,500.0 SLL for male farmers, 186,500.0 for female farmers and 191,500.0 SLL (45.3 US\$) in total. All costs are based on N = 80 surveys.

Table c.3: Opportunity costs **Ghana** in Ghana Cedi (GHC)

	Sex				Total			
	Male		Female		GHC		US\$	
	Mean (± SD)	Median	Mean (± SD)	Median	Mean (± SD)	Median	Mean (± SD)	Median
Opportunity costs N=209	11.5 (± 42.2)	0.0	50.8 (± 191.1)	0.0	15.1 (± 70.0)	0.0	10.3 (± 47.7)	0.0

²⁰ 1 SLL = 0.00023 USD, <http://www.oanda.com/currency/converter/>, 10.12.2010

Table c.3 shows the opportunity costs in **Ghana**. The calculated median based on N = 209 surveys shows 0.0 GHC for male and female farmers as well as for the total of farmers.

Table c.4: Opportunity costs **Sierra Leone** in Sierra Leonean Leone (SLL)

	Sex				Total			
	Male		Female		SLL		US\$	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Opportunity costs N=80	-20,119.6 (\pm 42,920.2)	0.0	-352.9 (\pm 35,912.3)	0.0	-11,718.8 (\pm 41,045.7)	0.0	-2.8 (\pm 9.7)	0.0

Table c.4 illustrates the opportunity costs for **Sierra Leone**. As well as in Ghana the calculated median for N = 80 surveys shows 0.0 GHC for male, female and the total of farmers.

Income

Table d.1: Mean price per 50kg bag of sorghum paid by Guinness Ghana Breweries Ltd. in Ghana Cedi (GHC)

	Sex		Total	
	Male	Female	GHC	US\$
	Mean (\pm SD)	Mean (\pm SD)	Mean (\pm SD)	Mean (\pm SD)
Price per bag N=213	19.8 (\pm 1.3)	20.6 (\pm 1.6)	19.9 (\pm 1.4)	13.2 (\pm 0.9)

Table d.1 indicates the amount of money the farmers received for one 50kg bag of sorghum sold to Guinness Ghana Breweries Ltd (N=213). Male farmers received 19.8 GHC with an SD of 1.3 GHC; female farmers received 20.6 GHC with an SD of 1.6 GHC. In total farmers were paid 19.9 GHC with an SD of 1.4 GHC which comes up to 13.2 USD with an SD of 0.9 USD.

Table d.2: Mean price per 50kg bag of sorghum paid by brewery in **Sierra Leone** in Sierra Leonean Leone (SLL)

	Sex		Total	
	Male	Female	SLL	US\$
	Mean (\pm SD)	Mean (\pm SD)	Mean (\pm SD)	Mean (\pm SD)
Price per bag N=80	66,978.3 (\pm 3101.9)	66,411.8 (\pm 3192.0)	66,737.5 (\pm 3133.1)	15.7 (\pm 0.7)

Table d.2 shows the amount of money farmers received from Sierra Leone Brewery Limited for one 50kg bag of sorghum for N=80. Male farmers received 66,978.3 SLL with an SD of 3,101.9 SLL; female farmers received 66,411.8 SLL with an SD of 3,192.0 SLL. In total farmers were paid 66,737.5 SLL with an SD of 3,133.1 SLL which comes up to 15.7 USD with an SD of 0.7 USD.

*Table d.3: Income sorghum per household and per acre in 2009/2010 **Ghana** in Ghana Cedi (GHC)*

	Sex				Total			
	Male		Female		GHC		US\$	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Gross income sorghum N=213	237.2 (\pm 90.0)	240.0	198.4 (\pm 105.3)	200.0	233.8 (\pm 91.9)	240.0	159.2 (\pm 62.6)	163.4
Net income sorghum N=209	85.0 (\pm 104.2)	94.5	-31.3 (\pm 255.9)	8.0	74.4 (\pm 129.1)	93.2	50.6 (\pm 87.9)	63.4

Table d.3 presents the gross and net income earned for producing and selling sorghum in **Ghana**. The gross income has been calculated on the basis of N = 213 surveys. Male farmers earned 240.0 GHC, female farmers 200.0 GHC. The total of farmers received 240.0 GHC which is 163.4 US\$. The net income based on N = 209 surveys illustrates 94.5 GHC for male farmers, 8.0 GHC for female farmers and 93.2 GHC (63.4 US\$) for the total of farmers.

*Table d.4: Income sorghum per household and per acre in 2009/2010 **Sierra Leone** in Sierra Leonean Leone (SLL)*

	Sex				Total			
	Male		Female		SLL		US\$	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Gross income sorghum N=80	379,945.7 (\pm 60187.3)	390,000.0	385,414.7 (\pm 32396.5)	390,000.0	382,270.0 (\pm 60,804.5)	390,000.0	90.5 (\pm 14.4)	92.3
Net income sorghum N=80	204,337.0 (\pm 79839.0)	198,000.0	199,208.8 (\pm 86810.4)	207,000.0	202,157.5 (\pm 82,373.5)	199,500.0	47.8 (\pm 19.5)	47.2

Table d.4 presents the gross and the net income earned for producing and selling sorghum in **Sierra Leone**. The gross income as well as the net income have been calculated for N = 80. Male, female and the total of farmers earned 390,000.0 SLL (92.3 US\$) gross. The net income illustrates 198,000.0 SLL for male farmers, 207,000.0 SLL for female farmers and 199,500.0 SLL (47.2 US\$) for the total of farmers.

Table d.5: Net income besides sorghum = income before per household and per acre **Ghana** in Ghana Cedi (GHC)

	Sex				Total			
	Male		Female		GHC		US\$	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Net income besides sorghum N=200	93.8 (\pm 213.1)	57.8	54.4 (\pm 234.8)	59.3	90.3 (\pm 214.8)	59.3	61.5 (\pm 146.2)	40.4

Table d.5 demonstrates the net income farmers in **Ghana** earned before the start of the project which simultaneously is the net income they receive besides the income for sorghum now. For male farmers this amounts up to 57.8 GHC, for female farmers 59.3 GHC. In total, farmers earn 59.3 GHC (40.4 US\$) besides sorghum.

Table d.6: Net income besides sorghum = income before per household and per acre **Sierra Leone** in Sierra Leonean Leone (SLL)

	Sex				Total			
	Male		Female		SLL		US\$	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Net income besides sorghum N=80	177010.9 (\pm 91387.5)	180000.0	203647.1 (\pm 96988.6)	201500.0	188331.3 (\pm 94139.7)	181500.0	44.6 (\pm 22.3)	42.9

Table d.6 shows the net income farmers in **Sierra Leone** earned before the start of the project, and accordingly the net income they receive besides the income for sorghum now. For male farmers this amounts up to 180,000.0 SLL, for female farmers 201,500.0 SLL. In total, farmers earn 181,500.0 SLL (42.9 US\$) besides sorghum.

Table d.7: Comparison of income before and after the project **Ghana** in Ghana Cedi (GHC) (Graphic in appendix 6)

	Sex				Total			
	Male		Female		GHC		US\$	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Net income before N=200	93.8 (\pm 213.1)	57.8	54.4 (\pm 234.8)	59.3	90.3 (\pm 214.8)	59.3	61.5 (\pm 146.2)	40.4
Total net income after N=197	178.9 (\pm 222.8)	167.0	18.8 (\pm 351.4)	69.0	164.3 (\pm 240.6)	158.0	111.8 (\pm 163.8)	107.6
Increase of income (%) N=181	290.7 (\pm 624.4)	117.8	3419.2 (\pm 12762.6)	105.5	550.0% (\pm 3711.4%)/ 117.3%			

Table d.7 illustrates the comparison of net income before and after the project in **Ghana**. The net income before calculated for N = 200 is 57.8 GHC for male farmers, 59.3 GHC for female farmers and 59.3 GHC (40.4 US\$) for the total of farmers. The total net income after the project is 167.0 GHC for male, 69.0 GHC for female and 158.0 GHC (107.6 US\$) for the total of farmers. This is an increase of 117.8 % for male farmers, 105.5% for female farmers and 117.3% in total, based on N = 181. For the comparison of the net incomes for the total of farmers, the Wilcoxon-Test has been carried out to test the null: “The median of the differences between net income and income after is 0.” The p-value is <0.0001 and therefore the null hypothesis rejected which means there is a significant difference between the income before and after the project.

Table d.8: Comparison of income before and after the project **Sierra Leone** in Sierra Leonean Leone (SLL) (Graphic in appendix 6)

	Sex				Total			
	Male		Female		SLL		US\$	
	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median	Mean (\pm SD)	Median
Net income before N=80	177,010.9 (\pm 91,387.5)	180,000.0	203,647.1 (\pm 96,988.6)	201,500.0	188,331.3 (\pm 94139.7)	181,500.0	44.6 (\pm 22.3)	42.9
Total net income after N=80	381,347.8 (\pm 121,633.8)	380,500.0	402,855.9 (\pm 141,262.3)	435,000.0	390,488.7 (\pm 129913.6)	397,500.0	92.4 (\pm 30.7)	94.1
Increase of income (%) N=80	223.1 (\pm 372.5)	116.0	129.3 (\pm 104.9)	98.1	183.2% (\pm 293.0%)/ 100.2%			

Table d.8 illustrates the comparison of net income before and after the project in **Sierra Leone**. All figures have been calculated for N = 80. The net income is 180,000.0 SLL for male farmers, 181,500.0 SLL for female farmers and 181,500.0 SLL (42.9US\$) for the total of farmers. The total net income after the project is 380,000.0 SLL for male, 397,500.0 SLL for female and 397,500.0 SLL (94.1 US\$) for the total of farmers. This is an increase of 116.0 % for male farmers, 98.1% for female farmers and 100.2% in total. For the comparison of the net incomes for the total of farmers, the Wilcoxon-Test has been carried out to test the null hypothesis: “The median of the differences between net income and income after is 0.” The p-value is <0.0001 and therefore the null hypothesis rejected which means there is a significant difference between the income before and after the project.

Satisfaction

After a short description of table e.1 and e.2, the most frequent answers of farmers in both countries to the question whether they have any suggestions, observations or comments concerning the project are given in the following. A complete set of answers to this question is represented in appendix 8.

*Table e.1: Satisfaction of farmers in **Ghana** (Graphic in appendix 6)*

Satisfaction	Sex				Total	
	Male	%	Female	%	#	%
Completely unsatisfied (1) N=213	1	5	0	0	1	5
Unsatisfied (2) N=213	19	9.8	4	21.1	23	10.8
Satisfied (3) N=213	92	47.4	8	42.1	100	46.9
Completely satisfied (4) N=213	82	42.3	7	36.8	89	41.8
					213	100

Table e.1 illustrates the satisfaction of farmers in **Ghana**. The respondents had the possibility to point out their contentment with the project from the lowest “completely unsatisfied” (1) to the highest “completely satisfied” (4). One male farmer (5%) indicated to be completely unsatisfied.

Nineteen male farmers (9.8%) and four (21.1%) female farmers are unsatisfied which is a total of 23 (10.8%) farmers. Ninety-two male farmers (47.7%) and eight female farmers (42.1%) are satisfied which represents a total of 100 (46.9%) farmers. Eighty-two male (42.3%) and seven (36.8%) female farmers evaluate the project with completely satisfied. This signifies a total of 89 (41.8%) farmers.

*Table e.2: Satisfaction of farmers in **Sierra Leone** (Graphic in appendix 6)*

Satisfaction	Sex				Total	
	Male	%	Female	%	#	%
Completely unsatisfied (1) N=80	0	0	0	0	0	0
Unsatisfied (2) N=80	0	0	0	0	0	0
Satisfied (3) N=80	16	34.8	16	50	32	40
Completely satisfied (4) N=80	30	65.2	18	37.5	48	60
					80	100

Table e.2 illustrates the satisfaction of farmers in **Sierra Leone**. None of the farmers indicated to be completely unsatisfied or unsatisfied. Sixteen (34.8%) male farmers and 16 (50%) female farmers are satisfied which represents a total of 32 (40.0%) farmers. 30 (65.2%) male and 18 (37.5%) female farmers evaluate the project with completely satisfied. This signifies a total of 48 (60.0%) farmers.

Question 29 of the survey: “Do you have any suggestions, observations or comments concerning the project” generated the following most frequent answers:

In Ghana, 50 (23.5%) farmers set value on an early delivery of fertilizer to increase their production. Some of them also stated that not enough fertilizer is available to cover all of their cultivation. More tractors to support the harvest were required by 47 (22.1%) respondents. Threshers to facilitate the process of sorghum production are desired by 42 (19.7%) farmers.

Thirty-two (15.0%) respondents indicated to attach importance to an early delivery of seeds. Also the provision of tarpaulins belongs to the most frequent answers and was named by 20 (9.4%) farmers.

In Sierra Leone, financial support in form of micro-credit is desired by 60 (75%) farmers. 29 (36.3%) respondents set value on the provision of a store and drying floors. Increase in the price for one bag of sorghum paid by the brewery is wished by 18 (22.5%) farmers. Seventeen (21.25%) interviewees state that they would appreciate a reduction of the transportation costs of sorghum. The provision of more workshops to learn more about the cultivation of sorghum was named by nine (11.25%) farmers.

5.3 Discussion

Looking at the results, the main research question *“Has the net income of the smallholder farmers increased by participating in the WASCD project?”* can clearly be answered by “yes”. More specifically it has to be highlighted, that the set target of increasing the net incomes by 40 - 60% has been exceeded. Corresponding tables show that the net income of smallholder farmers in **Ghana** has statistically significantly increased by **117.3%**. While farmers earned 59.3 GHC (40.4 USD) before the project, by selling sorghum they reached a net income of 158.0 GHC (107.6 USD). The net income of farmers in **Sierra Leone** was 181,500.0 SLL (42.9 USD) before the project and has reached 397,500.0 SLL (94.1 USD) by participating in the project which means a statistically significant increase of **100.2%**.

Having a look on the remaining results, further observations attract attention. Female involvement in the survey in Ghana has been low. Only 19 (8.9%) women participated by answering the interviewers’ questions out of a total of 213 farmers. This can be explained by the fact that female participation in agricultural activities is low. According to the project coordinator in Ghana, women are generally seen as helping their husbands to undertake farming enterprises. Even if female farmers have lost their husbands, they prefer their male children or a trusted distant male member of the family to lead. The fact that anyhow some female farmers participate in the project is a result of many campaigns of gender activists during the last years.

In comparison, female participation in Sierra Leone has been quite high. 34 (42.5%) of 80 farmers which have been interviewed were female. The project coordinator in Sierra Leone

explains this fact by stating different reasons. Right from the beginning women had been encouraged to participate in the project and to speak at the organized workshops. It came out that female farmers are more reliable which had been demonstrated regarding loans amongst others. Regarding Sierra Leone, women have a say in certain areas and are often pushier than men which give them the necessary self-confidence.

Furthermore, the majority of nucleus farmers in Sierra Leone are female which may also have played an important role why many women decided to participate in the project. Before the start of the project, sorghum was a subsistence crop rather than a cash crop which made it also more important for women to cultivate.

Looking at tables c.1 and c.2, the payment for inputs deserves a closer examination. While in Sierra Leone farmers had to pay 14,000.0 SLL (3.3 USD) for inputs, farmers in Ghana had to pay 80.0 GHC (54.5 USD). This huge difference is caused by the costs of fertilizer. In Sierra Leone sorghum is cultivated without any application of nourishment. It is either not available or farmer simply cannot afford it. For those reasons, races have been raised for which the soil's nutrient supply is sufficient and provide the highest outcome without the use of fertilizer. In contrast, farmers in Ghana do use fertilizer for their farming activities and therefore also for the cultivation of sorghum. Although fertilizer accounts for more than the half of the total production costs (144.9 GHC/99.4 USD), a higher production outcome than in Sierra Leone is the result. While in Sierra Leone 5.9 bags of sorghum per acre had been produced in the last year of the project, 11.9 bags per acre had been produced in Ghana. Consequently, the total net income of farmers in Ghana in line with the project is even higher than in Sierra Leone despite the high production costs.

Also the total production costs attract attention. While female farmers in Ghana pay 183.9 GHC, male farmers only pay 140.0 GHC. To investigate whether this is due to the small number of female respondents or caused by another reason, further research is suggested. Looking at the production costs in Sierra Leone, female farmers pay 186,500.0 GHC in comparison to male farmers who pay 193,500.0 GHC which presents only a small difference. Tables c.3 and c.4 demonstrate opportunity costs in Ghana and Sierra Leone. The median of these costs in both countries is 0 which leads to the assumption that the influence on further

calculations is not of importance. Nevertheless, the calculated mean shows a huge difference for male (11.5 GHC) and female farmers (50.8 GHC). Although the low participation of female farmers as well as a huge standard deviation has to be taken into consideration, suppositions on reasons for this imbalance can be made. High opportunity costs for women could be another indicator for their low involvement in the project. To get deeper insight into this supposition, further research on this topic in the future is suggested.

In case of Sierra Leone, the mean shows negative figures for both, male and female farmers. An explanation could be that many farmers are not aware of their expenses related to their cultivations. Most of them do not compare income with expenditures which make their farming activities often unprofitable. In both countries workshops helped farmers to get insight into simple book keeping which helped them to understand the process and to get a better overview.

Limitations

Conducting household surveys in developing countries holds enormous difficulties and problems, especially in rural areas and thereby generates some limitations. Own experiences and literature provide a huge list of things that have to be taken into consideration and kept in mind when conducting or reviewing research in these countries.

A major problem in this kind of research is the equivalence of data. “Not only there are major differences between developing countries, there are also variations within developing countries.”²¹ In case of this questionnaire, this was shown with regard to different cultivation tasks. While threshing and winnowing has been seen as two tasks in Ghana, in Sierra Leone it has been seen as one process. While designing the questionnaire, the equivalence of words and expressions had to be ensured. The term “household”, for example can have different meanings in different cultures. “The basic household structure is an extended family, organized for the majority of people around the farm and its rice production. Many households are polygynous, where a husband may have more than one wife (...).”²² Interviewers had to make sure that

²¹

<http://books.google.de/books?hl=nl&lr=&id=TwrHnIs5zweC&oi=fnd&pg=PR9&dq=the+difficulty+of+conducting+surveys+in+developing+countries&ots=j8Gzt7ab7q&sig=Fo0wSf7hq0mJ6patsDDMYS9tICs#v=onepage&q=the%20difficulty%20of%20conducting%20surveys%20in%20developing%20countries&f=false>, 14.10.2010

²² <http://www.everyculture.com/Sa-Th/Sierra-Leone.html>, 14.10.2010

every farmer understands this term equally. In this case, household was defined as “number of people who benefit from the sorghum income.”

As already mentioned in ‘Estimation of income variables’ in appendix 4, the calculation of the net income farmers earned before the start of the project is based on the assumption that this income is in accordance with opportunity costs. Although this calculation of former income might appear risky and vague, the pre-test showed that this approach provides the only possibility to enable a comparison of income before and after. Farmers do not record their expenditures and revenues, which makes it difficult to ask for (realistic) figures of former years. The already mentioned book keeping workshops will help to get more realistic and reliable data in the future.

Many different languages are spoken in Sierra Leone and Ghana. Only few farmers in the rural areas understand English why it is inevitable to have an interpreter while conducting a survey. The translation from an English questionnaire to local languages may provide some misunderstandings, which possibly lead to an improper answer.

Education of the respondents and also the capacity and personality of the observer have major influence on the reliability of the survey. Respondents may not understand the questions, fail to respond in terms of the alternatives provided, or “believe that the interviewer is a government agent whom they must placate and give socially acceptable (rather than true) answers.”²³ Farmers had serious difficulties with the estimation of the amounts related to costs and income. Calculating the mean of those data generates a huge amount of outliers which leads to a biased overall picture. For that reason for all tables related to ‘costs’ and ‘income’, next to the mean with standard deviation, the median has been calculated and is seen as more significant.

Reliable surveys also depend very much on the observer himself. The interviewer should consider several points when asking the questions. A full understanding of the purpose of each question is most important. Answers should not be suggested in any way and all questions should be asked to minimize non-response. To guarantee a successful outcome, interviewers in

23

<http://books.google.de/books?hl=nl&lr=&id=TwrHnIs5zweC&oi=fnd&pg=PR9&dq=the+difficulty+of+conducting+surveys+in+developing+countries&ots=j8Gzt7ab7q&sig=Fo0wSf7hq0mJ6patsDDMYS9tICs#v=onepage&q=the%20difficulty%20of%20conducting%20surveys%20in%20developing%20countries&f=false>, 15.10.2010

Sierra Leone and Ghana have been trained. The main purpose of such training is uniformity in the interviewing procedures of the survey. This is necessary to avoid different interpretations of the definitions, concepts and objectives. In this context, it is also important to explain the whole purpose of the survey and how the results are going to be used. While pre-testing interviewers had been observed to make sure that these objectives are fulfilled.

Nevertheless, there are limitations in using the personal interview method. Despite trainings, interviewers may give different interpretations to the questions and also suggest answers to respondents. Personal characteristics, e.g. age or sex may influence the attitude of respondents and interviewers may read questions wrongly because of the divided attention of interviewing and recording.

The chosen sample size of 3% in Ghana and 5% in Sierra Leone may appear not representative. Due to a weak infrastructure in both countries a higher sample would have requested enormous time and effort and has not been seen as necessary to get a realistic and presentable outcome. *“A survey of 20 respondents is better than no survey. For example, in the absence of a survey one only has hunches about who is for or against various policy alternatives facing a decision maker. The sample of 20 at least gives a rough idea of what people are thinking and is better than one’s hunches.”*²⁴

Despite all mentioned limitations, this study provides an important contribution to the effect question of the WASCD project. Regardless of the small sample size and the conducted estimation of incomes, the study presents comprehensible and logic results which are also reflected in the farmers’ satisfaction. After former research on the increase in net income was only based on rough estimations, this study presents a demonstration of the fact that the project in fact has made an enormous contribution to the improvement of the farmers’ livelihoods.

