

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Tropical AgriSciences

Department of Economics and Development



Risk management of cocoa producers in Ghana

Diploma Thesis

Prague 2015

Supervisor:

RNDr. Ing. Tomáš Rátinger, Ph.D.

Author:

Adéla Svobodová

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Department of Economics and Development

Faculty of Tropical AgriSciences

DIPLOMA THESIS ASSIGNMENT

Bc. Adéla Svobodová

International Development and Agricultural Economics

Thesis title

Risk Management of Cocoa Producers in Ghana

Objectives of thesis

The objective of the research is to investigate risk sources and risk management practices of cocoa producers in Ghana. It translates in three partial objectives

- i) to review literature on risk and risk management in cocoa production
- ii) to prepare, conduct and evaluate interviews with cocoa farmers in a particular region in Ghana
- iii) to discuss the current practices of farmers in Ghana and the ways how these can be improved.

Methodology

The student is supposed to conduct two three activities to fulfill the objectives:

1. to do an extensive literature review of cocoa production risks and of potential risk management practices. It should result in classification of risks and their severity.
2. to run a survey (as set of structured interviews) with cocoa farmers in Ghana western region – BOAKO and Adiembra , the district SetwiWiaso

The questionnaire survey will include general inf. like gender, age, years of farming, education etc., information about farm (size, location, availability), risks (natural – floods, price, diseases), other risk threatening income (transport , storing, insurance). The survey will be evaluated using statistical methods.

3. results of the above two activities will be discussed and risk management options will be proposed.

The proposed extent of the thesis

40-60 pages

Keywords

cocoa production, cocoa pests, price risk, risk management,

Recommended information sources

Asante-Poku A., Angelucci F., 2013. Analysis of incentives and disincentives for cocoa in Ghana. Technical notes series, MAFAP, FAO, Rome.

COCOBOD: <https://www.cocobod.gh/>

SMEJKAL, V., RAIS, K. Řízení rizik. 1. vydání. Praha: Grada Publishing, 2003. 272 s. ISBN 80-247-0198-7.

Wranger, T. Cocoa shortfall: Pollination curbs climate risk to cocoa, Nature, 511, 155, doi:10.1038/511155b

Expected date of thesis defence

2015/06 (june)

The Diploma Thesis Supervisor

Dr. RNDr. Tomáš Ratinger, Ph.D.

Electronic approval: 25. 3. 2015

Ing. Vladimír Verner, Ph.D.

Head of department

Electronic approval: 14. 4. 2015

doc. Ing. Jan Banout, Ph.D.

Dean

Prague on 24. 04. 2015

Declaration

I declare that I have worked on my diploma thesis titled Risk management for cocoa producers by myself and I have used only the sources mentioned at the end of the thesis.

In Prague on the 24th of April 2015

Adéla Svobodová

Acknowledgement

I would like to thank Dr. RNDr. Tomáš Rátinger, Ph.D. for the valuable advice and support during my work on this Thesis and also to Ing. Momo Amadu Alhassan for support during my research in Ghana.

Abstract

The diploma thesis is about risks that can be found in cocoa production in Ghana and the protection that the farmers, extension organization or government used. The theoretical background describes the term “risk” and its classification and how risk management is connected to agriculture. The risk management mentions the main decision and steps that should be involved in cocoa production. The risk management techniques are divided into main groups as on-farm strategies in that the farmers face risks on their own and face risk-sharing strategies that involve, for example, insurance. Theory also defined the organizational structure of the cocoa supply chain in Ghana and characterized cocoa by species, production processes, quality, government support and finally cocoa sustainability. The research took place in the Western region of Ghana, which has the highest concentration of cocoa production in comparison to other regions. The main objective of the research was to gain information about risks that the farmers face and also how they are protected from these risks. The results describe the primary data gained from the research and for evaluation, the partial hypothesis are used, contingency tables and chi² test. In conclusion, all gained results are compared with other sources and some recommendations to improve the system are defined.

Keywords: cocoa production, cocoa diseases, price risk, risk management

Table of contents

1	Introduction	12
2	Literature Review.....	13
2.1	General information	13
2.1.1	Economic background.....	13
2.1.2	Geography	14
2.1.3	Climate	15
2.2	Risk	15
2.2.1	Classification of risks	16
2.2.2	Agricultural risks.....	17
2.3	Risk management in agriculture	18
2.3.1	Decision-making process	18
	Sources: FAO (2008), Rais, Smejkal (2003)	19
2.3.2	Steps of risk management	19
	Sources: FAO, 2008	20
2.3.3	Risk management techniques in agriculture	20
2.4	Organizational structure of the cocoa supply chain	23
2.4.1	Ghana Cocoa Board	25
2.4.2	Cocoa farmers	27
2.4.3	Licensed Buying companies (LBCs)	28
2.4.4	Haulers	28
2.4.5	Domestic Processors	29
2.5	Cocoa.....	29
2.5.1	Characterization of cocoa.....	29
2.5.2	Species of cocoa.....	30
2.5.3	Processing of cocoa.....	30
2.5.4	Production of cocoa.....	31
2.5.5	Policy	32
2.5.6	Quality of cocoa	33
2.5.7	Price of cocoa.....	33
2.5.8	Sustainability of cocoa	34