²⁴Kurt Finsterbusch, Professor of Sociology at the University of Maryland specialized in Social Impact Assessment
http://pdf.usaid.gov/pdf_docs/PNADG566.pdf, 15.10.2010

PART II - The sorghum supply chain and its intermediary

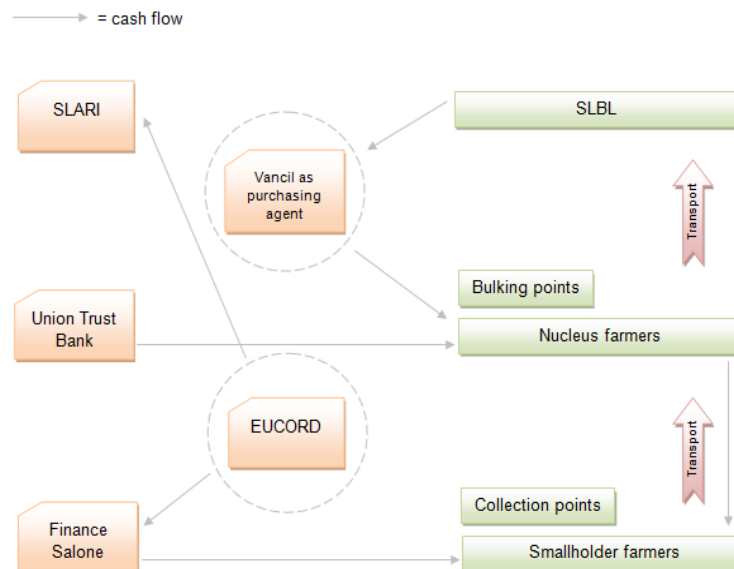
Part II of this study serves to analyze and evaluate the sorghum supply chain in Sierra Leone, set up in the course of the WASCD project. Highlighted is the aspect of the intermediary involved in the whole process to facilitate and coordinate the comprised activities. This part contributes to answer the question of the supply chain's sustainability after the withdrawal of the project.

6. The sorghum supply chain in Sierra Leone

Various stakeholders compose the sorghum supply chain in Sierra Leone. Appendix 9 describes these stakeholders by presenting the most important facts and figures. Sections 6.1 and 6.2 illustrate and explain the supply chain as-is and to-be. Therefore the USAID microLINKS²⁵ approach has been used to develop a value chain map in three steps by setting up a generic worksheet, a basic map as well as a detailed map. While the detailed map is shown in the corresponding sections, a major version as well as the worksheet and basic map are illustrated in appendix 10. Section 6.3 and 6.4 deal with the role of an intermediary within the supply chain. The prospective scenario within SLBL is presented and also alternatives in case of problems or complications are described. Finally, recommendations are given in section 6.5.

6.1 The current supply chain structure

Detailed map



²⁵ http://www.microlinks.org/ev_en.php?ID=9651_201&ID2=DO_TOPIC, 19.08.2010

The actors/participants

The current supply chain starts with the ***smallholder farmers*** who have decided to participate in the project and now cultivate sorghum to sell it to the Sierra Leone Brewery Limited. Those farmers come from the Sierra Leonean Districts of Kambia, Port Loko, Koinadugu, Bombali and Tonkolili in the North, Pugehum, Moyamba, Bonthe and Bo in the South, the Eastern districts Kono, Kailahun and Kenema and the Western Rural. They are combined in associations, comprising approximately 200 farmers, depending on the district's size and its number of participants. About eleven workshops have been conducted from June 2007 to February 2010. More than 400 farmers were trained in culture of understanding the basic of farm management so as to enable them manage their entire farming operations.

In the villages of the participating smallholder farmers, collection points were set up to store the sorghum until it is brought to the ***nucleus farmer***, the head of a farmer association. Alternatively, the nucleus farmer has the task to collect the sorghum from the farmers himself. The management of transportation from farmers to nucleus farmers depends on their own arrangements, mostly based on the distance that has to be covered. In most cases, either the farmer has to pay means of transportation to bring it to the nucleus farmer himself or the nucleus farmer charges a certain amount for transportation costs. Nearby the nucleus farmer, other storages can be found where the sorghum is stocked until it is collected by ***Sierra Leone Brewery Limited (SLBL)***, the only purchaser within the supply chain. Before the collection, it is also the task of the nucleus farmer to control the quality of the sorghum. SLBL takes over the transportation costs to the brewery and provides bags to store the sorghum. Vancil Consultancy as a purchasing agent covers the compensation of these bags until it gets the money from the nucleus farmer.

Within the brewery, further quality control takes place, conducted by SLBL employees. After this control, the sorghum is stocked within the brewery until the processing. Finally the sorghum is used for the brewage of Star and Guinness and the production of Maltina.²⁶

²⁶ See also Part III

The supporters

Within the supply chain, **Vancil Consultancy**, in the following referred to as *Vancil*, the supporting non-profit organization in Sierra Leone, conducts the role as a purchasing agent between SLBL and the nucleus farmers. Contracted by **EUCORD**, Vancil also coordinates all activities between the brewery, supporters, nucleus farmers and smallholder farmers and thereby ensures an undisturbed course of action.

The seeds, the farmers need to cultivate sorghum, are results of research conducted by **The Sierra Leone Agricultural Research Institute (SLARI)**. At the beginning of the project, the research institute selected 17 varieties, which came into consideration and sent them to the Nigerian Technological Control Laboratory in Lagos who did further research. Seven varieties were short-listed from which SLARI finally selected and multiplied two varieties for the project. By on-farm demonstrations, farmers were taught best practices, i.e. the best way of cultivating sorghum to gain the highest output. Funds to support the institute's research are provided by EUCORD and transmitted by Vancil.

The farmers have to spend money for labor and input around the cultivation and harvesting process, which comprises in general land clearing, planting, weeding, harvesting, threshing & winnowing, transportation, seeds, bags and lease of land. To provide them an essential financial support, agreements with credit providers were set up during the project's course of action. The microfinance institution **Finance Salone** provides micro-credit directly to the smallholder farmers, which enables them to pay for the mentioned costs.

EUCORD provides funds for this micro-credit, which are transmitted by Vancil. SLBL issues the guarantee to buy a certain amount of sorghum at a certain price, which gives Finance Salone the security of receiving their money, and interests back in time. Micro-credit is provided only at critical times (e.g. shortly before harvesting) to make sure the money is only used for the project and not spent for other things. Another important credit provider is the **Union Trust Bank Limited (UTB)**. This bank provides credit of a larger amount to the nucleus farmers, which are mainly used to finance commercial activities.

The most important aspect of both credit providers are low and affordable interests. Other bank institutes offer credits at interest rates up to 95%, which makes the farmers' cultivation not profitable anymore.

Payments are arranged via Vancil. The organization receives the money for the sorghum from SLBL. Vancil passes the pay to the nucleus farmers who in turn give it to the smallholder farmers. Pricing regulations are the result of a consultation process between nucleus farmers, Vancil as purchasing agent as well as representative of EUCORD and SLBL. Every year prices for the sorghum are negotiated on basis of the world market price for malt. Vancil debates with the nucleus farmer to bring forward a proposal. With this suggestion he consults the SLBL's Managing Director. In this way the price the farmers receive for the sorghum is determined.

Critical tasks

Analyzing the supply chain's course of action and evaluating opinions of all stakeholders, three tasks within the supply chain turn out to be critical ones:

- Sorghum transportation
- Credit arrangements
- And pricing regulations.

The lack of well-developed streets makes transportation to a time-consuming and sometimes challenging task. Bad road conditions complicate the transport especially during the rainy season from May to November. Flooding sometimes makes it impossible to pass certain routes and often vehicles are stuck in the mud. In addition, wide distances make transportation a very cost-intensive indicator, whose costs can only be covered because SLBL absorbs the transport from the nucleus farmer to the brewery in Freetown. If the farmer would have to pay the costs for transportation to the brewery himself, the sorghum production would not be profitable anymore and farmers would not participate.

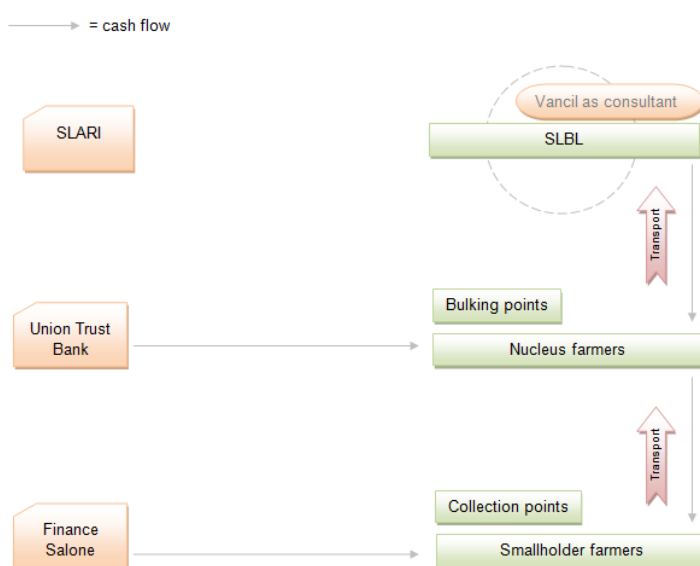
Getting credit on time is inevitable for farmers. Micro-credit is the only possibility to enable cost recovery for all tasks involved in the cultivation process. The harvesting of sorghum has to be done at a certain point in time. If labor cannot be paid at this time, the sorghum will become unusable. Although Finance Salone and UTB are very satisfied with the project's

development, problems with supportive funds or difficulties of other nature would endanger credit provision and thereby the functioning of the whole supply chain.

Price negotiations are difficult with regard to world market prices. On the one hand, the price for the sorghum has to be attractive for the farmers; on the other hand SLBL must be able to justify the purchase of more expensive sorghum in contrast to imported malt. The price they agree upon has to be reasonable which presents a very subjective task to determine because no fixed limits or regulations exist.

6.2 The prospective supply chain structure

Detailed map



Actors/participants and supporters

After the termination of the “West African Sorghum Value Chain Development” project in March 2011, the supply chain will be built up as can be seen in this detailed map²⁷. Vancil will draw back their business and no longer carry out the task as a purchasing agent. Also the company’s second function of coordinating and facilitating project activities on behalf of EUCORD will not be continued. All of these tasks shall be implemented within SLBL from April 1 2011 for which purpose a 3-years-plan has been established.²⁸

²⁷ See appendix 10 for a major version

²⁸ See section 6.3

Aim of the nucleus farmers is to convert their farmer associations into a legal organization. By registering the associations, they will become strong bodies within the supply chain with direct links to the parties. *“By registering our association we will get a voice!” (Isatu Ngevuba, Nucleus farmer, Kono)*

SLARI will go on with their research on seeds. The by the farmers used varieties are evaluated, tested and thereby improved. One of the most important outcomes so far concerns fertilizer, which came out to be not profitable for the sorghum cultivation. *“Continuing with research after the withdrawal of these kinds of projects belongs to our mandates.” (Dr. Idriss Baggie, SLARI)*

Regarding the critical tasks

Currently the Sierra Leonean government puts a lot of effort into the improvement of the infrastructure because of the 50 years independence celebrations in April 2011. Through the accumulation of huge amounts of loans from international financial institutions like the World Bank or the IMF, they improve streets in bad conditions and construct new ones across the whole country.²⁹

Furthermore, commitment 4 of the “Progress report on the implementation of the programme of action for the least developed countries for the decade 2001-2010” states the following: “22. The road network is progressively being improved with the support of the European Union and the World Bank. Over 70% of the rural feeder road network, and about 320 key bridges and ferries have been rehabilitated. Several highway projects are ongoing including the Freetown-Conakry highway that links Sierra Leone and Guinea as part of the trans-West African highway. The requirement for improvements in the road sector is massive and need substantial investments.”³⁰³¹

In the supply chain involved parties hope that this will improve the conditions of transportation soon and thereby make it less expensive, less complicated and faster. After the project, SLBL will continue taking over the highest amount of transportation costs. *“I think*

²⁹ <http://inwent-ijj-lab.org/Weblog/2010/08/08/sierra-leone-at-50-years-what-the-independence-anniversary-committee-should-do-to-beautify-freetown/>, 03.11.2010

³⁰ <http://www.un.org/special-rep/ohrls/ldc/MTR/Sierra%20Leone.pdf>, 04.11.2010

³¹ See also PEST analysis, appendix 11

within two or three years road conditions will have improved significantly.”(Ivan Carrol, Vancil Consultancy, 2010)

Finance Salone as well as the UTB will continue with the provision of micro-credit and small credit to the smallholder farmers and nucleus farmers respectively. For a successful continuation, it is important that SLBL keeps on giving a purchasing guarantee and that the credit-providers get their money and interest back in time.

Price negotiations will be held by nucleus farmers and a Sorghum Procurement Manager within SLBL to ensure that all concerned parties are still involved in the decision making.

6.3 SLBL as intermediary in the future



To not rely on another organization and to shorten the supply chain, the proposition is made to integrate an intermediary within SLBL. In consultation with the Managing Director, a 3-years-plan has been established to follow this goal.

This intermediary will take over the tasks, currently conducted by Vancil as purchasing agent and on behalf of EUCORD. Vancil will interview prospective candidates who will be selected by SLBL, and choose a convenient employee who is capable of conducting all necessary tasks in the future as *Sorghum Procurement Manager*. This will be a candidate with a brewing background to guarantee also practical knowledge. For now it is planned to employ only one person. If the prospective development shows difficulties in handling the work load, it is considered to employ a second person to support the Manager.

April 2011 - March 2012

Vancil will continue as a purchasing agent for SLBL for one year, while simultaneously, a Sorghum Procurement Manager will be trained and instructed. He or she will be taught all facts concerning sorghum and its cultivation requirements with regard to land clearing, planting, weeding, ridging, harvesting, threshing and winnowing. Knowledge about different necessities in different districts will be transmitted to ensure that the farmers' needs can be addressed properly. They will inform the employee about the background as well as the development of the project and initiate physical meetings with farmers to introduce him or her. In addition,

meetings with the participating stakeholders shall give the Procurement Manager deeper insight into the supply chain's functioning and sequence. By getting all this necessary skills and knowledge, a successful continuation of the supply chain shall be ensured. This Manager will be located in Vancil's offices and work part-time when needed. Vancil will still be responsible for the accounting while SLBL will be invoiced. The contract has not been drafted yet and a fee for Vancil's employees still has to be considered.

April 2012-March 2013

In this phase of the integration, the international project coordinator will be an advisor to the SLBL Procurement Manager. SLBL will start to manage and pay the farmers directly while the accounting will be taken over by the Finance Department. Vancil's Field Manager will be placed within SLBL to support the Procurement Manager. The contract has not been drafted yet and a fee for the advisory tasks has to be considered.

March 2013 onwards

The sorghum value chain will be fully managed by SLBL and his Sorghum Procurement Manager. In case of any continuation problems, Vancil's staff can still be contacted to give advice and help. To select the adequate candidate for the position as Sorghum Procurement Manager, several aspects have to be taken into consideration which is presented in the following.

The importance of an intermediary

The question whether SLBL is capable of taking over EUCORD's tasks and thereby control the local supply chain mainly depends on the Sorghum Procurement Manager's competence. During the examination of the sorghum project and while interviewing farmers and stakeholders in Ghana and Sierra Leone, it became clear that an intermediary in this kind of projects is essential. Spending time in both countries enabled to experience huge cultural differences among the people of which some also have been discussed in appendix 4.

Geert Hofstede's analysis of cultures emphasizes own experiences. Appendix 12 shows a chart and an explanation of the Dutch organizational sociologist's five dimensions of culture in West Africa. These dimensions assist in differentiating cultures all over the world and are the results of Hofstede's long-term research studies. On the chart, which combines Ghana, Nigeria and Sierra Leone, a Power Distance Index (PDI) of 77 for these countries can be seen. "The PDI

measures the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally. This represents inequality (more versus less), but defined from below, not from above. It suggests that a society's level of inequality is endorsed by the followers as much as by the leaders."³²

In short, the very high PDI (in comparison Netherlands: 38) shows the large gap between the wealthy and the poor which is also reflected within the supply chain. Differences concerning education, language and ethics between the stakeholders are huge which is sometimes expressed by a lack of respect from top to bottom. Although the supply chain mainly serves to improve the lives of smallholder farmers, a direct connection between them and wealthier people appears to be very difficult. Those distinctions require a mediating actor who is able to put him- or herself in all participants' place and who knows how to talk and negotiate with them in an objective way. Physical contact to all stakeholders is very important to build up trust in the project. *"Now that the farmers saw our car, they know that we care about them. We have to be here regularly to gain their trust."* (Ivan Carrol during the visit of farmers in Kabala)

To fulfill the role of an intermediary, the prospective actor should exhibit different characteristics and competencies to be successful. To be able to put himself in other's place to achieve best communication conditions, he has to have a good knowledge of human nature. He must be able to listen to the different actors and sometimes to be insistent when the situation calls for it. Good skills of negotiation can be required if parties insist on certain conditions which have to be changed. While talking to the stakeholders, he has to be able to distinguish between facts and chatters to avoid misunderstandings, rumors and therewith connected excitements. Coordinating and facilitating in those kinds of projects can be stressful and cost a lot of time due to long distances between stakeholders and also bad internet connections. Patience and stress-resistance therefore mark important characteristics as well. Planning all flows (sorghum, payments, credits, etc.) between the participants and also trips to different districts and villages to visit stakeholders has to be planned carefully which asks for good organizations skills.

A practical background, like in this case a brewing background, can be very helpful to get a better understanding of activities. Someone who knows what is important and necessary for

³² http://www.geert-hofstede.com/hofstede_west_africa.shtml, 06.11.2010

the brewage of beer and who knows the characteristics and necessities of sorghum, will be able to help farmers with possible problems and questions concerning the grain all around the cultivation process. Connected to that is the necessity of a deep knowledge of the whole project. The intermediary has to be able to answer each problem that might occur within the chain which is not achievable if he is not totally involved and informed.

Ideally, the intermediary should have different local language skills to make it possible to talk to the farmers who often do not possess English skills. Otherwise he has to make sure to take along a translator if needed. A country's resident would implicate perfect pre-conditions since he is familiar with his country and knows about culture and languages. If there cannot be found a Sierra Leonean, the intermediary must be willing to learn and also be very adaptable. If he is not used to these living and working conditions, he has to be aware of huge differences and challenges he needs to get used to.

Possible reasons for failure

The lack of one or more of these characteristics does not automatically implicate a failure of the intermediary but at least increases the risk of it. Additionally, there are other reasons which could lead to an undesirable outcome of implementing the mediating agent within SLBL. Being the link of several parties with different wishes, ideas and perceptions requires neutrality. Employing the intermediary within one participating stakeholder runs the risk of losing this objectivity. Possibly own interests come to the fore which could influence for example price negotiations. Farmers may lose trust because of thinking that he will only act in his own interests and not take their requirements into account.

It is doubtful if smallholder farmers and also nucleus farmer want to talk and negotiate to this intermediary in the same way they would do with an independent person. Due to the mentioned high PDI, it is possible that this person will be perceived as a high-ranking and wealthy person to whom it is very difficult or unpleasant to talk to. In case a man will be chosen, especially women might have too much respect to put wishes or ideas forth. In case a woman will be elected, men might not show enough respect for her. Those gender roles are also discussed appendix 4.

6.4 Alternative intermediaries

In case it is not possible to find an appropriate candidate within SLBL or if the selected intermediary should fail for whatever reasons, possibilities of alternatives have to be examined. In the following two options are described.

Other non-profit organizations, based in Sierra Leone

One possibility for a new intermediary would be identifying a new non-profit-organization, based in Sierra Leone which could take over EUCORDs tasks and act as an agent. One example for an NGO as intermediary is TechnoServe in Ghana. They are currently facilitating and coordinating different tasks within the WASCD project and will continue to do so in the future. In case of Sierra Leone, this organization would have to be informed about the WASCD project's initiations, course of action and current state of affairs to get a deep insight into the project. Certainly, members of this NGO would have to exhibit the same characteristics as mentioned before. Since those organizations have experiences with different projects, this would provide an advantage because of already existing knowledge of culture, people and their behavior. The inclusion of an NGO could provide a temporary solution for a couple of years. After that, new considerations how to proceed would have to be done.

Setting up a new organization

Setting up a new branch of business provides another possibility to keep an intermediary involved. Such an organization, of which the aim is to facilitate and coordinate between stakeholders, could arise in two different ways. Either a completely new organization is build up or this business develops out of an already existing NGO. Similar examples for the last one are micro-credit providers which were founded in cooperation with consulting companies whose members became part of the bank's management afterwards.

The history of micro-credit goes back to the 19th century when credit institutions began to emerge in Europe while in the early 20th adaptations of those institutions started to appear in Latin America. Between the 1950s and 1970s, more and more organizations were set up by governments and donors with the target of providing credit to small farmers to raise their

productivity and incomes.³³ Since a couple of years, the start-up of new micro bancs presents a different approach. Those banks possess a bank license right from the start and are built up as a public limited company. Risk capital is provided amongst others by consulting companies which are specialized in development aid. These consultants also constitute the management of those banks and are property owners.³⁴ An example of such a bank which started in cooperation with a consulting company is Banco ProCredit (formerly known as NovoBanco) in Mozambique. The bank introduced agricultural loans which are considered by most banks to be unattractive. It was set up in 2000 by the German consultancy firm Internationale Projekt Consult (IPC). This consultancy firm advises banks in developing countries how to build up their capacity to provide financial services to small and medium-sized enterprises. IPC's services comprise management consulting, institution building, branch network expansion, and staff training. Today the management board is composed by two former IPC management members. Members of already existing NGOs or consulting companies in Sierra Leone could start up a new business out of their already existing tasks and responsibilities like employees of IPC became management members of Banco ProCredit's management board.

Building up a completely new company would provide more difficulties since a possible lack of background knowledge would imply the examination with topic related issues in a wide scope. In comparison to an NGO, this company would work profit-oriented. Payments would have to be overtaken by SLBL first until a fixed amount of sorghum equipoise and thereby sorghum farmers have a stable and reliable income. At this point, it would be possible to come to a mutual agreement of cost division.

6.5 Recommendations

Involving an intermediary within the supply chain is inevitable which was shown and confirmed by literature, own observations in Ghana and Sierra Leone and different opinions of project initiators. Without a mediating agent all mentioned differences concerning culture, education and language would disequilibrate the supply chain and endanger its sustainability.

³³ <http://www.globalenvision.org/library/4/1051/>, 17.11.2010

³⁴ http://www.uni-heidelberg.de/presse/ruca/ruca3_2002/terberger.html, 17.11.2010

Involving a Sorghum Procurement Manager within SLBL is a good approach which combines practical knowledge with project knowledge transferred by Vancil and SLBL itself. Nevertheless, to guarantee a successful outcome all listed requirements have to be considered. This new position has to be examined closely and any problems have to be solved immediately to avoid a threat of operations. In case any difficulties, complications or problems occur, all stakeholders should sit together to discuss further proceedings. If it is not possible to implement the intermediary within SLBL successfully, the two other named options should be reconsidered.

Setting up a new organization and thereby creating a completely new branch of business is regarded to provide the best alternative. A profit-oriented company could specialize on the task of mediating and concentrate on the supply chain only without having other projects in the background like other NGOs do. Emerging out of an already existing NGO, employees would provide the necessary knowledge of related issues. A possible cost division of all implied stakeholders would build the foundation of preventing a conflict of interest.

PART III - Sorghum as raw material for the food industry

Part III of this study serves to analyze the possibilities of sorghum in the future as raw material for the food industry. The evaluation of this part will define opportunities of the sorghum market and thereby contribute to answer the question of the supply chain's sustainability after the withdrawal of the project.

7. The opportunities of sorghum

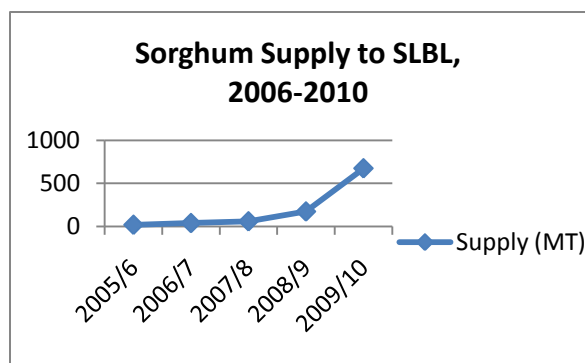
To present the opportunities of sorghum, first of all the sorghum production development since 2006 is shown in section 7.1. How this sorghum has been processed within SLBL is described in section 7.2. Section 7.3 gives an overview about two possible scenarios how to increase the amount of sorghum within the brewery, followed by requirements of feasibility. Alternative markets for sorghum are presented in section 7.4 and subsequently recommendations to create opportunities are given in section 7.5.

7.1 Sorghum production development since 2006

Since 2006, sorghum production has increased enormously. Research on varieties of sorghum, trainings in best practices, access to credit and the prospect of a higher income motivated more and more farmers over the years to participate in the sorghum project.

In 2006, two participating districts produced a total of 20 metric tons (MT) of sorghum. In 2007, this amount increased to 40 MT when more farmers joined the associations in the same districts. One year later, four other districts participated in the project, which brought up a delivery of 65 MT. Almost the triple was produced in 2009 when sorghum farmers of three more districts decided to participate. The success got around, and so in 2010 a total of about 1,600 farm families, spread over 13 districts, delivered 670 MT of sorghum.

Farm families participating in the WASCD project 2006 - 2010	
2006	100 farm families
2007	350 farm families
2008	780 farm families
2009	1080 farm families
2010	1600 farm families



7.2 Sorghum processing within SLBL

From 2006 until 2008, the sorghum supply was below SLBL's demand. In those years, the brewery was capable of using 230 MT of sorghum per year for the production of Star, Maltina and Guinness while farmers delivered 20, 40 and 65 MT.

In 2009 and 2010, the supply of sorghum grew enormously. While farmers delivered 174 MT in 2009, the amount increased to 675 MT in 2010 while only 300 MT/year can currently be processed. Because of quality problems with Guinness in 2009, SLBL could only process about 130 MT instead of 230 MT. Although since March sorghum is used for the brewage of Guinness again, the surplus of 2009 and the huge delivery in 2010 led to high stocks and not all of the sorghum could be used for production. Despite the huge stock problems and usage capacity of only 230 MT/year at that time, SLBL committed to the farmers to buy the amount that the farmers estimated for 2010: 400 MT. Based on this commitment, SLBL set maximum targets for the farmers at a level of 130 MT of sorghum in 2011. This figure was agreed with the farmers based on SLBL's commitment of 400 MT minus the overproduction of 2010 of 270 tons = 130 MT. Later SLBL has raised this figure to 170 MT based on further efforts to increase the sorghum use in its recipes.

	Star	Guinness	Maltina
2008			
Sorghum %	13	15	12
July 2009			
Sorghum %	13	0	12
October 2009			
Sorghum %	16	0	12
March 2010			
Sorghum %	16	10	17

*Usage of Sorghum 2008-2010*³⁵

³⁵ Presentation on Sorghum Value Chain Development, SLBL

The currently used 300 MT of sorghum are composed as follows:

	Star	Guinness	Maltina
October 2010			
Sorghum %	22	10	24

Usage of sorghum October 2010

7.3 Two prospective scenarios

To increase the capacity of sorghum usage within SLBL, two possible scenarios are described in the following:

- (1) The increase of sorghum usage to ~ 570 MT/year
- (2) The increase of sorghum usage to ~730 MT/year

(1) To achieve the aim of 570 MT/year, the recipes of Star, Guinness and Maltina have to be adapted. The percentages of sorghum will have to be increased as follows:

	Star	Guinness	Maltina
2011			
Sorghum %	30	20	33

Scenario (1)

SLBL plans to reach these amounts early 2011.

(2) To increase the amount to 730 MT/year, it is not possible to boost the percentages of sorghum any further. 30/20/33 is the maximum and cannot be extended. The only way to raise the quantity is to increase the sales volume. Forecasts see a growth of 37 % which will lead to a capacity of 730 MT in 2016. Those forecasts are based on different investigations made by the brewery. Currently SLBL determines 80% of the beer market in Sierra Leone. The total size of the market amounts to 0.11 mln hectoliters annually. 1.75 liters of beer are consumed per capita (in comparison: Netherlands: 10.8mln, 65 liters per capita).³⁶

³⁶ Heineken Group, Opco Overview 2010

Next to considering the company's previous sales, research has been conducted on the most important reason for an increase of these figures: the fact of the origination of new villages, populated by "expatriates". Currently already 5,000 foreign employees settled down to establish mines for different resources the country processes like for example gold or diamonds in the hinterland of Sierra Leone. It is expected that another 15,000 people will accrue in the next years. Next to new living space, also bars will be built up which provides new opportunities for the sales of beverages.³⁷ In addition to these forecasts made within SLBL, a PEST analysis has been conducted to identify factors that might influence the company's demand levels³⁸.

SLBL intends to implement both scenarios within the indicated years; adapting their recipes to increase the percentages of sorghum by early 2011 and increase the capacity to 730 MT in 2016.

Requirements for feasibility

Different requirements have to be accomplished to make those two scenarios possible:

Scenario (1): How much sorghum can be used for the brewage of a drink depends on recipe prescriptions. Recipes are guarded by so called 'brand owners', the company to which the brand and the recipe legally belong. For Star and Maltina this is Heineken NV in the Netherlands, for Guinness this is Diageo in the U.K.³⁹ Different varieties of ingredient compositions are tested in laboratories within the brewery and the results are sent to the responsible brand owners. The amount and consistency of foam and differences in taste are two examples of changes which are taken into consideration.⁴⁰ By adapting the recipes it has to be ensured that sales volumes will not decrease because of the changed characteristics of the beverages consumers might not like.

Scenario (2): Certainly, forecasts made by SLBL have to prove true to be able to increase the amount of used sorghum. Supposed the brewery will reach their goal, additional storage bags (so-called cocoons) will be needed of which the expenditure is expected to be 20.000 USD in 2011 and another 20.000 USD in 2014.

³⁷ Rob Marijnen, Business Development & Export Director Heineken International BV, 05.11.2010

³⁸ See appendix 11

³⁹ Cor Honkoop, Managing Director SLBL, 29.09.2010

⁴⁰ Rob Marijnen, Business Development & Export Director Heineken International BV, 05.11.2010

7.4 Alternative markets for sorghum

During interviews with the WASCD project's initiators, stakeholders in Sierra Leone as well as Supply Chain Managers of Heineken International BV, the question whether there are any other possibilities existing to purchase bulk sorghum in Sierra Leone was generally answered with: "No."

For foreign investors, the market is not attractive because of the weak economy and poorly developed infrastructure, amongst other reasons.⁴¹ Local entrepreneurs do not possess enough capital to start up a new business in such amplitude or simply do not show interest⁴². Doing business in Africa is hard work. According to the World Bank, who monitors obstacles for market entry with indicators such as of the 35 least business-friendly countries, 27 are located in sub-Saharan Africa. Some legislation even makes formal businesses completely impossible: if registered enterprises would pay all taxes officially due in Sierra Leone, they would spend almost three times their total profits.⁴³

Furthermore, sorghum is not a staple food in Sierra Leone, but rice. Its image as "coarse grain" or "poor people's crop" is consolidated in the peoples' minds, and although many farmers cultivate sorghum for self-consumption, it does not belong to the most important foodstuffs. In contrast to the easily processable rice, sorghum requires to be milled before it can be converted into a household food dish. Farmers mill the grain manually to use it for the preparation of porridge for example. Selling it on local markets in larger quantities would only be profitable if the sorghum could be milled beforehand.

However, despite of all the before mentioned aspects that make it difficult to develop a functioning sorghum market, there are current efforts by Heineken to involve a new purchaser in the supply chain. Bennimix Food Co. Ltd., located in Freetown, Sierra Leone produces infant weaning cereals⁴⁴. With current plans to produce a new, sorghum based, "power breakfast", Bennimix would be able to absorb approximately 30 MT of sorghum p.a. The product is aiming to meet the demand of the World Food Program (WFP), "the world's largest humanitarian

⁴¹ See also PEST analysis in appendix 11

⁴² Ted Krebbeks, Assistant Supply Chain Manager, Heineken International BV, 05.11.2010

⁴³ <http://www.economist.com/node/7879918>, 04.11.2010

⁴⁴ <http://www.sliepa.org/export-company/bennimix-food-co-ltd>, 25.01.2011

agency fighting hunger worldwide”, voluntary funded and part of the United Nations.⁴⁵ The involvement of this new purchaser is still in negotiation and a successful outcome is likely, but cannot be ensured yet.

7.5 Recommendations to create opportunities

As a result of the difficult socio-economic environment for the development of alternative sorghum markets, it becomes apparent that opportunities for other purchasers are very limited. As long as the political risk remains high and the economic situation in Sierra Leone unstable, foreign investors are unlikely to enter the newly developed sorghum market.

Bennimix Food Co. Ltd. and the WFP provide a possibility which gives reason to hope. The absorption of 30 MT of sorghum p.a. would mark an important contribution to the supply chain. More importantly, a sustainable involvement of this new purchaser would very likely attract other companies to follow their example. The versatile applicability of sorghum offers diverse possibilities of food (and animal feed) processing. In Ghana, for example, Nestlé and Cadbury currently use malt extract from barley for the production of some beverages, which could easily be replaced by malt extract from sorghum⁴⁶.

Another possibility on a smaller level, yet still important would be the supply of the local market. Up to now, selling sorghum on markets in Sierra Leone is rather unattractive for farmers due to the difficult milling process. The nucleus farmer in Kono, Sierra Leone stated that the provision of a milling machine would simplify sales enormously. Farmers would be able to provide larger quantities of milled sorghum to local people who can prepare a variety of dishes out of it. Local bank institutions which are currently providing micro-credit to the farmers could present a possibility to supply a milling machine.

Nevertheless, searching for new sorghum purchasers should be a constant process to avoid the risk of only one purchaser in the supply chain.

⁴⁵ <http://www.wfp.org/about>, 04.11.2010

⁴⁶ Stephen Minkwaara, International Project Coordinator, TechnoServe, 2011

8. The risk of only one sorghum purchaser

To evaluate the risk of only one sorghum purchaser, the foregoing analysis of the supply chain and the opportunities of sorghum as well as the conducted SWOT and PEST analysis⁴⁷ are taken into consideration. The generated picture highlights one aspect as the main risk of a sustainable future – monopsony, also called buyer’s monopoly. This term, introduced by Joan Robinson in her book “The Economics of Imperfect Competition”⁴⁸ is defined as a market situation in which the product or service of several sellers is bought by only one buyer.⁴⁹ One of the major consequences of this market situation is that the monopsonist has power over the price since no price definition takes place by the market itself⁵⁰.

At this moment, SLBL represents the only sorghum purchaser in the supply chain. Currently, the determination of the price takes place through negotiations between nucleus farmers, Vancil as purchasing agent as well as representative of EUCORD, and SLBL. After the withdrawal of the WASCD project, Vancil’s role in this consultation process will be overtaken by the Sorghum Procurement Manager. The guarantee of fair pricing regulations solely depends on SLBL as monopsonist in the supply chain. As also mentioned in the SWOT analysis, undefined price limits exist which would require going back to imported malt and it is difficult to say when this point would be achieved.

Nevertheless, Heineken BV lays emphasis on its “Brewing a Better Future” statement.⁵¹ This integrated and long-term ambition for Heineken world-wide involves numerous targets to be achieved in the future. The increment of local sourcing of agricultural raw materials in Africa belongs to those aims. Although this statement does not refer to the price determination directly, it highlights SLBL’s strong willingness to buy the sorghum, also reflected in the SWOT analysis. Combining all strengths, weaknesses, opportunities and threats, the confrontation

⁴⁷ See appendix 11

⁴⁸ Robinson, Joan, *The Economics of Imperfect Competition*, Palgrave Macmillan, 1969

⁴⁹ <http://www.answers.com/topic/monopsony>, 29.01.2011

⁵⁰ <http://eh.net/encyclopedia/article/boal.monopsony>, 29.01.2011#

⁵¹ “Our new approach is built on the foundations provided by our three core values – Passion for Quality, The responsible Enjoyment of our brands and a Respect for people, the environment and the society in which we live and work. As the world’s most international brewer, and with more than 230 beer brands in our global portfolio, “**Brewing a Better Future**” reflects our intent, our values, our heritage and the plans we have now put in place for the businesses consolidated in 2009.” (<http://www.sustainabilityreport.heineken.com/brewing-a-better-future.html>, 17.12.2010)

matrix⁵² presents four different strategies; attack, strengthening, defense and withdrawal. Related to the aspect of only one purchaser, which is represented in each quarter of the SWOT, the following strategies have been established:

STRENGTHS (1) Strong belief of all stakeholders in project (2) Significant increase of sorghum farmer's income (3) Enormous increase in sorghum production within short time (4) Many farmers who want to participate (5) SLBL's strong willingness to buy sorghum (6) Possibility within SLBL to increase amount of sorghum	WEAKNESSES (7) Stakeholders might be too optimistic and thereby unrealistic (8) Only one sorghum purchaser (9) Limited number of stakeholders (drop outs endanger supply chain) (10) "Young" supply chain (11) Critical tasks (6.3) (12) No unlimited increase of sorghum usage possible within SLBL (13) High prices for sorghum in comparison to world market prices
OPPORTUNITIES (14) Expected improvement of infrastructure (15) Expected growth in sales volume of beverages (16) New sorghum purchasers (17) Various possibilities to use sorghum (beverages, food, animal feed) (18) New high yielding varieties (19) Possible tax incentives of government for 100% sorghum beer	THREATS (20) Sorghum market not attractive for foreign investors (21) Weak economy (22) Weak infrastructure (23) Changing world market prices for Barley and other grains (24) Sorghum is seen as "inferior" food

→ Strategies⁵³:

Defense strategy

(20) + (5): In case no foreign investors can be found because of the weak economy and the risk involved, SLBL has to persist as only purchaser. Therefore the company's strong willingness and social responsibility thinking are inevitable.

Attack strategy

(4) + (16): The number of participating farmers increased each year. Success got around and more and more farmers want to cultivate sorghum. New sorghum purchasers would provide new absorption possibilities and benefit the farmers.

Strengthening strategy

(8) + (16): The most significant weakness, the existence of only one purchaser has to be improved by identifying and involving more purchasers.

⁵² See appendix 11

⁵³ For all strategies, see appendix 11

Withdrawal strategy

(20) + (8): To defend the supply chain from not being attractive for foreign investors, other local purchasers have to be found first to strengthen the market.

These strategies point out the necessity of SLBL's willingness to buy the sorghum but also highlight the importance of continued searching for other purchasers.

Having a look on the opportunities of sorghum, the requirements for feasibility of the in section 7.3 named scenarios are realistic and the SLBL's Managing Director is fully convinced that the aims of increasing the amounts of purchased sorghum will be achieved. For 2011 and 2012, price agreements as well as an agreement on the quantity of sorghum the brewery will buy from the farmers have already been made. Although section 7.4 and 7.5 points out only few alternative markets, possibilities do exist and effort has to and will be made in order to find different purchasers in the future.

Conclusion and recommendations

To answer the research questions, three different aspects of the WASCD project were analyzed in this study: 1) the financial impact, 2) the sorghum supply chain itself and 3) the possibilities of sorghum as raw material in the food industry.

Part I of the study answers the first research question with “yes, the net income of the farmers has increased” whereby the initially set target of 40 - 60% has even been exceeded. This outcome is the basis for the second question of sustainability. Without content farmers who tangibly benefit from the project, the supply chain could not continue successfully on a long term basis. Interviews conducted have clearly shown that participating smallholder farmers fully appreciate the project and implicitly indicated that they want to continue the sorghum cultivation. *“Now that I’m participating in this project, I can send my son to school.” (Smallholder farmer in Wa Municipal, Ghana, 2010)*

The collected comments and responses can provide a valuable basis for initiation of a regular interaction with supply chain farmers in order to discuss and elaborate issues considered relevant by the farming communities. All project stakeholders have to ensure that their observations and wishes are taken seriously to ensure that farmers can continue with the sorghum production secure and motivated.

In addition, the designed questionnaire to investigate the increase in net incomes can and will be used for future household impact studies. It provides not only an instrument to follow up on the future process of the supply chain in Sierra Leone and Ghana, but also represents a tool which can be used for the impact measurement of similar projects. Since previously only rough estimations on the income increase served to demonstrate the project’s impact, it is now possible to prove it on a factual basis.

Part II provides a second approach to assess the prospects of sustainability of the supply chain. This analysis provides further evidence of the profound satisfaction of all stakeholders, which is very important since alternatives are rare. The involvement of an intermediary to facilitate and coordinate the activities has been investigated as being essential. The prospective Sorghum Procurement Manager will initially be supported by Vancil which promises a successful approach since all necessary knowledge will be transferred smoothly. *“I’m convinced that the*

supply chain will be sustainable, also with SLBL as only sorghum purchaser.” (Henk Knipscheer, Managing Director EUCORD, 2011)

The integration of the key management task of an intermediary into SLBL will require a lot of effort and should be done carefully. All requirements mentioned in section 6.3 are considered necessary for the successful work as an intermediary and have to be kept in mind and aimed for conscientiously. In case of difficulties, the suggested alternatives in section 6.4 should be evaluated immediately and considered in order to not endanger the supply chain’s overall course of action. Therefore, in spirit of trust and transparent communication all stakeholders should sit together to avoid any conflict of interest and to ensure broad agreement with the new intermediary along the value chain.

Part III of the study elaborates on the prospects of sorghum as raw material in the food sector. The presented scenarios to increase the amount of sorghum within SLBL are realistic and fixed annual contracts with the smallholder farmers will guarantee the absorption for the coming season. “We now have a ready market for sorghum!” was a frequent comment by many farmers that were interviewed. SLBL’s strong and now proven willingness to purchase the sorghum marks the core element of the supply chain. Heineken’s expressed commitments to social responsibility in conjunction with the company’s high public profile are to date however the only factor to rely on in reducing the risk of monopsony. Interviews with the SLBL Managing Director as well as Managers within Heineken International have proved their motivation to do everything possible in order to continue as a reliable sorghum purchaser. *“The Sorghum Value Chain development project knows nothing but winners because the projects outcome is both substantial and sustainable. For both the farmers and the brewery a long term mutual beneficial relationship is definitely established”.* (Cor Honkoop, Managing Director SLBL, 2011)

However, to minimize monopsony serious efforts to identify alternatives in the sorghum market should by no means be disregarded. Although opportunities to link with other purchasers are very limited as presented in section 7.4, Bennimix Food Co. Ltd. and the WFP give reason to hope and should be followed ambitiously. The various possibilities of sorghum usage provide the opportunity for a continued lookout for other purchasers. Last but not least, the local market provides a possibility for which the provision of a milling machine is necessary.

Farmer associations, which are aiming to convert into legal organizations, should get into contact with local bank facilities to discuss possibilities of the acquirement.

The pre-condition for a successful continuation of the sorghum supply chain is that all recommendations given in this report are conscientiously taken into consideration. Communication along the value chain is seen as an overarching requirement for success. After the termination of the WASCD project, the whole supply chain process should be evaluated frequently and questioned by all stakeholders. Regular meetings should be held to discuss questions and potential problems to maintain the achieved level of trust and transparency. This research has shown that projects like the WASCD project do not end with the date of termination. It is essential that after the withdrawal of the project's initiators, all stakeholders feel responsible for and gain benefits from the successful continuation. However, the WASCD project has been successful and the same approach for similar projects should be used in the future. Each project will challenge different difficulties and provide new lessons learned, but the outcomes of this study will help to mark and illuminate some of them in advance.

In general, the success of development projects with a Public-Private-Partnership approach and a high number of stakeholders is far from guaranteed, as numerous failures in the past demonstrate. These kinds of projects are often criticized for not helping and supporting people in rural and most impoverished areas. In this case however, the study results clearly show that the project was highly successful in increasing the income of smallholder farmers in one of the poorest regions of the world. It can also safely be assumed that - under the condition that all stakeholders remain committed - the sorghum supply chain will not only be sustainable, but shows scope for outscaling and differentiation.

The Common Fund for Commodities (CFC) uses projects as the WASCD project explicitly to stimulate duplication by other donors and/or the private sector which usually seek to minimize their investment risks. This report provides unequivocal proof that the project design leads to poverty reduction, macro economic benefits and a win-win situation for all participants, which provides a strong incentive for other investors in similar value chain projects. Indeed already during finalization of this study, results have been presented to Guinness Ghana and were used by the CFC to convince executive, which resulted in a preliminary pledge to

significantly scale out their sorghum operations to East Africa (Uganda, Kenya and Tanzania in cooperation with the CFC). This is similar to Heineken's efforts to transfer the project design (adjusted by lessons learned) to its local breweries in Burundi, Ruanda and Cameroon. Heineken will use the study results to secure further public funding from the Dutch Government to include more countries with Heineken presence. Both companies are very proud of their participation and present the WASCD project in the forefront of their sustainability report.

Bibliography

Internal data

- ✧ Nigerian Breweries Plc, *Special Supplement on Sorghum*
- ✧ Mr. Ageni Yusuf, *Sustainable development through sorghum production*, Document of Heineken International BV
- ✧ Presentation on Sorghum Value Chain Development, SLBL
- ✧ Heineken Group, *Opco Overview 2010*
- ✧ Heineken NV, *Annual Report 2009*
- ✧ Common Fund for Commodities, *WASCD project - Appraisal report (CFC/FIGG/34)*, 01.12.2005
- ✧ Common Fund for Commodities, *WASCD project - Mid-term evaluation report (CFC/FIGG/34)*, June/July 2008
- ✧ Common Fund for Commodities, *WASCD project – Project Progress Monitoring Report No. 2 (CFC/FIGG/34)*, June 2007
- ✧ Common Fund for Commodities, *WASCD project – Project Progress Monitoring Report No. 4 (CFC/FIGG/34)*, November 2009
- ✧ EUCORD, *WASCD project – Interim Progress Report amended (CFC/FIGG/34)*, September 2009
- ✧ EUCORD and CFC, *Project Report #2, West African Sorghum Value Chain Development (Sierra Leone & Ghana) CFC/FIGG/34*, 31.03.2007
- ✧ EUCORD and CFC, *Project Report #3, West African Sorghum Value Chain Development (Sierra Leone & Ghana) CFC/FIGG/34*, 30.06.2007
- ✧ EUCORD and CFC, *Project Report #5, West African Sorghum Value Chain Development (Sierra Leone & Ghana) CFC/FIGG/34*, 31.03.2009
- ✧ EUCORD and CFC, *Project Report #7, West African Sorghum Value Chain Development (Sierra Leone & Ghana) CFC/FIGG/34*, 31.03. 2010

Literature

- ✧ Bishop, Kate, Department of Anthropology Indiana University, *An evaluation of the impacts of the Cameroon Sorghum Project*, June 2010
- ✧ Common Fund for Commodities, Netherlands, *Impacts of the CFC-FAO-ICRISAT Livelihood Improvement Project in Asia – Region I - India*, January 2009
- ✧ Common Fund for Commodities, Netherlands, *Impacts of CFC-FAO-ICRISAT Livelihood Improvement Project in Asia, Region II - China*, 2009
- ✧ Common Fund for Commodities, Netherlands, *Impacts of CFC-FAO-ICRISAT Livelihood Improvement Project in Asia, Region II - Thailand*, 2009
- ✧ Common Fund for Commodities, Netherlands, *Building Stronger Farmers' Associations*, 2008
- ✧ Grit, Roel, *Zo doe je een onderzoek*, Groningen/Houten, Noordhoff Uitgevers, 2009
- ✧ Knipscheer, Henk, Winrock International, *Successful Integration of Small Scale Farmers into the Commodity Supply Chain*, 10.10.2008
- ✧ NCDO, Amsterdam, *Economic Impact Assessment Model – Local economic impact of the Sierra Leone Brewery Limited, a Heineken operating company*, 2006
- ✧ Proctor, Tony., *Essentials of Marketing Research*, Pearson Education Limited, 2005
- ✧ United Nations, *Designing Household Survey Samples: Practical Guidelines*, New York, 2005

Websites

- ✧ <http://www.fao.org/ag/agp/agpc/doc/gbase/data/pf000319.htm>, 20.08.2010
- ✧ <http://www.grains.org/sorghum>, 26.08.2010
- ✧ <http://www.fao.org/docrep/t0818e/t0818e01.htm>, 26.08.2010
- ✧ <http://www.wisegeek.com/what-is-sorghum.htm>, 26.08.2010
- ✧ <http://www.fao.org/ag/agp/agpc/doc/gbase/data/pf000319.htm>, 26.08.2010
- ✧ http://www.ehow.com/list_6875324_uses-sorghum-brewing-industry.html, 26.08.2010
- ✧ <http://www.afripro.org.uk/papers/Paper01Taylor.pdf>, 26.08.2010
- ✧ <http://news.bbc.co.uk/2/hi/africa/3502733.stm>, 30.08.2010

- ✧ <http://www.spiegel.de/spiegel/print/d-40952573.html>, 19/01/2011
- ✧ <http://unstats.un.org/unsd/demographic/sources/surveys/Handbook23June05.pdf>, 04.11.2010
- ✧ <http://www.oanda.com/currency/converter/>, 10.12.2010
- ✧ <http://books.google.de/books?hl=nl&lr=&id=TwrHnls5zwEC&oi=fnd&pg=PR9&dq=the+difficulty+of+conducting+surveys+in+developing+countries&ots=j8Gzt7ab7q&sig=Fo0wSf7hq0mJ6patsDDMYS9tICs#v=onepage&q=the%20difficulty%20of%20conducting%20surveys%20in%20developing%20countries&f=false>, 14.10.2010
- ✧ <http://www.everyculture.com/Sa-Th/Sierra-Leone.html>, 14.10.2010
- ✧ http://pdf.usaid.gov/pdf_docs/PNADG566.pdf, 15.10.2010
- ✧ http://www.microlinks.org/ev_en.php?ID=9651_201&ID2=DO_TOPIC, 19.08.2010
- ✧ <http://slbrewery.com/index.php/about-us-othermenu-31/vision-othermenu-42>, 20.10.2010
- ✧ <http://slbrewery.com/index.php/about-us-othermenu-31/mission-statement>, 20.10.2010
- ✧ <http://slbrewery.com/index.php/home-mainmenu-1>, 20.10.2010
- ✧ <http://www.asti.cgiar.org/pdf/Sierra-Leone-Note.pdf>, 20.10.2010
- ✧ http://www.arcrelief.org/site/PageServer?pagename=programs_sierraleone, 20.10.2010
- ✧ <http://www.utrustbank.com/>, 20.10.2010
- ✧ <http://inwent-ijj-lab.org/Weblog/2010/08/08/sierra-leone-at-50-years-what-the-independence-anniversary-committee-should-do-to-beautify-freetown/>, 03.11.2010
- ✧ <http://www.un.org/special-rep/ohrls/lcdc/MTR/Sierra%20Leone.pdf>, 04.11.2010
- ✧ http://www.geert-hofstede.com/hofstede_west_africa.shtml, 06.11.2010
- ✧ <http://www.globalenvision.org/library/4/1051/>, 17.11.2010
- ✧ http://www.uni-heidelberg.de/presse/ruca/ruca3_2002/terberger.html, 17.11.2010
- ✧ <http://www.economist.com/node/7879918>, 04.11.2010
- ✧ <http://www.wfp.org/about>, 04.11.2010
- ✧ <http://www.sliepa.org/export-company/bennimix-food-co-ltd>, 25.01.2011
- ✧ <http://www.answers.com/topic/monopsony>, 29.01.2011

- ✧ <http://eh.net/encyclopedia/article/boal.monopsony>, 29.01.2011
- ✧ <http://www.sustainabilityreport.heineken.com/brewing-a-better-future.html>, 17.12.2010

Appendix 1: Country profiles Ghana & Sierra Leone

Country profile Ghana



Located in West Africa, Ghana is bordered by the Gulf of Guinea, Burkina Faso, Cote d'Ivoire and Togo. The country's capital and largest city is Accra with 1,963,264⁵⁴ inhabitants and 3,835,304⁵⁵ in the metropolitan area. 15 - 64 year old people with a percentage of 59.2 dominate Ghana's total population of 23,887,812, 37.2% are 0 - 14 years old.

The median age of Ghanaian people is 21.1 years with a life expectancy reaching 60.1 years. 50% of the people live in the urban areas with an urbanization rate of 3.5%. The official language in Ghana is English, next to many local languages as for example Akan (45.3%) and Ewe (12.7%). The literacy rate of the population is 57.9% whereof 66.4% is male and 49.8% is female. The main religion with a percentage of 68.8% is Christendom followed by Islam with 15.9%. The country's government type is a constitutional democracy and since January 2009, President John Evans Atta Mills is the chief of state and head of government at the same time. The country's currency is Ghana cedi (GH¢) with the current exchange rate: 1 GH¢ = 0,69 United States Dollar (USD) and 1 USD = 1.43 GH¢.⁵⁶

Economy

Due to a wide range of natural recourses, Ghana has roughly twice the per capita output (\$ 1,500; 2009 est.) of the poorest countries in West Africa. Nevertheless, the country remains heavily dependent on international financial and technical assistance. On the Ghanaian website www.ghanaweb.com, 87 foreign and 316 local NGO's are registered. Ghana is member of more than 50 international organizations, as for example the FAO, IMF, UNESCO and WMO. Agriculture forms the most important part of the domestic economy, which accounts for more than a third of the GDP (agriculture 33.6%, industry 25.1%, services 41.2%) and employs more than half of the work force, mainly small landholders (agriculture 56%, industry 15%, services

⁵⁴ <http://population.mongabay.com/population/ghana/2306104/accra>, 02.09.2010

⁵⁵ <http://www.citypopulation.de/Ghana.html>, 02.09.2010

⁵⁶ <http://www.oanda.com/currency/converter>, 02.09.2010

29%). Cocoa, rice, cassava, peanuts, corn, shea nuts, bananas and timber belong to the most important products.

The unemployment rate decreased from 20% in the years 2003-2007 (1997 est.) to 11% in the years 2008-2010 (2000 est.).⁵⁷ In 2007, the population living below the poverty line reached 28.5% (est.).⁵⁸

Country profile Sierra Leone

After the Civil War from 1991 to 2002 that resulted in several thousand deaths and the displacement of about one-third of the population, democracy is slowly being reestablished in Sierra Leone. On the Human Development Index (2010) the country ranks 158 out of 169⁵⁹ and 70.2% of the people live below the poverty line. The military, which took over full responsibility for security after the departure of UN peacekeepers at the end of 2005, is steadily developing as a guarantor of the country's stability.



Situated in the west of Africa, Sierra Leone is bordered by the North Atlantic Ocean, Guinea and Liberia.

Capital and largest city is Freetown with 772,843⁶⁰ (2004) inhabitants. 59.2% of the country's total population of 23,887,81 is between 15 and 64 years old while 37.2% is between 0 and 14 years old.

The average age of Sierra Leoneans is 19 while life expectancy reaches 55.25 years (country comparison to the world: 196). 38% of the total population lives in the urban area with a rate of urbanization of 2.9%. The official language in Sierra Leone is English which is only used by a literate minority. Mende is the principal vernacular in the South, Temne the principal vernacular in the North. Krio, an English-based language is the lingua franca and a first language for 10% of the population but understood by 95%. The government type is a constitutional democracy. Since September 2007, President Ernest Bai Koroma is both the chief of state and head of government. The government's priorities include furthering development, creating jobs and stamping out endemic corruption.

⁵⁷ http://www.indexmundi.com/ghana/unemployment_rate.html, 02.09.2010

⁵⁸ <https://www.cia.gov/library/publications/the-world-factbook/geos/gh.html>, 02.09.2010

⁵⁹ <http://hdr.undp.org/en/statistics/>, 02.09.2010

⁶⁰ <http://www.citypopulation.de/SierraLeone.html>, 02.09.2010

The country's currency is the Sierra Leone Leone (SLL) with the current exchange rate:
1 SLL = 0,00024 United States Dollar (USD) and 1 USD = 4,100.00 SLL.⁶¹

Economy

Sierra Leone is an extremely poor nation with tremendous inequality in income distribution. Nearly half of the working-age population is engaged in subsistence agriculture of which the most important products are rice, coffee, cocoa, palm kernels, palm oil, peanuts; poultry, cattle, sheep, pigs and fish. Physical and social infrastructure is not well developed in Sierra Leone and serious social disorders continue to hamper economic development. Substantial aid from abroad is essential to offset the severe trade imbalance and supplement government revenues.⁶² The GDP per capita ranks 218 in comparison to the world and amounts up to \$900. The composition by sector is divided into agriculture 49%, industry 31% and services 21%. Official figures on the unemployment rate cannot be found, but "a nationwide employment survey done by the German government agency for overseas development GTZ and the government of Sierra Leone in 2006 revealed that there were 500,000 job seekers in the country. Apparently, this number must have risen today but the government and stakeholders are doing little to address the menace."⁶³

⁶¹ <http://www.oanda.com/currency/converter>, 02.09.2010

⁶² <https://www.cia.gov/library/publications/the-world-factbook/geos/sl.html>, 02.09.2010

⁶³ <http://allafrica.com/stories/200807010808.html>, 02.09.2010

Appendix 2: Additional information on sorghum

Worldwide - The United States is the world's largest sorghum producer followed by India and Nigeria. Over the last years, in developed countries utilization of sorghum grain has turned away from food consumption towards utilization in industry and in the livestock feed sector. For these purposes, it is traded on the world market which is dominated by U.S. exports to Mexico. Other importing countries and regions include Japan, the EU, Africa, Colombia and Korea. Around the world, sorghum production and consumption are on the rise but they are not growing as fast as the world population. Therefore, the supply per capita is actually decreasing. Of the total world area planted with sorghum, over 80% can be found in developing countries. Here sorghum is generally grown in low rainfall and drought-prone areas that are usually unsuitable for growing other crops. For millions of people in the semi-arid tropics of Asia and Africa, sorghum is the most important staple food. This crop sustains lives of the poorest rural people and will continue to do so in the near future. In 2008, the production levels of sorghum in Africa and the world were estimated at 20 million and 60 million metric tons respectively.⁶⁴⁶⁵

Africa – In Africa, sorghum is the second most important cereal after maize and grown in a large belt that reaches from the Atlantic coast to Ethiopia and Somalia, bordering the Sahara in the North and the equatorial forests in the South, generally where rainfall is too low to successfully cultivate maize. In Ghana and Sierra Leone, sorghum is the third most important cereal crop that is especially cultivated in the drier and more impoverished parts.

Ghana - In Ghana, sorghum is an important staple food and also consumed as the main ingredient of the popular, traditionally produced sorghum beer.

Sierra Leone - In Sierra Leone, sorghum is used as an ingredient for a wide range of indigenous foods and beverages but not regarded as a main staple food crop. It used to be cultivated in combination with upland rice, adapted for humid tropics and was not available on the local market. Many farm households rely on sorghum as a major food source during the “lean period”, being the food for scarce months before the harvest of the main season rice crop.⁶⁶

⁶⁴ Common Fund for Commodities, 01.12.2005, WASCD project, Appraisal report (CFC/FIGG/34)

⁶⁵ <http://www.grains.org/sorghum>, 26.08.2010

⁶⁶ Common Fund for Commodities, 01.12.2005, WASCD project, Appraisal report (CFC/FIGG/34)

Appendix 3: Main project stakeholders

The Common Fund for Commodities



The Common Fund for Commodities, based in Amsterdam, is an intergovernmental financial institution established within the framework of the United Nations. The Fund operates under the novel approach of commodity focus instead of the traditional country focus. Member countries benefit from projects financed by the Fund, whose basic rationale is to enhance socio-economic development of commodity producers and to contribute to the development of the society as a whole. The Fund finances projects for smallholder farmers as well as small and medium sized enterprises involved in commodity production, processing and trade in developing and least developed countries.

The Common Fund for Commodities has financed development projects for nearly two decades through its mandate, which is to enhance social and economic development in commodity dependent developing countries (CDDCs) and especially, in least developed countries (LDCs). The multi-country dimension of the project financing mechanism and commodity initiatives undertaken by the Fund and its partners has proven to be the most suitable approach to improve overall problems and challenges in the commodity sector in Member-Countries.

Replicable project outcomes and dissemination products mainly address issues such as: market access and development; agro-processing; product competitiveness; infrastructure; marketing and access to finance, among other related activities within the commodity sector.⁶⁷

The ***Food and Agriculture Organizations of the United Nations (FAO) - Intergovernmental Group on Grains (FIGG)*** acts as the Supervisory Body of the project. Participating in all kind of grain projects, this International Commodity Body prevents an overreaching of producers or consumers. The FIGG is a forum for intergovernmental consultation and exchange on trends in production, consumption, trade, stocks and prices of

⁶⁷ <http://www.common-fund.org/>, 31.08.2010

wheat and coarse grains, including regular appraisal of the world grain situation and short-term outlook. Nearly all grains importing and exporting countries are Members of the IGG on grains.⁶⁸

Heineken International BV



Heineken is one of the world's leading brewers and is committed to growth and remaining independent. The company sells its products to more than 170 countries and has 125 breweries in 70 countries. In Europe, they are the largest brewer and they are the world's largest cider producer. More than 80.000 people are working for Heineken worldwide.

The company's aim is to be a leading brewer in each of the markets in which they operate and to have the world's most valuable brand portfolio.

A combination of wholly owned companies, license agreements, affiliates and strategic partnerships and alliances in Western Europe, Central and Eastern Europe, Africa and the Middle East, The Americas and Asia Pacific make them achieve their global coverage.

Heineken also plays a very important role in society and in the communities in which they work. Corporate responsibility belongs to the company's priorities and underpins together with sustainability everything they do.

Seven areas were defined which Heineken believe they should focus on their energy in order to maximize benefits for society, their stakeholders and their company, namely Energy, Water, Safety, Agriculture, Supply chain responsibility, Responsible beer consumption and impact on developing markets.⁶⁹

During the Millennium Development Goals Summit hosted by the United Nations on 22nd September 2010, Heineken received the 2010 World Business and Development Award (WBD) for its local supply chain initiative in Sierra Leone. According to the members of the International Judging Panel, Heineken impressed by demonstrating a clear link between vital business practices and the contribution of the project towards the Millennium Development Goals.⁷⁰

⁶⁸ http://www.fao.org/es/ESC/en/15/53/highlight_56.html, 31.08.2010

⁶⁹ <http://www.heinekeninternational.com/homepage.aspx>, 31.08.2010

⁷⁰ http://www.heinekeninternational.com/100922_heinekenint_wbd_award.aspx, 31.08.2010

Diageo plc and its subsidiaries



Diageo is the world's leading premium drinks business with a wide collection of international brands across spirits, wine and beer. The company was created in 1997 but their brands have a longer history which goes back to the 18th century. Trading in approximately 180 markets, Diageo employs over 20,000 people around the world. With offices in 80 countries, they also have manufacturing facilities across the globe including Great Britain, Ireland, United States, Canada, Spain, Italy, Africa, Latin America, Australia, India and the Caribbean.

Diageo manages its business in terms of global priority brands, local priority brands and category brands. The focus on organic growth are global priority brands which contributed to 57% of total volume in the year ended 30 June 2010. These brands are its primary growth drivers across their markets and so are the main focus on its business. Global priority brands are Johnnie Walker, Smirnoff, Baileys, Captain Morgan, José Cuervo, J&B, Tanqueray and Guinness.

Cooperate social responsibility plays an important role within Diageo. Creating the right conditions for an enduring, successful business are the company's targets: Employees living their full potential, communities that are prosperous, and a stable environment.⁷¹

European Cooperative for Rural Development (EUCORD)



EUCORD is a non-for-profit organization based in Brussels. Its mission is to help people living in poverty in developing countries improving their well-being. It aims to achieve this by engaging the private sector in delivering services to rural communities to ensure healthy families and sustainable livelihoods. Over the past six years, EUCORD has built a strong and reliable project implementation capacity. To its values belong establishing cooperative partnerships characterized by transparency and mutual respect, relationships that are fair and empowering and recognizing the importance of self-reliance in pursuit of sustainability, fostering a spirit of volunteerism within its team and among its partners and achieving an impact through innovation and achieving results.

Currently EUCORD conducts multi-year program activities in Burundi, the Democratic Republic of Congo, Ghana, Guinea, Mali, Nigeria, Senegal and Sierra Leone. All project activities are aimed at improving the livelihoods of rural communities. In each country, public funding is

⁷¹ <http://www.diageo.com/en-row/Pages/default.aspx>, 31.08.2010

enhanced by private sector partners co-funding. One of its international partners is Heineken International BV.⁷²

EUCORD is an affiliate of the American non-for-profit organization Winrock International. Created in 1985 by merging the International Agricultural Development Service, the Winrock International Livestock Research and Training Center, and the Agricultural Development Council (A/D/C), the organization serves to empower the disadvantaged, increase economic opportunity, and sustain natural resources⁷³.

⁷² <http://eucord.org/default.html>, 31.08.2010

⁷³ http://www.winrock.org/about_us.asp, 31.08.2010

Appendix 4: Household survey - Methods

Designing the questionnaire

The method chosen to investigate the objectives of this study is a household survey. The script: “Designing Household Survey Samples: Practical Guidelines” published by the United Nations Statistics Division, was studied to get information about the conduction of household surveys and its approach.

Designing the questionnaire⁷⁴ for the household survey in Sierra Leone and Ghana included three phases. The first part consisted of generating adequate questions. Therefore, the CFC appraisal report⁷⁵ as well as different progress reports of the WASCD project have been examined and their different components have been analyzed to formulate appropriate questions. In addition, questionnaires of similar household surveys were reviewed and compared as for example can be found in Bishop (2010)⁷⁶.

In the second part the questionnaire draft has been presented to different project stakeholders who gave their feedback to ensure the achievement of a good questionnaire and to enable and facilitate the collection of accurate information, data processing and tabulation. To guarantee a setup of a survey that is understandable and accomplishable for the respondents, the last step consisted of a pre-test that was conducted in Ghana and Sierra Leone from September 19th 2010 until October 7th 2010. In both countries, together with two to three project members, smallholder farmers were visited and interviewed.



Pretest in Sierra Leone, Mile 91



⁷⁴ See appendix 5

⁷⁵ Common Fund for Commodities, 01.12.2005, WASCD project, Appraisal report (CFC/FIGG/34)

⁷⁶ Kate Bishop in collaboration with Appollinaire Adamou, June 2010, “An evaluation of the impacts of the Cameroon Sorghum Project”

The conducted test showed some difficulties concerning understanding and feasibility of adequate responses like for example the indication of different figures. Considering these findings, the questionnaire was adapted several times during the pre-test. After the first week in Ghana, satisfying changes had been accomplished. In Sierra Leone, only few adaptations had been necessary due to some differences between the countries. After the pre-test, the questionnaire was finalized and sent to project members in each country who conducted the actual survey.

Estimation of income variables

To identify whether the net income of the farmers increased, different income variables have been set up. First of all the sorghum gross income has been calculated by multiplying sold bags of sorghum with the amount of money the smallholder farmers get from the nucleus farmers for one bag (Questions 11-14);

$$\text{Sorghum gross income} = (\text{produced bags} - \text{unsold bags}) * \text{money per bag}$$

To calculate the sorghum net income, two different cost indicators have been calculated: 1) Production costs and 2) Opportunity costs:

1) The production costs are the result of six different questions. Farmers had to indicate for which kind of tasks they use paid labor and correspondingly the amount of payment as well as the amount of money for the food they provide (Questions 18, 19). Furthermore, they have been asked if they have to pay for certain inputs and if so, how much (Questions 20, 21). Finally, the amount of land lease they eventually have to pay has been implied in the calculation of the production costs (Questions 26, 27);

$$\text{Production costs} = \text{payment for labor} + \text{payment for food} + \text{payment for inputs} + \text{lease for land}$$

2) The opportunity costs have been estimated by asking for one cash crop they had stopped with to cultivate sorghum and thereby participate in the project. Farmers were asked to indicate the amount of sold bags of this cash crop in the last year. This was multiplied by the amount of money they get for one bag. Production costs were calculated on the same basis as explained above. To concentrate the amplitude of the questionnaire, all steps were summed up in one question (Question 25) and production costs calculated on an additional paper, which is not element of the questionnaire. Only the sum is specified in Question 25.c.

$$\text{Opportunity costs} = (\text{sold bags} * \text{money for bags}) - \text{production costs}$$

To estimate the sorghum net income, production costs and opportunity costs are subtracted from the sorghum gross income.

$$\text{Sorghum net income} = \text{Sorghum gross income} - (\text{productions costs} + \text{opportunity costs})$$

To compare the income the farmers had before the project with the income they receive now by participating in the project, an assumption to calculate former income has been set up:

Farmers have been asked which main cash crop besides sorghum they are cultivating at the moment. Since they are still farming this crop probably because of profit reasons, the assumption that they already cultivated this crop before the start of the project is made up. This earning is seen as their main source of income before the project and is compared to the current sorghum income. The net income before cultivating sorghum is calculated on exactly the same basis as the opportunity costs (Question 22).

$$\text{Net income before} = (\text{sold bags} * \text{money for bags}) - \text{production costs}$$

To have a consistent foundation and to make the results comparable, all questions are referred to one acre in the last year. The interviewers developed different methods to explain the character of one acre in case a farmer was not sure, to guarantee a realistic response.

Currencies in the tables are indicated in Sierra Leonean Leone (SLL) and Ghanaian Cedi (GHC). To illustrate the total of these countries, a column with US Dollars (US\$) currency has been added to all tables.

Sampling methods

Probability sampling

For household surveys, probability sampling is seen as the only convenient method of determining the sample size, i.e. the number of households or persons selected for inclusion in the survey.⁷⁷ The requirements for probability sampling are (1) that each element must have known mathematical chance of being selected, (2) that chance must be greater than zero and (3) it must be numerically calculable. This mathematical nature permits scientifically-grounded estimates to be made from the survey and sampling errors can be estimated from the data collected from the sample cases. Probability sampling usually is conducted in two stages. The

⁷⁷ <http://unstats.un.org/unsd/demographic/sources/surveys/Handbook23June05.pdf>, 04.11.2010

first stage generally involves choosing geographically-defined units while the last stage involves selecting the specific households or persons to be interviewed. Both stages must utilize probability methods for proper sampling.

Determination of sample size

To determine the sample size, Bishop's assumptions have been used as a model: To find out whether the goal of generating cash income for sorghum farmers in Cameroon had been achieved, a sample of 40 farmers was selected out of a population of 1190 farmers (3%). "They were selected from throughout the target area and represent the cultural and environmental diversity of the region."⁷⁸ This percentage is also used for the sample size determination for this research and seen as representative.

Geographically-defined units in case of Ghana and Sierra Leone are districts (nucleus farmers) and villages. In **Ghana**, the sample of farmers who have been interviewed was selected as follows:

7,300 smallholder farmers are participating in the project. In this case, the sample has been selected in three stages:

Nucleus farmers	Villages	Households	Total sample size
3	x3	x25	=220 (3%)

Sample size determination Ghana

- (1) Nucleus farmers are more important than geography why first of all three of them had been selected randomly out of a total of eleven nucleus farmers.

"Everything evolves around the nucleus farmer and all out-growers operate under one of them. Each nucleus farmer operates in a different location, very few operates across regions. Under no circumstances there is more than one nucleus farmer operating in the same village."⁷⁹

- (2) Each nucleus farmer has an average of nine villages from which three had been selected randomly.
- (3) Finally, 25 farming households had been selected randomly to reach a sample size of 3%.

⁷⁸ An evaluation of the impacts of the Cameroon Sorghum Project", Kate Bishop in collaboration with Appollinaire Adamou, June 2010

⁷⁹ Stephen Mwinkaara, Project Coordinator, Technoserve, Wa, Ghana, 19.09.2010

In **Sierra Leone**, the sample was selected as follows:

1,600 smallholder farmers are participating in the project. In this case, the sample has been selected in two stages:

Districts	Households	Total sample size
10x	8	=80 (5%)

Sample size determination Sierra Leone

- (1) Ten districts had been selected randomly out of 13 districts participating in the project.
- (2) In these districts, eight farming households had been selected randomly to reach a sample of 3%.

Reason for the higher sample size of 5% for Sierra Leone is the better reachability due to shorter distances between the participating districts and villages in this country.

Statistical analysis

The software IBM SPSS Statistics 18 was used for data entry and to analyze the obtained data.

After data entry, data plausibility checks were conducted to ensure correctness of data. If serious mistakes in the questionnaire occurred, they were excluded of the analysis⁸⁰.

Primary outcome was the increase of the median net income which was investigated using the Wilcoxon-Test to ensure that differences found in income before and after the project are not caused by chance. Instead of the mean income the difference in median income was tested because the pre-test has shown how difficult it is for the farmers to give all required estimates in the questionnaire so that a skewed distribution with many outliers of estimated income data can be assumed where the parametric paired t-test would be inadequate.

The following hypothesis was tested: "There is no difference in the net income before and after participating in the WASCD project." Secondary outcomes were demographics, costs, income and satisfaction which were analyzed descriptively. For nominal variables frequencies and percentages are shown. Metric variables were analyzed using mean and standard deviation as well as the median. Reasonable graphics were generated.

⁸⁰ For Ghana, seven questionnaires had to be sorted out as a result of incomplete and insufficient data. For Sierra Leone, all questionnaires could be used for the analysis.

Appendix 5: Questionnaire Sierra Leone & Ghana

Questionnaire sorghum farmers



Introduction

1. Are you the person who is responsible for the sorghum production?

☐ yes ☐ no

2. Are you the person who sells the sorghum?

☐ yes ☐ no

General information

3. Name

4. Sex

☐ male ☐ female

5. Location

Country _____

District _____

Village _____

6. How many people are living in your household?

Farming activities

7. Did you cultivate sorghum (including local varieties) before the start of the project 4 years ago?
(If no, please go on with question 11)

☐ yes ☐ no

8. If yes, in comparison to today, did you cultivate sorghum in a different way 4 years ago?
(If no, please go on with question 10)

☐ yes ☐ no

9. If yes, what has changed regarding the manner of the cultivation process (planting, harvesting, etc.)?

10. How many bags (50kg/bag) of sorghum per acre did you produce before the start of the project?

11. How many bags (50kg/bag) of sorghum per acre did you produce after the start of the project in the last year?

12. Did you sell all the sorghum you produced in the last year? (If yes, please go on with question 14)

☐ yes ☐ no

13. If no, how many bags per acre did you not sell?

14. How much money did you get for one bag sold to the nucleus farmer?

15. Have you ever had problems with producing too much sorghum, which could not be sold to the nucleus farmer?

(If no, please go on with question 17)

☐ yes ☐ no

16. If yes, please tell what you did with the surplus.

17. Did you use paid labor for the production of sorghum during the last year? *(If no, go on with question 20)*

☐ yes ☐ no

18. If yes, for which of the following tasks did you use the paid labor?

- | | | |
|-----------------------------------|--------------------------|------------------------------------|
| a. Land clearing | <input type="checkbox"/> | |
| b. Planting | <input type="checkbox"/> | |
| c. Weeding | <input type="checkbox"/> | |
| d. Ridging | <input type="checkbox"/> | (not applicable for Sierra Leone) |
| e. Harvesting | <input type="checkbox"/> | |
| f. Threshing | <input type="checkbox"/> | (in Sierra Leone seen as one task) |
| g. Winnowing | <input type="checkbox"/> | |
| h. Transport (from farm to house) | <input type="checkbox"/> | |

19. How much did you pay for the tasks per acre in the last year and for food provided, if any?

	Payment for labor	Payment for food
a. Land clearing	<input type="text"/>	<input type="text"/>
b. Planting	<input type="text"/>	<input type="text"/>
c. Weeding	<input type="text"/>	<input type="text"/>
d. Ridging	<input type="text"/>	<input type="text"/>
e. Harvesting	<input type="text"/>	<input type="text"/>

f. Threshing	<input type="text"/>	<input type="text"/>
g. Winnowing	<input type="text"/>	<input type="text"/>
h. Transport ⁸¹ (from farm to house)	<input type="text"/>	<input type="text"/>

20. Did you have to pay for the following inputs in the last year?

a. Seeds	<input type="checkbox"/> yes	<input type="checkbox"/> no
b. Fertilizer	<input type="checkbox"/> yes	<input type="checkbox"/> no (not applicable for Sierra Leone)
c. Land preparation (Ploughing)	<input type="checkbox"/> yes	<input type="checkbox"/> no (not applicable for Sierra Leone)
d. Sacks	<input type="checkbox"/> yes	<input type="checkbox"/> no

21. If yes, how much did you have to pay for the inputs per acre in the last year?

a. Seeds	<input type="text"/>
b. Fertilizer	<input type="text"/>
c. Land preparation (Ploughing)	<input type="text"/>
d. Sacks ¹	<input type="text"/>

22. Besides sorghum, what is your main cash crop, which you are still cultivating now? Please name only one.

a. How many bags (50kg) of this cash crop did you sell in the last year per acre?

b. How much money did you receive for selling one bag (50kg) of this cash crop in the last year?

⁸¹ Please multiply with amount of bags of question nr. 11

- c. How much is the cost of production for this cash crop per acre⁸²?

23. In comparison to this cash crop, what are the main advantages/disadvantages of sorghum?

Advantages_____

Disadvantages_____

24. Did you stop cultivating other crops for the cultivation of sorghum? *(If no, please go on with question 26)*

☐ yes ☐ no

25. If yes, with which cash crop did you stop? Please name only one.

- a. How many bags (50kg) of this cash crop did you sell in the last year of its production per acre?

- b. How much money did you receive for selling one bag (50kg) of this cash crop in the last year of its production?

- c. How much was the cost of production for this cash crop per acre²?

⁸² To be calculated by taking into consideration all the steps in Question 19.

26. Do you have to pay a lease for your land? *(If no, please go on with question 28)*

☐ yes ☐ no

27. If yes, how much did you have to pay in the last year per acre?

Satisfaction

28. On a scale of 1 – 4, how satisfied are you with the sorghum project?

☐ 1 (completely unsatisfied)

☐ 2 (unsatisfied)

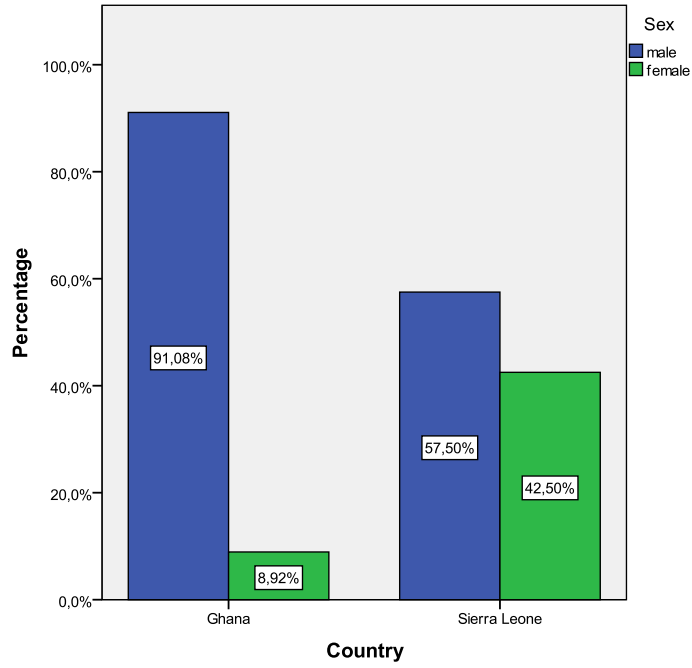
☐ 3 (satisfied)

☐ 4 (completely satisfied)

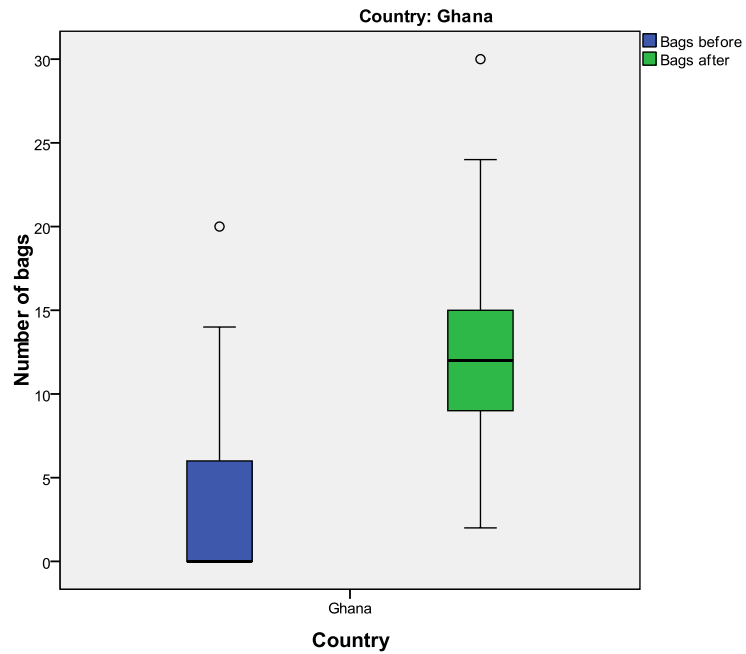
29. Do you have any suggestions, observations or comments concerning the project?

Appendix 6: Graphics

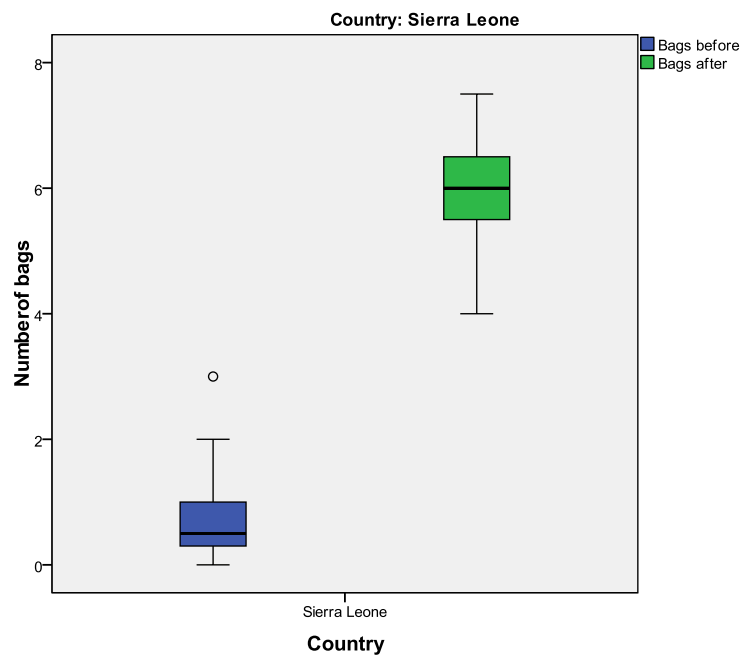
Graphic a.1: Distribution of respondents' sex per country



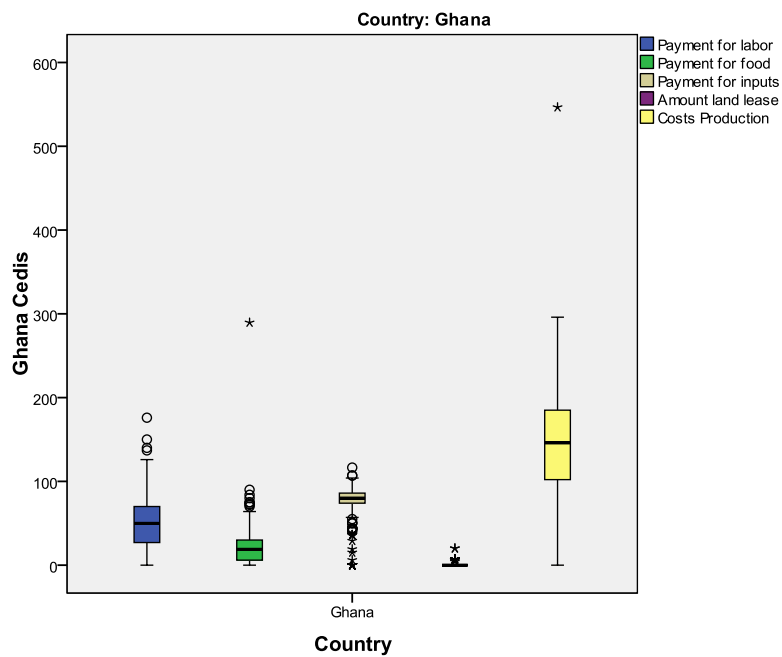
Graphic b.1: Produced bags of sorghum (50kg) per household and per acre before the project and in 2009/2010 in Ghana



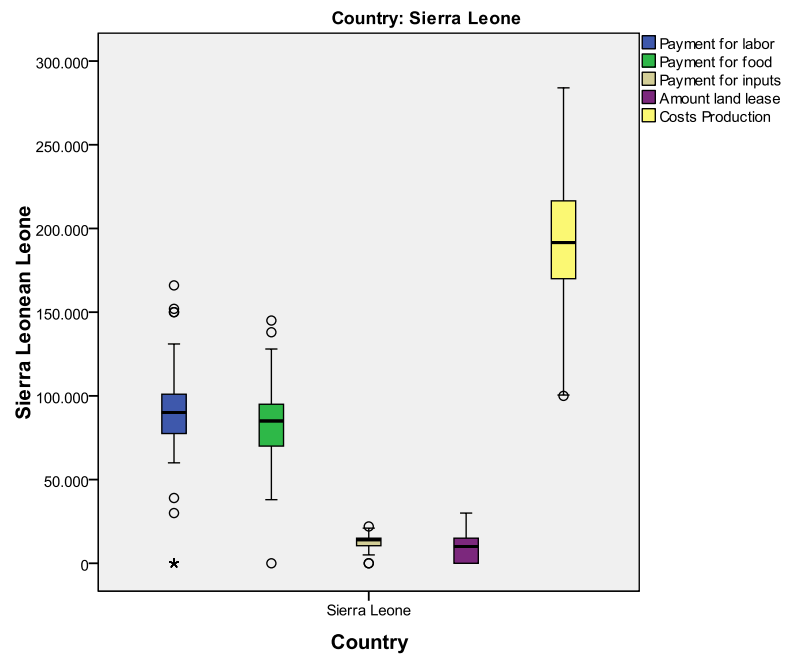
Graphic b.2: Produced bags of sorghum (50kg) per household and per acre before the project and in 2009/2010 in Sierra Leone



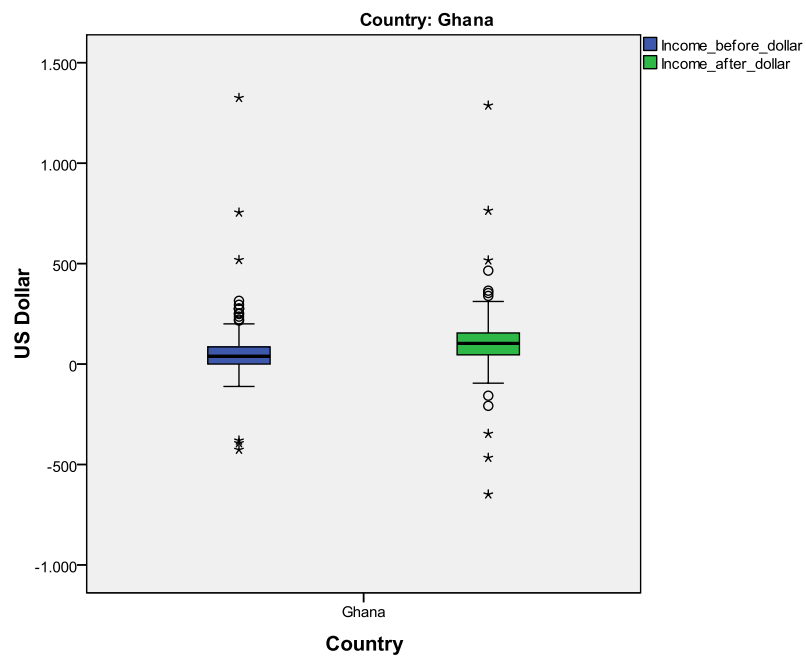
Graphic c.1: Cash costs of sorghum production Ghana in Ghana Cedi



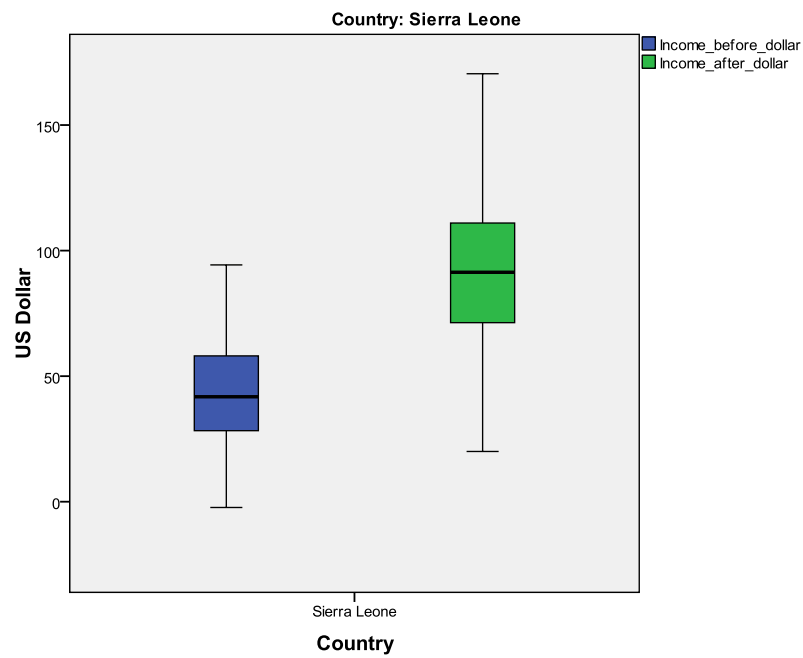
Graphic c.2: Cash costs of sorghum production Sierra Leone in Sierra Leonean Leone



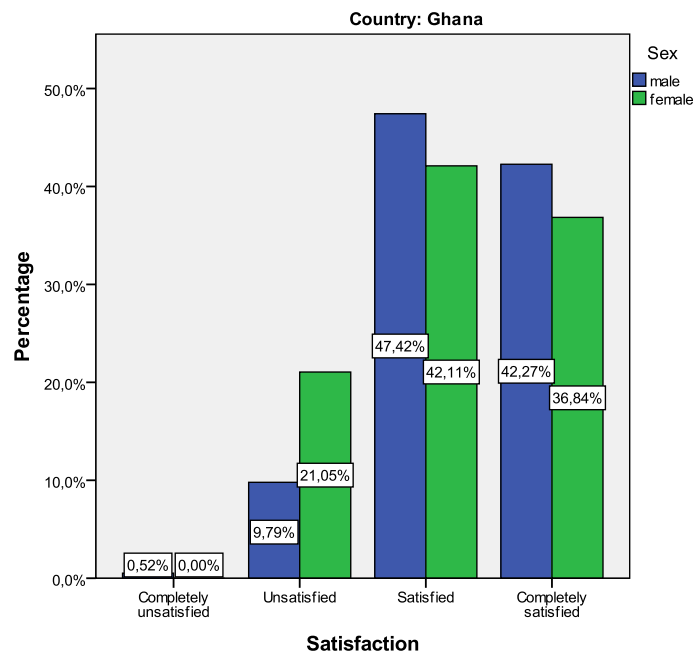
Graphic d.7: Comparison of income before and after the project Ghana in US Dollar



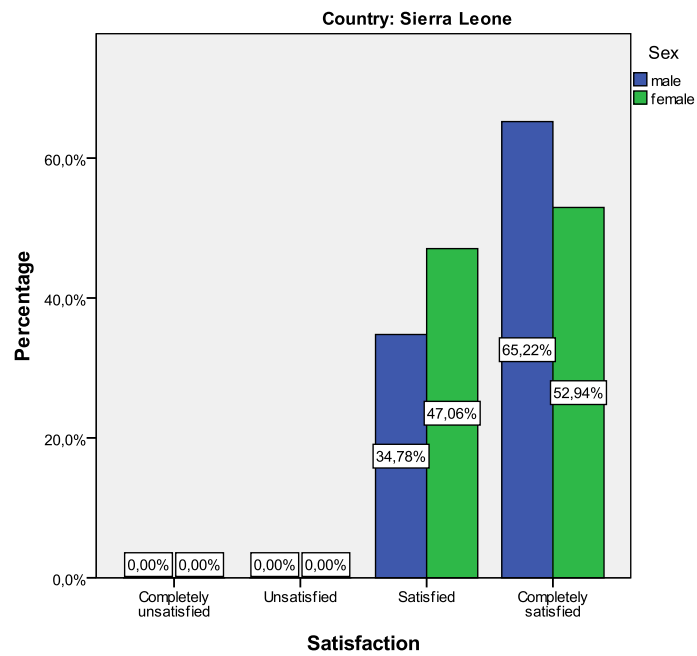
Graphic d.6: Comparison of income before and after the project Sierra Leone in US Dollar



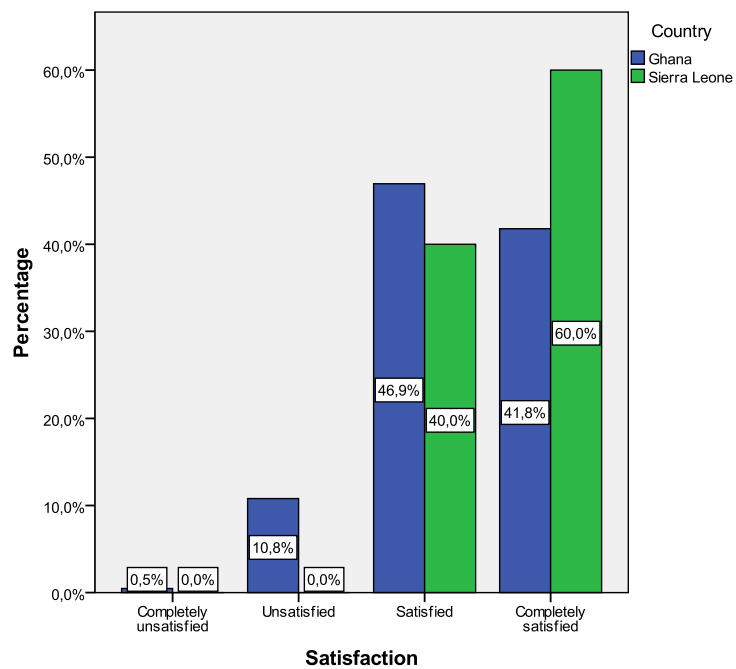
Graphic e.1: Satisfaction of farmers in Ghana



Graphic e.2: Satisfaction of farmers in Sierra Leone



Graphic e.3 (additional): Satisfaction in comparison



Appendix 7: Additional tables

Table a.2: Distribution of respondents' sex per district **Ghana**

	Sex				Total	
	Male		Female			
District	#	%	#	%	#	%
Nadowli West	23	88.5	3	11.5	26	100
Sawla-Tuna Kalba	23	92.0	2	8.0	25	100
Tirapa	60	87.0	9	13.0	69	100
Wa East	65	95.6	3	4.4	68	100
Wa-Municipal	23	92.0	2	8.0	25	100

Table a.3: Distribution of respondents' sex per district **Sierra Leone**

	Sex				Total	
	Male		Female			
District	#	%	#	%	#	%
Bo	5	71.4	2	28.6	7	100
Bombali	2	40.0	3	60.0	5	100
Kambia	4	40.0	6	60.0	10	100
Kenema	7	77.8	2	22.2	9	100
Koinadugu	6	50.0	6	50.0	12	100
Kono	5	50.0	5	50.0	10	100
Moyamba	5	62.5	3	37.5	8	100
Port Loko	6	60.0	4	40.0	10	100
Tonkolili	6	66.7	3	33.3	9	100

Appendix 8: Set of answers to Question 29:

“Do you have any suggestions, observations or comments concerning the project”

Ghana

- ✧ Provide threshers for threshing; Also tarpaulins; Review the price upward
- ✧ Early delivery of fertilizer
- ✧ Continue to provide credit for us
- ✧ It is a very good project and I believe it should continue; Inputs such as fertilizer and tractors that use to come, did not come this year and we are appealing that it should not stop
- ✧ I suggest that donors should provide some awards to serious and hard working farmers; Provision of warehouse is very important since sorghum is left in the premises of farmers after sorghum is bought
- ✧ It is a good source of income to us; The inputs given to us aid us in the cultivation of other crops as we usually intercrop the sorghum with other crops
- ✧ Help us with machines for threshing
- ✧ I appreciate the support we are given in the form of seeds, fertilizers and sacks for bagging our produce
- ✧ There are some insects that pose as threats to the sorghum but we don't know how to treat them and so I hope we can be educated on how to use pesticides and if they can be provided to us
- ✧ It has improved our livelihoods and we hope the support given us can be increased
- ✧ Do not meet labor cost; I suggest to reduce inputs cost and increase price per bag
- ✧ This support is good as it has improved our livelihoods
- ✧ The support should be increased so that we can benefit more; Ware (store) houses should be provided so that after harvesting we can store them there
- ✧ I will be grateful if tractor services could be improved so that we would start planting at the right time
- ✧ Difficulty in threshing, if we could be given a threshing machine to help; Also a tarpaulin
- ✧ Much education on cultural practices of the crop
- ✧ The yield was very poor and because of that we could not get money
- ✧ Seeds should be tested to ensure that they are viable before they are distributed
- ✧ Provide chemicals for spraying; Review the prices of sorghum upward
- ✧ Seed should arrive fast and should be tested to make sure they are viable; Early arrival of tractors and tractors are not enough; Early arrival of inputs, especially for fertilizer

- ✧ Provision of tarpaulin for drying; Planters for faster sowing; Early arrival of inputs, e.g. seeds, fertilizer
- ✧ Early arrival of tractor; Early buying and payment; Early arrival of inputs, e.g. fertilizer
- ✧ Early arrival of tractors; Early payments and buying
- ✧ Ploughing should be done early; Inputs should be provided at the right time
- ✧ There should be available tractor services; Fertilizer availability will also help to increase production
- ✧ The project should continue with the credit
- ✧ No comments
- ✧ No comments
- ✧ No comments
- ✧ There should be clear communication between outgrowers and nucleus farmers
- ✧ The price at which the sorghum is bought should be higher than it is now and that will help us a lot; The inputs should be given us on time and in good quantity
- ✧ Low price
- ✧ We want quick payments for our produce; Early arrival of fertilizer will help improve our yield; We would be grateful if you could supply us threshers on credit
- ✧ Money should be provided for the weeding; Food to feed laborer
- ✧ We could not make money on that very year
- ✧ Early arrival of tractors; Early arrival of inputs such as seeds, fertilizer
- ✧ Tractor services should be improved; Availability of threshers would give farmers the go-ahead to produce more
- ✧ It is a profitable project; Tractor services should be provided early enough to meet production period
- ✧ Early planting, providing farming input for farmer
- ✧ Provide one more tractor for our nucleus farmer to speed up our production and increase
- ✧ Early arrival of tractors, seed and fertilizer; Early buying and payment
- ✧ The price is low and we will implore those responsible to do something about the price; If we could be granted some [unreadable word] aids, it would give us motivation that will lead to increased yield
- ✧ Early arrival of inputs such as seeds and fertilizers; Tractor services should be made available early enough for ploughing; It should include other crops like maize
- ✧ We need your help during the dry season so that we can also have something done apart from the production of sorghum when we nothing to do and we have to wait for the next season to come
- ✧ Tractor services should be improved to enable us plant at the right time to get maximum yield
- ✧ No comments

- ✧ Ploughing needs to be done within some short period during ploughing, hence, the tractors in the system are not enough; Provides tarpaulin for drying during harvesting
- ✧ There should be easy access to farm implements; There should be early delivery of fertilizer
- ✧ We need thresher
- ✧ We want to have something done in the dry season through TechnoServe and our nucleus farmer; Provide our nucleus farmer with one more tractor to increase the production
- ✧ Fertilizer provided is not always enough for the crops
- ✧ There should be a warehouse in the community to store the produce immediately after weighing
- ✧ The price should be increased to motivate us to farm effectively
- ✧ I want you to continue offering us credit facility; We also need threshing machines
- ✧ There is much profit; It should not stop but credit still should be provided
- ✧ Availability of threshers would encourage us to produce more acreages of sorghum
- ✧ Sorghum farming should be continued because it is helpful
- ✧ I want you to assist me with machine for threshing; I want quick payments for my produce
- ✧ No comments
- ✧ Provide tarpaulins to help during rains; Means of transportation sorghum from farm to house
- ✧ Tractor services should be improved
- ✧ Early arrival of inputs, e.g. seeds, fertilizer and also tractor services
- ✧ We will appeal that tractor services should be made available to us early enough; The fertilizer provided is not enough for us to increase yield
- ✧ Give us some loans to be running business during the dry season
- ✧ No comment
- ✧ Early ploughing; Buying should be done early
- ✧ I want threshing machines; I want you to continue buying the sorghum from us
- ✧ I want increase in price; I want us to be provided with tarpaulins
- ✧ Early arrival of tractor services; Early buying and payment
- ✧ Early arrival of inputs, e.g. seeds, fertilizer; Tractors should be made available early enough for ploughing; Tarpaulin for drying and threshing
- ✧ Improved tractor services will help to boost yield
- ✧ Timely meetings with the project sometimes not appropriate, e.g. during farming season

- ✧ We need to have something doing in dry season after the producing of the sorghum through you TechnoServe; We also want you to provide our nucleus farmer with tractor since the area he covers is large, in the farming season it will reach all the farmers in order to avoid production loss
- ✧ The price should be revised upwards
- ✧ No comment
- ✧ Hate ploughing
- ✧ We want you TechnoServe let us get something doing during the dry season
- ✧ If you could support outgrowers with loan on cash to help carry out farming activities smoothly; If you could support us with a warehouse which will enable us practice inventory credit rather than throwing our commodities away at a giveaway price
- ✧ I have observed that some of us were not paid last year for our produce; I also want quick payments for our produce
- ✧ We want threshers to aid our harvesting; We want improved seeds for planting; Increase the price
- ✧ There should be early delivery of fertilizer; The price per bag should be increased to 25 Ghana cedi; If you could supply us tarpaulins on credit
- ✧ Tractors services should be provided early enough; Inputs should be provided early, e.g. seeds, fertilizer
- ✧ Always buy our sorghum in good time
- ✧ I would like to see the project continue because it is a good source of livelihood
- ✧ Price is too low
- ✧ Threshing machines; Transporting of sorghum with trailers
- ✧ We need threshing machines; The project should be continued because it is more profitable than all our crops
- ✧ More credits should be given to expand our farms
- ✧ I see it that the production cost is high
- ✧ Food to feed labors; Early ploughing; Chemicals to spray when sorghum is booting
- ✧ We need a threshing machine for threshing our sorghum
- ✧ Much education on the cultural practices of the crop
- ✧ I suggest that if the partners concern could always assist outgrowers with threshing machines during harvesting; Sometimes inputs come very late which affect output and therefore should be checked; We as outgrowers also realized that some seed are at time not in good quality which affects germination
- ✧ Inputs should be provided at the right time, e.g. seeds, fertilizer
- ✧ We want threshers to aid out threshing; We also want early delivery of inputs; The production of sorghum should be continued
- ✧ Inputs should be provided in good time; Provide tractors for land preparation

- ✧ We would be grateful to have threshers made available to us
- ✧ No comments
- ✧ Supply inputs early
- ✧ If the price could be further adjusted, it would be a great benefit to us
- ✧ We need early planting of the sorghum
- ✧ Add more money to the buying price to energize the farmers
- ✧ Threshing is difficult, please provide threshers; Provide receipt for cost of production; Provide portable water for our community
- ✧ Early access to tractors for ploughing; The price per bag should be increased to 25 Ghana cedi
- ✧ It would be good for outgrowers if you could make available threshing machines; Provide some tarpaulins/Tents; Support also tractors to make work easier; Community also complains about portable drinking water that affect farmers during the beginning of the season. We therefore needed some support; We also need warehouse to keep sorghum after purchase, because sorghum is left in the hands of farmers for some time which gives a lot of problems
- ✧ Provide more credit for sorghum production
- ✧ Revise the price upwards
- ✧ I want tent to aid my harvesting; Threshing machines are also needed for threshing; We also want regular visit of your field officers to advice us what to do in the fields; Early access to tractor services is very important
- ✧ No comment
- ✧ Tractor services should be made available early enough
- ✧ Because yield was very bad
- ✧ Buying should be done early; Farming tools like cutlasses should be provided; Provide drying tents
- ✧ I want you to give us credit to produce soya beans or groundnuts because they are more profitable than this sorghum; Payments should be done quickly
- ✧ I want you to provide tractors to each community to aid us to plough our lands early; We also want tents
- ✧ We need a thresher; We do not the project to be yearly project; We want to have something doing in the dry season
- ✧ Ploughing should be done at the right time; Much education on cultural practices about the crop
- ✧ Early ploughing; Buying should be done early
- ✧ I am satisfied with the sorghum project
- ✧ Provide animals to farmers, during the dry season the farmer can have something doing but through the nucleus farmer
- ✧ We should be informed of the cost of production
- ✧ Observation good; suggestion to increase and lower the tractor plough and fertilizer; To purchase threshers for threshing

- ✧ It was good; Inputs should be provided at the right time, e.g. seeds, fertilizer
- ✧ Provides threshing machine for us to produce quality grains
- ✧ Threshing machines are our main target because I can produce more than what I have been producing if there was a threshing machine available; Tractor services should also be improved because some farmers grow sorghum late due to lack of tractors
- ✧ No comments
- ✧ We were not given anything for our effort
- ✧ Help me to confront striga on my field
- ✧ Donors should support farmers with threshers, tarpaulins/tents as well as tractor service to make work easier; I also appeal for increase in the price of sorghum
- ✧ Early arrival of inputs, e.g. seeds, fertilizer; Assistance in cultivation of other crops; Early payment and buying
- ✧ No comments
- ✧ I suggest that donors should also support farmers with cash to enable farmers do other activities like weeding, ridging, harvesting, etc. in time
- ✧ No comments
- ✧ If you can supply us with cash credit to aid our weeding, ridging and harvesting
- ✧ I will be able to produce more sorghum if donors could support farmers with threshing machines, tarpaulins/tents and other important equipment; We also need warehouse to keep our sorghum after it has been harvested
- ✧ The project is profitable for me and should be continued; Want increase in the price for bag
- ✧ The work is difficult and we should be given food to feed our labors
- ✧ The emergency organizing of meeting is not the best, especially in the farming season
- ✧ I want us to be provided with inputs early enough
- ✧ Supervision should be intensive; Early arrival of inputs
- ✧ We need early ploughing, early providing of inputs and provides one more tractor for the ploughing services
- ✧ Because I did not make money
- ✧ Sorghum project is quite satisfactory to me so I don't have any comment
- ✧ Inputs should be made available early, e.g. seeds, fertilizer; Different crop could be introduced
- ✧ Inputs should be provided on time to increase production
- ✧ We want to be told the total cost of inputs on credit even before the selling of our produced
- ✧ Reduce the prices of the farm inputs, especially fertilizer and seeds and the interest rate for us to also reach your

demand and ours

- ✧ It is a very good project and they should continue
- ✧ Early access to tractor services to enable us plant early; The ready market should be continued; Early delivery of fertilizer should be enhanced
- ✧ Fertilizer should be more than one for an acre, e.g. NPK2 and SA1
- ✧ We need a lot of support to grow sorghum for at least twice in a season for every year; You can also give awards to hard working farmers for others to follow; Increase sorghum price higher in order to raise the level of output
- ✧ I want the sorghum project to be continued because it is very profitable; The ready market should be continued but at least they should always pay us early
- ✧ Different varieties could be introduced for cultivation; Early arrival of inputs such as fertilizer, seed; Service of tractor should be improved
- ✧ My suggestion is that I want us to also have some business running in dry season through TechnoServe
- ✧ Early arrival of inputs; We want quick payments for our produce; We also want warehouses
- ✧ Early arrival of fertilizer; Plough at the right time
- ✧ Inputs arrived to some farmers very late which affects their output; Machines such as threshers should be provided to make work easier and faster; Give us awards to serious and hard working farmers
- ✧ No comments
- ✧ We need a warehouse as a storage facility after sorghum been bought; Help us with threshing machines to do the work easier and faster; Provide insecticides on credit to farmers to spray on sorghum farms
- ✧ No comments
- ✧ If the sorghum could be bought at a higher price, I think this could help us a lot
- ✧ I could not make any profit
- ✧ We want improved seeds; The price per bag should be increased
- ✧ The project has actually reduced our poverty level; The assistance should continue to come
- ✧ Early ploughing; Early fertilizer supply
- ✧ Improved tractor service is needed
- ✧ Increase prices of sorghum to help pay back loans; If you could support us with insecticides to spray on crops; We have difficulties in keeping sorghum in our homes because of insufficient space in the home
- ✧ Threshing is difficult, if we could get threshers; Fertilizer rate is small
- ✧ Input should be made available early enough, e.g. seeds, fertilizer

- ✧ Provide some incentives to serious and hard working farmers; If you could also provide a threshing machine to thresh sorghum; Tarpaulins/tents are also very important since some sorghum is harvested during the rainy season
- ✧ Tractors should be made available early enough; Money should be provided to hire labor
- ✧ We need threshing machines to grow sorghum on large quantities; We also need some support like inventory credits
- ✧ Because our crops were infected by cotton stainer
- ✧ Early arrival of tractors; Seeds should be threshed before distribution; Early buying and payment
- ✧ It would be good if you provide us with threshing machine and a tractor to make our work faster
- ✧ We need a ware house to store sorghum after we sold sorghum; We also need machines like threshers and tractors to make work easier and faster
- ✧ No comments
- ✧ Provide more machines/tractor to our nucleus farmer to increase the production of sorghum; Provide threshing machine to produce a larger quantity
- ✧ Sometimes they are not taken on time and so we have problems keeping them because we don't have store houses; When they come for the sorghum, payment for them is usually delayed
- ✧ No comments
- ✧ No comments
- ✧ I want the project to be continued because it is profitable; Threshing is difficult if you could help us with threshing machines; We also want access to tents
- ✧ Assistance should be continuous; Early arrivals of inputs, e.g. seeds, fertilizer
- ✧ We need another thresher; We also need one more tractor
- ✧ If you can get us another crop to add to sorghum we would be grateful; Early delivery of fertilizer and other inputs necessary for good yield; I want you to help us with irrigation facility so that we can grow sorghum during dry season
- ✧ The returns are usually not satisfying; I wish they could increase the price at which they buy the sorghum
- ✧ It is a good project and support should continue
- ✧ We want you to use our group to find something we can do in the dry season since we do not have anything to do
- ✧ There is a high cost of production; low income rate of purchase
- ✧ Provide our nucleus farmer with another tractor in order for us to produce more sorghum

- ✧ Help outgrowers with threshing machines to make their work easier; I assist to grow sorghum twice in a season but due to the delay of input supply, it becomes difficult for me; There is also a problem of storage after sorghum has been sold to the nucleus farmer; Increase price of sorghum annually because a lot of commodities have price change always
- ✧ Provision of farm implement for the farming activities, e.g. planting and threshing
- ✧ To increase price per kilo and reduce inputs
- ✧ We need some support like providing tarpaulins/tents, threshing machines and if possible insecticides to support farming; Provide some incentives to hard working farmers; Increase price of sorghum every year or every season to meet our targets
- ✧ Early arrival of input; Early payment of buying; Provisions of inputs early; Tarpaulins for threshing; Technical advice on prevention of insects
- ✧ Provide threshing machines to enable us to grow sorghum in large quantities; Provide also some awards to serious and hard working farmers
- ✧ Inputs should be provided at the right time
- ✧ During harvesting insecticide should be provided to spray before harvesting
- ✧ Inputs should be made available early enough, e.g. seeds, fertilizer
- ✧ Tractors should be made available for ploughing early
- ✧ Early arrival of fertilizer, seeds, tractor services; Provision of tarpaulins
- ✧ No comment
- ✧ The company should continue to assist us in sorghum production
- ✧ I want early access to fertilizer and tractor services
- ✧ Increase price every season to meet other commodities that are sold in the market; Provide awards to serious farmers that will set as an example for others to follow; Provide tarpaulins/tents to nucleus farmers so that outgrowers can always go for when needed
- ✧ Provision of implement for planting and threshing
- ✧ The project is good and the support should continue to come
- ✧ The threshing is very difficult, if you could assist us with threshing machines; The project is good and should be continued
- ✧ Provide tarpaulins/tents to serious farmers on credit to make the work easier and faster; Support us with threshing machine; Tractor service always get to some farmers late which affect those farmers and therefore should be checked
- ✧ Much education on the cultural practices of the crop
- ✧ Inputs should be made available at the right time, e.g. seeds, fertilizer; Tractor services should be available at the right time

- ✧ The project has given us ready market
- ✧ We need more tractors to do the plough for us to produce the sorghum to reach the demand of you

Sierra Leone

- ✧ Financial support to be provided in the form of micro-credit
- ✧ To increase the price per 50 kg of sorghum and provide micro-credit
- ✧ Provide micro-credit facilities for us; Provide food for work; Market should be made available
- ✧ To provide micro-credits; To build stores and drying floors
- ✧ Sierra Leone Brewery to increase the quantity of farmers they buy from farmers
- ✧ To provide micro-credit and build a store and drying floor; Increase the transport cost of sorghum
- ✧ To provide micro-credit facilities; To build stores and drying floors
- ✧ To increase the price per 50kg of sorghum; To provide micro-credit
- ✧ To build a store and drying floor
- ✧ To provide micro-credit for us; To increase the transport cost
- ✧ To provide micro-credit facility
- ✧ To provide stores and drying floors; To increase the transportation cost from centre of collection to the brewery
- ✧ To increase the price per 50 kg bag of sorghum; To provide micro-credit
- ✧ We want micro-credit; We want sores and drying floor
- ✧ To provide micro-credit; To increase the price per 50 kg bag; To increase the transport cost
- ✧ Build a drying floor and a store
- ✧ To build stores and drying floor; Increase the price of sorghum and provide micro-credit
- ✧ To build store and drying floor and provide micro-credit
- ✧ To provide micro-credit facility
- ✧ To increase the quantity of sorghum supplied to SLBL by the farmers; To increase the transport cost from collecting points to SLBL Ltd in Freetown
- ✧ Provide micro-credit and build stores and drying floor; To continue to conduct training workshop for farmers
- ✧ To build stores and drying floor and expand the market for sorghum
- ✧ To build a store and a drying floor; Provide micro-credit

- ✧ To provide micro-credit and build stores and drying floor
- ✧ To provide micro-credit and also to build a store and drying floor; To increase the transport rate from centre of collection to Freetown
- ✧ To provide micro-credit for us.
- ✧ Build a store and drying floor; SLBL to increase the quantity of sorghum they buy from farmers
- ✧ To increase the price of sorghum; To provide micro-credit
- ✧ To build store and drying floor; Provide micro-credit
- ✧ To increase the price of sorghum and provide micro credit
- ✧ To build a store and drying floor; To increase the transport cost from area of collection to Freetown
- ✧ To provide micro-credit and build store and drying floor
- ✧ Build a store and drying floor; Increase the price of sorghum
- ✧ To provide micro-credit for us.
- ✧ To build stores and drying floor; To provide micro-credit
- ✧ To provide micro-credit
- ✧ To provide micro-credit for us
- ✧ To provide micro-credit facility
- ✧ To provide micro-credit and increase the quality of sorghum to be supplied to the brewery by farmers
- ✧ SLBL to increase the quantity from farmers
- ✧ To conduct more training workshops in order to build our capacity; To provide micro-credits
- ✧ To provide micro-credit for us; To increase the transport cost per 50 kg bag of sorghum
- ✧ To build stores and drying floor; The Brewery to enlarge their industry so that they will buy more sorghum from the farmers
- ✧ To provide micro-credit facility; To build store and drying floor
- ✧ To build store and drying floor; To provide micro-credits
- ✧ To provide micro-credit for us; To conduct more workshops
- ✧ To increase the transport cost per 50 kg bag from collecting point to Freetown
- ✧ Increase the price of sorghum; Provide micro-credit
- ✧ To provide micro-credit and to increase the transport cost from point of collection to SLBL in Freetown
- ✧ To provide micro-credits and build stores and drying floors
- ✧ To increase the price of sorghum; To provide micro-credit for us

- ✧ Alternative market to be provided; To assist us with transportation; To provide storage facilities- centralized or by regions;
Micro-credit facilities to be provided; To provide a drying floor
- ✧ To increase the price of 50 kg bag of sorghum
- ✧ To increase the transportation cost; Provide micro-credit for us
- ✧ To increase the price of sorghum
- ✧ Micro-credit facility to be provided; To provide storage facility and a drying floor
- ✧ Provide micro-credit and increase the transport cost
- ✧ To provide a store and drying floor and also micro-credit
- ✧ Provide micro-credit; Increase the transport of sorghum
- ✧ To provide micro-credit for us
- ✧ To ensure that all sorghum produced is bought; To increase the price of sorghum; To provide micro-credit
- ✧ Provide micro-credit and build stores and drying floor
- ✧ To provide micro-credit; To increase the transport cost from collecting points to SLBL Ltd in Freetown
- ✧ To increase the price of the sorghum
- ✧ To provide micro-credit for us
- ✧ To provide micro-credit facility for us; To increase the price of sorghum
- ✧ Let micro-credit facility be provided
- ✧ To increase the quantity of sorghum supplied to the brewery by farmers; To increase the transport of sorghum from collecting points to the brewery in Freetown
- ✧ Provide micro-credit and increase the price of sorghum; Conduct more training farmer workshops
- ✧ There should be increase in price per bag Of 50kg; Access and availability of micro-credits to sustain production;
There should be increase in transportation in lorry fare from place of loadings to Sierra Leone Brewery; Transportation facility like Honda bikes or light vans should be made available to me
- ✧ SLBL Ltd to increase the quantity of sorghum bought from farmers
- ✧ Micro-credit facility to be provided
- ✧ Micro-credit facilities to be provided; Let all sorghum we produce be bought
- ✧ To provide a store drying floor and micro-credit; Brewery to increase the quantity of sorghum bought from farmers and also increase the transport cost from collecting points to the SLBL in Freetown
- ✧ To provide a store and drying floor; To provide micro-credit for us; To build our capacity, conduct training workshops;
To expand the market so that we will produce more sorghum
- ✧ To provide micro-credit facility; To build up our capacities by conducting training workshops

- ✧ Micro-credit facilities to be provided
- ✧ Let the price of sorghum be increased; More training workshops to be conducted; Micro-credit facilities to be provided
- ✧ To provide micro-credit
- ✧ Let them increase the price of sorghum; To provide micro-credit; SLBL Ltd to buy all the sorghum we produce;
To conduct more training workshops

Appendix 9: Stakeholders supply chain Sierra Leone

Smallholder farmer

The smallholder farmers cultivate the sorghum which is delivered to the brewery. In 2006, they were informed by the nucleus farmers about the project and had the possibility to join. After the project turned out to be very promising, more and more farmers participated over the years.

“I am proud that because of the sorghum project a lot of new jobs can be created. And I am able to send my son to school now.” (Mohama Mahamud, sorghum farmer in Ghana)

Nucleus farmer

A nucleus farmer is a commercial or semi-commercial farmer who organizes a group of outgrowers. These outgrowers can be member of a formal association or an informal group. The nucleus farmer manages the local collection point and arranges the long distance transport to SLBL. In Sierra Leone 18 leaders organize associations of about 200 farm families. Nucleus farmers were chosen by Vancil Consultancy at the beginning of the project in 2006. The organization got recommendations by World Vision who had already experience with those farmers during other agricultural projects.

“Currently we are working on the legalization of the association to make it a strong body within the supply chain. I hope that thereby the supply chain will be sustainable in the future.” (Mrs. Isatu Ngevuba, nucleus farmer in Kono, who won the award for the best performing nucleus farmer in 2008-2009. For her farmer association a constitution draft is already set up.)

Sierra Leone Brewery Limited (SLBL)

“To be an Exemplary Company, contributing to the sustainable development of Sierra Leone by creating more value to all Stakeholders.”⁸³ (Mission SLBL) “To be the most preferred, low cost, high quality beverage supplier in Sierra Leone in a corporate socially responsible manner. Sierra Leone Brewery Limited's core values - respect, enjoyment and a passion for quality - help to define our corporate culture and working methods. They are fundamental to the way we do

⁸³ <http://slbrewery.com/index.php/about-us-othermenu-31/vision-othermenu-42>, 20.10.2010

business today; they support our drive towards economic, environmental and social sustainability.”⁸⁴ (Mission Statement SLBL)

SLBL internationally is owned by Heineken International (83.15%), Diageo (11.59%), Paterson Zochonis (3.02%) and by locals/Sierra Leoneans (2.24%). Within Heineken International, SLBL is part of the region Africa & Middle East that is headed by the regional president Thomas A. de Man. The Sierra Leonean company, which is based in Freetown, consists of the four areas Production, Engineering & Logistics; Finance & Pension Fund; Sales, Marketing & Distribution and HR; and Admin, CSR & Company Secretariat which are managed by SLBL’s Managing Director Cor Honkoop since July 2009. 114 people are employed by SLBL, which makes the company to one of the most important employers in the country.⁸⁵



The company’s products are Star beer; Maltina, a non-alcoholic malt drink; Heineken; Xí Climax, a non-alcoholic drink; and Guinness. With regard to the Sorghum project, Star, Maltina and Guinness are the products, which contain sorghum and therefore make the whole project possible. SLBL is the only purchaser of sorghum, which makes the brewery the most important enabler of the project.⁸⁶

“I am totally convinced that the supply chain will be sustainable after the withdrawal of the project.” (Cor Honkoop, Managing Director, SLBL)

Vancil Consultancy

Vancil Consultancy is a non-profit organization, based in Freetown. The international project coordinator Ivan Carrol employs four people, including a part time accountant, a secretary, a project officer and a driver. Before setting up this company, Ivan Carrol has been the Managing Director of SLBL for three years. Vancil Consultancy operates in two functions within the supply

⁸⁴ <http://slbrewery.com/index.php/about-us-othermenu-31/mission-statement>, 20.10.2010

⁸⁵ <http://slbrewery.com/index.php/home-mainmenu-1>, 20.10.2010

⁸⁶ See also Part III

chain; as a purchasing agent for SLBL and as a facilitator and coordinator of the project activities in name of EUCORD to guarantee an undisturbed course of actions.

“The brewery really wants to help the farmers. That can also be seen by the award they recently received. I am sure that the supply chain will be sustainable in the future.” (Ivan Carrol)

The Sierra Leone Agricultural Research Institute (SLARI)

SLARI under the Ministry of Agriculture, Forestry, and Food Security (MAFFS) is the country's principal agricultural research institute, accounting for close to three-quarters of total agricultural research staff and expenditures in 2009. Based in Freetown, the research institute employs 53 researchers.⁸⁷ Destroyed during the Civil War, SLARI's accommodations were built up again during the last years and the institute is proud of owning high quality technical equipment.

“The sorghum surplus shows the project's success. I'm convinced that the supply chain will be sustainable in the future”. (Dr. Idriss Baggie, SLARI)

Finance Salone

“To contribute to the economic rebuilding of Sierra Leone by providing financial services to low-income entrepreneurs through a profitable microfinance institution with national scope.” (Mission Finance Salone)

After the Civil War, the destruction of social and economic infrastructure left only little recourse to rebuilt Sierra Leoneans' lives. With regard to the finance sector, the system of rural and postal banks collapsed. Providing access to financial services has become essential to restart agricultural or business activities, increase people's income and finally to facilitate the economic recovery process. In 2001, American Refugee Committee (ARC) has responded to this need with its microfinance program – Finance Salone. Beginning in 2001, ARC provided loans to the population to restart their lives and their clients started to begin or expand small-scale trading, production, and service businesses. In 2002, operations were consolidated under the banner of Finance Salone to increase the chance of success. In January 2005, ARC transferred

⁸⁷ <http://www.asti.cgiar.org/pdf/Sierra-Leone-Note.pdf>, 20.10.2010

the Finance Salone business operations to a limited liability, for-profit, finance company under Sierra Leone law.⁸⁸

"We are very content with the project and I'm sure it will be sustainable." (Benjamin Noballa, Finance Salone)

Union Trust Bank Limited (UTB)

"Our Mission is the establishment of an efficient, sound and enduring financial institution that gainfully explores the tremendous human and material potentials of the country in order to create national wealth and ensure lasting prosperity." (Mission UTB)

UTB was incorporated on 26th April 1995 as a private limited liability company under the Companies' Act of the Laws of Sierra Leone. "The shareholders of the bank, comprising indigenous individuals and corporate entities, constitute a cross-section of the principal actors in the national economy. This character renders UTB the first major private financial institution to be conceived, promoted, owned and managed by indigenous Sierra Leoneans."⁸⁹

Currently the UTB employs 230 people at nine branches and six outlets all over Sierra Leone.

„Our intention by producing finances for the sorghum farmers is in sync with our desire to establish a solid footprint in small scale enterprises with priority in the agro-based industry in Sierra Leone. (...) We recognize that by collaborating with them we are supporting the socio-economic aspiration of our sear Sierra Leone trough creation a sustainability of employments in rural settings." (Kobi Walker, UTB)

⁸⁸ http://www.arcrelief.org/site/PageServer?pagename=programs_sierraleone, 20.10.2010

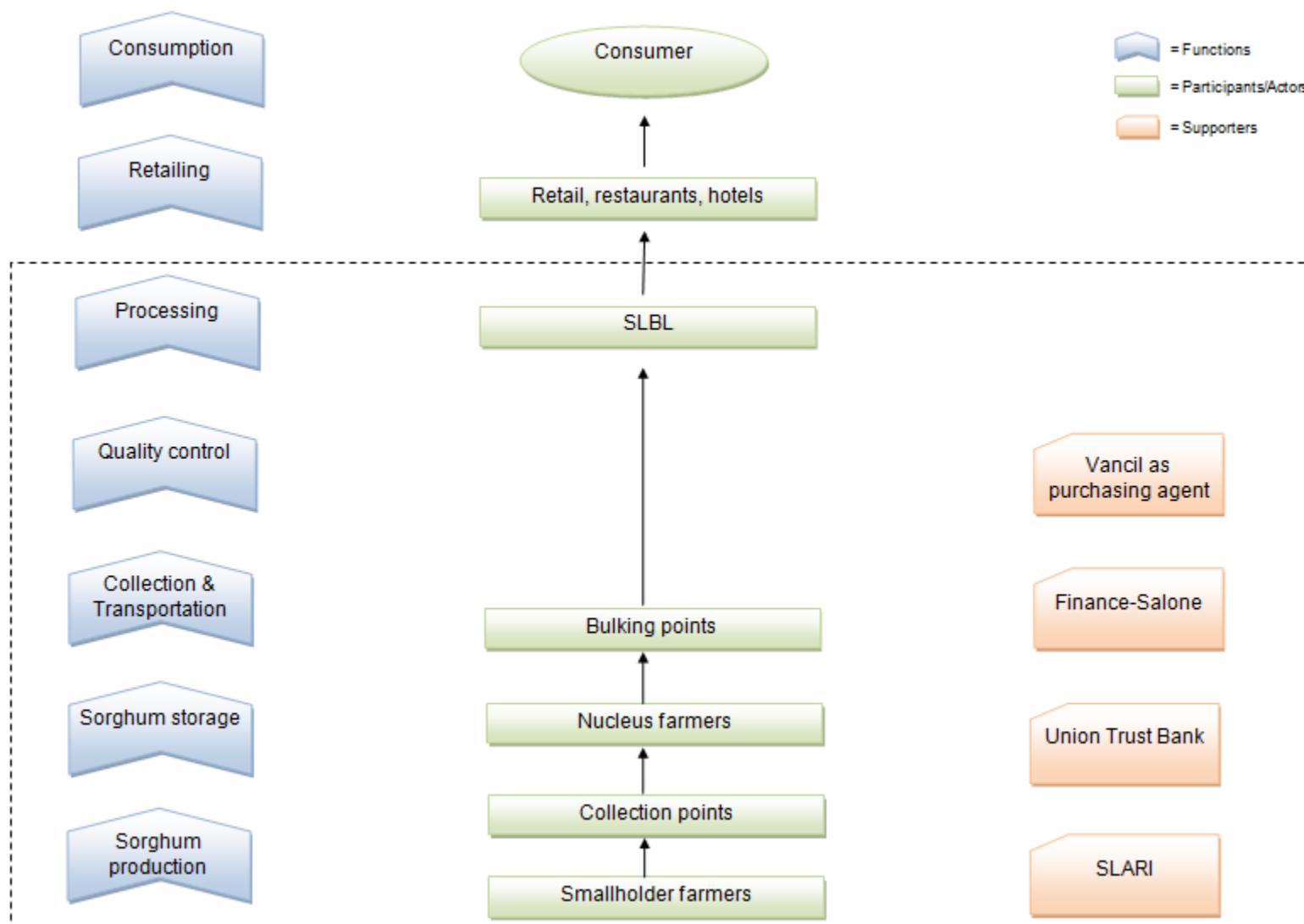
⁸⁹ <http://www.utrustbank.com/>, 20.10.2010

Appendix 10: Generic worksheet, basic map and detailed maps

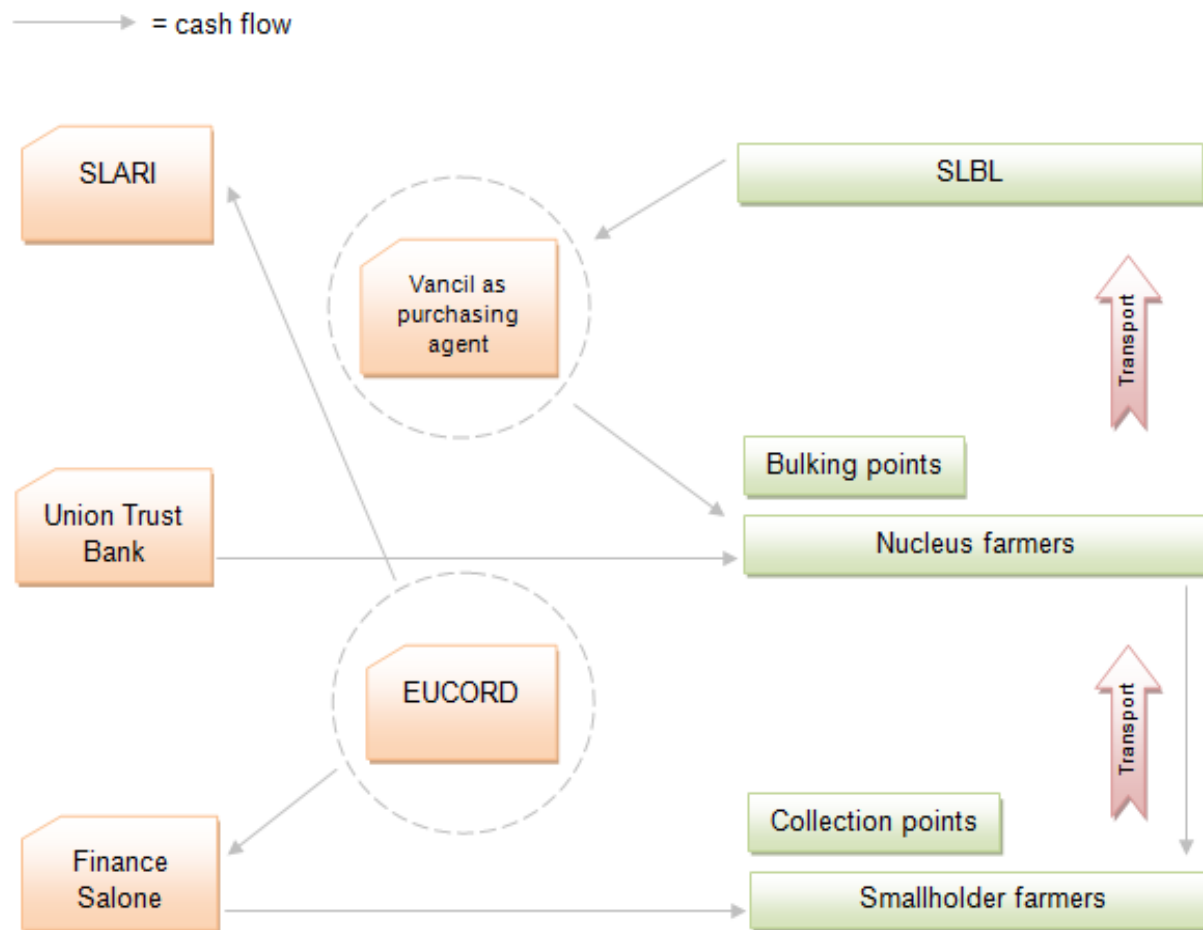
Generic worksheet supply chain Sierra Leone

Functions	Participants/Actors				
	Smallholder farmers	Nucleus farmers	SLBL	Retail, Restaurants, Hotels	End consumer
Consumption					
Retailing					
Processing					
Quality control					
Collection & Transportation of Sorghum					
Sorghum Storage					
Sorghum Production					

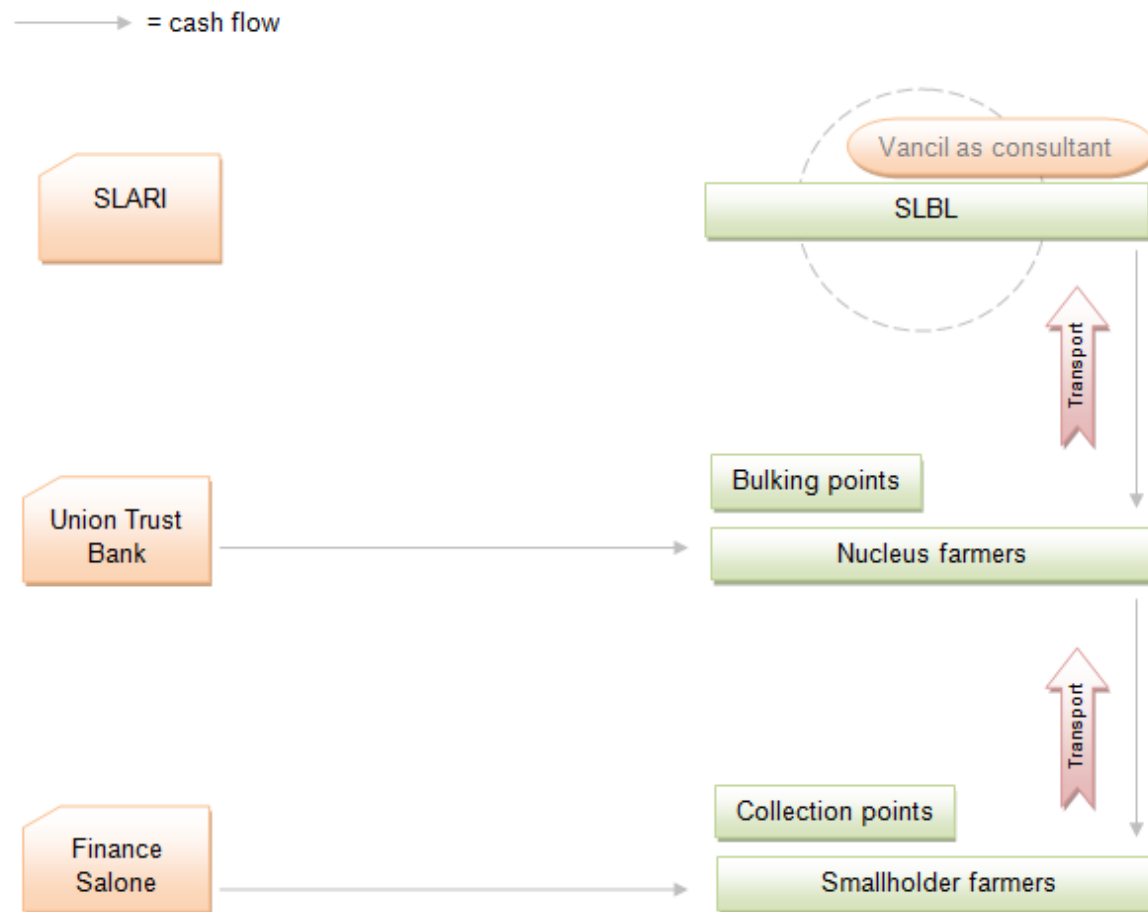
Basic map supply chain Sierra Leone



Detailed map – current supply chain



Detailed map – prospective supply chain



Appendix 11: PEST, SWOT and confrontation matrix

PEST, SWOT and confrontation matrix

To evaluate the sustainability of the supply chain, external and internal analyses are necessary. Macro-environmental factors as well as strengths and weaknesses of the supply chain itself give a picture of what is inevitable to take into consideration to guarantee a successful continuation of the supply chain after the withdrawal of the project. Therefore a PEST and a SWOT analysis have been conducted. The subsequent confrontation matrix is made by combining the strengths, weaknesses, opportunities and threats and answers the following questions: 1) How can a strength be used to participate in an opportunity? 2) How can a strength be used to defend ourselves from a threat? 3) How can a weakness be improved to participate in an opportunity? 4) How can a weakness be improved to defend ourselves from a threat?⁹⁰

PEST analysis

<ul style="list-style-type: none"> • Civil War 1991 – 2002 • Huge participation of International Organizations • “Programme of action for the least developed countries for the decade 2001-2010” 	<ul style="list-style-type: none"> • GDP per capita: US \$900 • GDP – composition by sector: agriculture 49%, industry 31%, services 21% • Inflation rate 11.7% • Population below poverty line: 70%⁹¹ • Exports: USD 216 million • Imports USD 560 million 	<ul style="list-style-type: none"> • Population: 5,245,695 • Age structure: 0-14 years: 41.7%, 15-64 years: 54.7%, 65 years and over: 3.6% • Median age: 19 years • Population growth rate: 2.216% • Sorghum itself is seen as an “inferior” food 	<ul style="list-style-type: none"> • Ongoing research on sorghum grain • New high yield varieties
Political factors	Economic factors	Sociocultural factors	Technological factors

Political factors

The Civil War in Sierra Leone from 1991 until 2002 caused tens of thousands of deaths and the displacement of more than 2 million people.⁹¹ Ernest Bai Koroma, president since September 2007 whose party APC (All People’s Congress) won a majority in parliamentary elections held in August 2007, promised zero tolerance on corruption and to fight against the mismanagement of state resources. Although Sierra Leone has experienced substantial growth in recent years, poverty and unemployment remain big challenges. Reconstruction needs are great which makes

⁹⁰ <http://www.mtine.nl/theorie/Marketingplan.pdf>, 02.12.2010

⁹¹ <https://www.cia.gov/library/publications/the-world-factbook/geos/sl.html>, 02.12.2010

the recovery slow.⁹² Numerous International Organizations help with funds and projects to push on the country's recuperation.

In January 2006, a progress report on the implementation of the “programme of action for the least developed countries for the decade 2001-2010” was published by the government of Sierra Leone.⁹³ This program comprises seven commitments on different topics and describes which progress has been achieved so far. One of these commitments states “Building productive capacity to make globalization work for LDCs.” One point is the support of the agricultural sector by provision of machinery and improved seedlings to farmers and farming communities to encourage crop diversification amongst others. The government supports various initiatives such as the food security program “Operation Feed The Nation” and with support from partners like UNDP or FAO, considerable improvement has been made in the agricultural sector.

Economical factors

As already referred to in appendix 1, Sierra Leone is an extremely poor country. Having a look on key economic factors this fact can be identified very clearly. The GDP per capita amounts up to USD 900 (country comparison to the world: 220) where agriculture captures 49%, industry 31% and services 21%. The inflation rate is 11.7% (country comparison to the world: 204) and about 70% of the population lives below poverty line. The gross national income (GNI) per capita in Sierra Leone is 809 USD (in comparison Netherlands: 40,658 USD).⁹⁴ Exports are stated at USD 216 million (country comparison to the world: 179), imports at USD 560 million (country comparison to the world: 187).

Sociocultural factors

With a median age of 19 years, Sierra Leone is a very “young country” (in comparison: Netherlands: 40.8 years⁹⁵). Over the half of the total population of 5,245,695 is between 15 and 64 years old. Life expectancy at birth is 55.69 years which ranks 197 in country comparison of the world.

⁹² http://news.bbc.co.uk/2/hi/africa/country_profiles/1061561.stm, 02.12.2010

⁹³ <http://www.un.org/special-rep/ohrls/ldc/MTR/Sierra%20Leone.pdf>, 03.12.2010

⁹⁴ http://hdr.undp.org/en/media/HDR_2010_EN_Table1.pdf, 02.12.2010

⁹⁵ <https://www.cia.gov/library/publications/the-world-factbook/geos/nl.html>, 03.12.2010

A study on alcohol consumption in Sierra Leone (Morten Bøås and Anne Hatløy, 2005)⁹⁶ shows that drinking alcohol is not very common among the Sierra Leonean population. According to their investigation, 75 percent of the population above 15 years claims that they never tasted alcohol. Of those who do drink alcohol, younger people, considered to be less than 25 years old, seem to drink more rarely than elder ones. There are various reasons for non-drinking under which the most important is just not to be interested in drinking. Also religion is a very important factor. 89 percent of Muslim respondents cite this as a reason, as well as 62 percent of Christians. The third major reason is that respondents were brought up not to drink. Talking to local people and experiencing daily life in Sierra Leone calls this study into question. People rather might be ashamed to say they do drink although they are not allowed to or because of religious reasons. Anyhow, with 0.11 hectoliters annually and a 1.75 liters consumed per capita⁹⁷, the beer market is very small in comparison to other African countries. Overall opinions and facts on the income of Sierra Leoneans put their small available amount of money in the foreground as a reason.

The study also focuses on what people drink. According to their investigation, bottled beer is the most frequently used alcoholic beverage in Sierra Leone. The researchers argue that drinking is not only about stimuli, but also a way of creating a collective social identity and belonging. International brand names are important representations of modernity. Those brands are what you are supposed to drink when socializing with peer groups and friends or meeting colleagues for after-hour business meetings.

As already mentioned in section 2.1, sorghum often is seen as “poor people’s crops”. “In some African countries, people would rather die than eat sorghum.”⁹⁸ “Sorghum is seen as ‘inferior’ food.”⁹⁹ Nevertheless, many farmers stated during the conducted interviews that they use some of the cultivated sorghum also for self-consumption.

⁹⁶ Morten Bøås and Anne Hatløy, 2005, “Alcohol and Drug Consumption in Post War Sierra Leone – an exploration”

⁹⁷ Heineken Group, Opco Overview 2010

⁹⁸ Paul Kemp, Area Supply Chain Manager Heineken International BV, 24.11.2010

⁹⁹ Dr. Hendrik Knipscheer, Managing Director EUCORD, 25.11.2010

Technological factors

The Sierra Leone Agricultural Research Institute (SLARI) will go on with their research on new high yield varieties which will improve the cultivation of sorghum and result in a higher outcome. High quality technical equipment guarantee best research methods and with governmental funds this research will be an ongoing process.

SWOT analysis

STRENGTHS (1) Strong belief of all stakeholders in project (2) Significant increase of sorghum farmer's income (3) Enormous increase in sorghum production within short time (4) Many farmers who want to participate (5) SLBL's strong willingness to buy sorghum (6) Possibility within SLBL to increase amount of sorghum	WEAKNESSES (7) Stakeholders might be too optimistic and thereby unrealistic (8) Only one sorghum purchaser (9) Limited number of stakeholders (drop outs endanger supply chain) (10) "Young" supply chain (11) Critical tasks (6.3) (12) No unlimited increase of sorghum usage possible within SLBL (13) High prices for sorghum in comparison to world market prices
OPPORTUNITIES (14) Expected improvement of infrastructure (15) Expected growth in sales volume of beverages (16) New sorghum purchasers (17) Various possibilities to use sorghum (beverages, food, animal feed) (18) New high yielding varieties (19) Possible tax incentives of government for 100% sorghum beer	THREATS (20) Sorghum market not attractive for foreign investors (21) Weak economy (22) Weak infrastructure (23) Changing world market prices for Barley and other grains (24) Sorghum is seen as "inferior" food

(18), (19), (21), (24) → see also PEST analysis

Strengths

Strong belief in the project and strong willingness to participate are inevitable for a successful supply chain. All stakeholders are very content with the previous progress of the project and are convinced that the supply chain will be sustainable in the future. Acting out social responsibility, SLBL wants to continue buying sorghum of the farmers in the future, even if its price is higher

than the world market price of malt. Although there are undefined limits which would force the brewery to go back to imported malt, they are strongly willing to buy the local cultivated grain. “It is difficult to say at which point SLBL would come back to imported malt. That depends on a lot of factors and circumstances.”¹⁰⁰

The significant increase of 100.2 % of sorghum farmer’s income is one of the most important strength. The project succeeded in their main goal to improve the farmer’s livelihood by increasing their income. Without this success farmers would not be willing to participate in the project. They present the beginning of the supply chain and get the ball rolling. Figures of participating farmers increased from 100 in 2006 to 1,600 in 2010. Aligned with these numbers, also the sorghum production increased enormously as described in section 7.1. Yet there are possibilities within SLBL to increase the amount of sorghum they use for the brewage of their beverages.

Weaknesses

The very positive and optimistic attitude of all stakeholders may lead to an unrealistic appraisal of the whole project. All participating entities have to be aware of the most threatening fact of the supply chain, namely the existence of only one purchaser for sorghum – the brewery. The drop out of one of the stakeholders would endanger the whole supply chain. Possibilities of new actors are limited and proceedings can take a long time if a new one could be acquired. Furthermore, the supply chain is relatively young. “Agricultural projects require about 10 years to be fully developed.”¹⁰¹

Furthermore, the increase of the amount of sorghum within SLBL is limited. The already in 7.3 mentioned percentages are the maximum and cannot be exceeded.

	Star	Guinness	Maltina
2011			
Sorghum %	30	20	33

Scenario (1)

This means that SLBL can increase the amount only by extending their sales volumes. As already mentioned, SLBL is willing to buy the sorghum, even if the price exceeds the world market price.

¹⁰⁰ Rob Marijnen, Business Development & Export Director Heineken International BV, 05.11.2010

¹⁰¹ Paul Kemp, Area Supply Chain Manager Heineken International BV, 24.11.2010

But the company's Africa-wide strategy to procure at least 60% of its raw materials locally is linked to another proposition - it must be economically justifiable.

Additionally, the in 6.2 named critical tasks describe weaknesses. High transportation costs can only be captured by the brewery itself. A lack of appropriate vehicles and bad road conditions endanger transportation. Smallholder farmers mostly depend on nucleus farmers who in some cases charge a certain amount of money for the sorghum transportation.

Finally, without the provision of micro-credit farmers would not be able to pay for labor necessary for the cultivation. This strong dependency on credit providers is a risky factor since alternatives are rare. Many financial institutions do not have experience with agricultural loans and fear the risks of non- or delayed payment.

Opportunities

As already described in section 7.2, SLBL expects an increase in sales volumes of 37% in 2016. Furthermore, various possibilities to use sorghum could provide new purchasers, although numbers are currently limited as mentioned in 7.4. Additionally, new high yielding varieties provide possibilities for a higher output.

As mentioned in 6.2, a lot of effort is done to improve infrastructure. Another possible opportunity provided by the government could be tax incentives. As described in the PEST analysis, the government accomplishes different actions to improve Sierra Leone's provision. Various activities in the range of agriculture support local farmers. Tax incentives provided for beer, produced with 100% local raw materials, could be an inducement for SLBL to produce a new brand, 100% made of sorghum. SLBL would follow examples in Kenya, Uganda and Burundi where governments offered this incentive. "Senator Keg" in Kenya, also known as "Obama" by Diageo¹⁰² and "Eagle" in Uganda by SABMiller¹⁰³ are made with 100% local raw materials.

Threats

Examining economical factors of Sierra Leone, it becomes clear that the country is not attractive for foreign investors and therefore neither for the sorghum market. A country risk analysis, which goes beyond the scope of this study, would expose various threats regarding

¹⁰² <http://www.leisureandclass.com/?p=223>, 06.12.2010

¹⁰³ <http://www.inspiris.co.uk/documents/EagleLagerPaper.pdf>, 06.12.2010

political risks, exchange rate risks, economic risks, sovereign risks and transfer risks. Euromoney publishes a country risk survey monitoring political and economic stability of 186 countries twice a year¹⁰⁴. In this rating, Sierra Leone ranks 138 (in comparison Netherlands: 8)

		Overall score	Political risk	Economic performance	Structurals	Debt indicators	Credit rating	Access to bank finance/ capital markets
Sep 10	Mar 10	100	30	30	10	5	10	10
138	174	29.14	12.63	11.51	3.00	0.00	0.00	2.00

Euromoney, Country risk Sierra Leone, September 2010

The weak economy and poor infrastructure are reflected in this point and provide other threats in addition. A low purchasing power and a high inflation rate amongst others, hamper the company's activities while a weak infrastructure complicates transportation and leads to high costs. World market prices for malt and sorghum change constantly and are often difficult to forecast. Very low world market prices would force SLBL to import grains instead of purchasing local sorghum. As mentioned in the PEST analysis, sorghum is seen as "inferior" food. This overall opinion would have to be changed first to make it usable for other consumption products.

¹⁰⁴ <http://www.euromoney.com/Article/2675660/Country-risk-September-2010-Full-results.html>

Confrontation matrix

	Strengths	Weaknesses
Opportunities	<i>Attack strategy</i> (03) + (15) (03) + (18) (04) + (16) (04) + (17) (04) + (19) (05) + (14) (06) + (14)	<i>Strengthening strategy</i> (08) + (16) (11) + (14) (12) + (16) (13) + (15)
Threats	<i>Defense strategy</i> (20) + (05) (21) + (02) (22) + (05) (23) + (05) (24) + (04)	<i>Withdrawal strategy</i> (20) + (08) (22) + (11) (23) + (13)

Attack strategy

1) How can a strength be used to participate in an opportunity?

(3) + (15): The enormous increase in sorghum production within a short time serves the expected growth in sales volumes of beverages. SLBL will be able to increase the absorption of sorghum and farmers have to cultivate more. This will not be a problem since more and more farmers participate in cultivating the grain and also already participating farmers become more experienced each year.

(3) + (18): Additionally, new high yielding varieties provide the basis for further increase of sorghum production. Combined with learnt best practices and experience, farmer will be able to get a higher outcome.

(4) + (16): The number of participating farmers increased each year. Success got around and more and more farmers want to cultivate sorghum. New sorghum purchasers would provide new absorption possibilities and benefit the farmers.

(4) + (17): Closely connected to new sorghum purchasers are various possibilities to use sorghum. The farmers would have a greater chance to sell their sorghum if the product range could be enlarged.

(4) + (19): Another opportunity to absorb the sorghum of an increasing amount of participating farmers would present tax incentives of the government for 100% sorghum beer. SLBL would be able to absorb a bigger quantity of the sorghum.

(5) + (14): SLBL currently takes over high transportation costs from the nucleus farmers to the brewery. Improved infrastructure would reduce the costs and make the absorption of the sorghum even more attractive.

(6) + (14): An improved infrastructure would also favor SLBL's possibility to increase the amount of sorghum since transportation costs could be reduced for the transport of the additional sorghum.

Defense strategy

2) How can a strength be used to defend ourselves from a threat?

(20) + (5): In case no foreign investors can be found because of the weak economy and the risk involved, SLBL has to persist as only purchaser. Therefore the company's strong willingness and social responsibility thinking are inevitable.

(21) + (2): The significant increase of the farmer's income is countering the weak economy. The agricultural sector captures 49% of the GDP. Sorghum farmers make an important contribution to this sector.

(22) + (5): Although the infrastructure is weak, SLBL absorbs high transportation costs, because they want to buy the sorghum and support the farmers.

(23) + (5): SLBL's strong willingness again is reflected considering the changing market prices for barley and other grains. Even if the world market prices are lower, SLBL will continue buying the smallholder farmer's sorghum.

(24) + (4): Although sorghum is seen as "inferior food" by many Sierra Leoneans, many farmers have started to use it for self-consumption. It is possible that the sorghum's image will change when the people recognize the value of the grain.

Strengthening strategy

3) How can a weakness be improved to participate in an opportunity?

(8) + (16): The most significant weakness, the existence of only one purchaser has to be improved by identifying and involving more purchasers.

(11) + (14): One of the critical tasks within the supply chain is transportation because of its high costs. This could be improved by better road conditions, expected to be developed within a few years.

(12) + (16): The increase of sorghum usage within SLBL is limited. Although this fact cannot be changed or improved, new sorghum purchasers would provide another possibility.

(13) + (15): Prices for sorghum on the Sierra Leonean market are high. The expected growth in sales volume of beverages would justify the continuation of sorghum purchasing by SLBL.

Withdrawal strategy

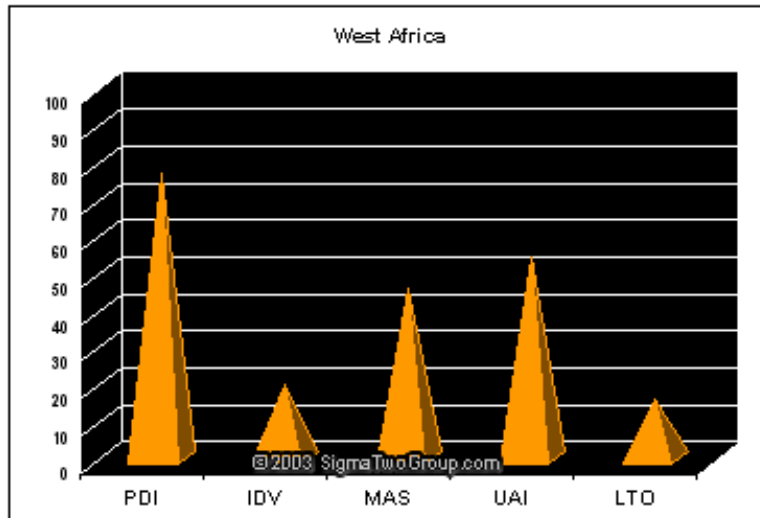
4) How can a weakness be improved to defend ourselves from a threat?

(20) + (8): To defend the supply chain from not being attractive for foreign investors, other local purchasers have to be found first to strengthen the market.

(22) + (11): A weak infrastructure is complicating transportation and making it very expensive. Appropriate vehicles would facilitate the transport. Furthermore it has to be guaranteed, that SLBL will continue taking over the biggest part of the transportation costs, otherwise for the farmers it would not be profitable anymore.

(23) + (13): Pricing within the supply chain is very important to defend it from changing world market prices for barley and other grains. Too high sorghum prices would force SLBL to come back to imported barley.

Appendix 12: Geert Hofstede's five dimensions of culture – West Africa



Power Distance Index (PDI) that is the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally. This represents inequality (more versus less), but defined from below, not from above. It suggests that a society's level of inequality is endorsed by the followers as much as by the leaders. Power and inequality, of course, are extremely fundamental facts of any society and anybody with some international experience will be aware that 'all societies are unequal, but some are more unequal than others'.

Individualism (IDV) on the one side versus its opposite, collectivism, that is the degree to which individuals are integrated into groups. On the individualist side we find societies in which the ties between individuals are loose: everyone is expected to look after him/herself and his/her immediate family. On the collectivist side, we find societies in which people from birth onwards are integrated into strong, cohesive in-groups, often extended families (with uncles, aunts and grandparents) which continue protecting them in exchange for unquestioning loyalty. The word 'collectivism' in this sense has no political meaning: it refers to the group, not to the state. Again, the issue addressed by this dimension is an extremely fundamental one, regarding all societies in the world.

Masculinity (MAS) versus its opposite, femininity refers to the distribution of roles between the genders which is another fundamental issue for any society to which a range of solutions are found. The IBM studies revealed that (a) women's values differ less among societies than men's values; (b) men's values from one country to another contain a dimension from very assertive and competitive and maximally different from women's values on the one side, to modest and caring and similar to women's values on the other. The assertive pole has been called 'masculine' and the modest, caring pole 'feminine'. The women in feminine countries have the same modest, caring values as the men; in the masculine countries they are somewhat assertive and competitive, but not as much as the men, so that these countries show a gap between men's values and women's values.

Uncertainty Avoidance Index (UAI) deals with a society's tolerance for uncertainty and ambiguity; it ultimately refers to man's search for Truth. It indicates to what extent a culture programs its members to feel either uncomfortable or comfortable in unstructured situations. Unstructured situations are novel, unknown, surprising, and different from usual. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules, safety and security measures, and on the philosophical and religious level by a belief in absolute Truth; 'there can only be one Truth and we have it'. People in uncertainty avoiding countries are also more emotional, and motivated by inner nervous energy. The opposite type, uncertainty accepting cultures, are more tolerant of opinions different from what they are used to; they try to have as few rules as possible, and on the philosophical and religious level they are relativist and allow many currents to flow side by side. People within these cultures are more phlegmatic and contemplative, and not expected by their environment to express emotions.

Long-Term Orientation (LTO) versus short-term orientation: this fifth dimension was found in a study among students in 23 countries around the world, using a questionnaire designed by Chinese scholars. It can be said to deal with Virtue regardless of Truth. Values associated with Long Term Orientation are thrift and perseverance; values associated with Short Term Orientation are respect for tradition, fulfilling social obligations, and protecting one's 'face'.

Both the positively and the negatively rated values of this dimension are found in the teachings of Confucius, the most influential Chinese philosopher who lived around 500 B.C.; however, the dimension also applies to countries without a Confucian heritage.¹⁰⁵

¹⁰⁵ http://www.geert-hofstede.com/hofstede_west_africa.shtml