3	Aims of the thesis.....	35
4	Methodology	36
4.1	Study area.....	36
4.2	Timeframe	37
4.3	Research design.....	37
4.4	Sample size.....	38
4.5	Data sources	38
4.6	Data collection methods	38
5	Results	40
5.1	Descriptive part	40
5.1.1	Primary data connected to identification of farmers	40
5.2	Primary data connected to the indentification of farm.....	41
5.3	Primary data connected to the risks and problems on cocoa farm.....	43
5.4	Analytical part.....	51
6	Discussion.....	56
7	Conclusion.....	59
8	References	60
9	Annexes	64

List of Figures

Figure 1:	Cocoa beans shipment by destination.....	14
Figure 2:	The decision making cycle.....	19
Figure 3:	Steps of risk management	20
Figure 4:	Cocoa supply chain in Ghana.....	25
Figure 5:	Cocoa production by region	37
Figure 6:	Age of respondents.....	40
Figure 7:	The years of working on farm.....	41
Figure 8:	Size of farm	42
Figure 9:	The location of farm.....	42
Figure 10:	Accessibility of the farm	43
Figure 11:	Problems on farm	44
Figure 12:	Risks on farm	44
Figure 13:	Natural risks	45
Figure 14:	Price risks	46
Figure 15:	Factors of influencing the price.....	46
Figure 16:	Consumption of cocoa.....	47
Figure 17:	Other risks	48
Figure 18:	Government support	48
Figure 19:	The biggest losses in cocoa production	49
Figure 20:	Problems transport x warehousing.....	50
Figure 21:	Child labor.....	50

List of Tables:

Table1: The dependency of age and main cocoa farm risk.....	51
Table2: The dependency of gender on the perception of risks.....	52
Table3: The dependency of the government support and risks.....	53
Table4: The dependency of gender on receiving governmental support	54
Table5: The dependency of age and receiving governmental support.....	55

Abbreviations:

CMC	Cocoa Marketing Company Limited
°C	Celsius degree
CRP	Cocoa Rehabilitation Project
CSAE	Centre for the Study of African Economies
COCOBOD	Ghana Cocoa Board
CODAPEC	National Cocoa Diseases and Pest Control
CRIG	Cocoa Research Institute of Ghana
CSSVDCU	Cocoa Swolen Shoot Virus Disease Control Unit
FARMD	Forum for Agriculture Risk Management in Development
FOB	Free On Board
FAO	Food and Agricultural Organisation
GAIN	Global Agriculture Information Network
GDP	Gross domestic product
GSSP	Ghana Strategy Support Program
GOG	Government of Ghana
ha	hectare
ICCO	International Cocoa Organization
km	kilometres
LBC	Licensed Buying Companies
m.a.s.l.	meters above sea level
NCAP	Neatherlands Climate Assistance Programme
ODI	Overseas Development Institute
PPRC	Producer Price Review Committee
QCC	Quality Control company
SPU	Seed Production Unit
SWDSI	Southwest Desicion Sciences Institute
USD	United States Dollar
WB	World Bank

1 Introduction

Farming is risky at all. The risks can be predicted but in general never with 100% accuracy. The cocoa as other crops production is influenced by many threats in forms of changing weather conditions, prices, institutional conditions and policies, and many other factors. Every farming producer try to minimize risks due to higher profitability. Of course with rising profit the risks are increasing.

Good risk management reduces problems through planning and minimizing negative effects. The farmers, especially in developing countries, need to be support through extension organization and government. These institutions can help farmers to determine the risks and understand their problems.

Cocoa is extended to over 50 countries across Africa, Latin America, the Caribbean and Asia. The world cocoa production is around 4 million tons (ICCO, 2012). Ivory Coast and Ghana together with Indonesia are largest exporter of cocoa in the world. The two leading African producers covers 60% of global cocoa production and for both countries it represents a major export commodity.

Cocoa is the most important Ghana crop and provides livelihoods for approximately 800,000 farmers. The production of cocoa dominates to Western region where is produced around 55% of cocoa production of Ghana according to Ghana Statistical Service.

Smallholder farmers take care of the cocoa production from beginning as harvesting the pods, fermentation to drying the cocoa beans that are sold to local buyers. The Ghana cocoa is high quality and known especially for typical taste.

Farmers today receive a relatively large share of the Free on Board (FOB) price. Bean quality is world renowned and frequently exceeds the most stringent international standards. COCOBOD is Ghana Cocoa Board that oversees nearly all aspects of the cocoa supply chain.

2 Literature Review

2.1 General information

Ghana is a low middle income country with GDP per capita of \$1,613 (the figure referring to 2012). The contribution of the agricultural sector on GDP amounts 22.9%, a bit less than the industrial sector (28%), while services account for 49.1% in year 2012 (Ghana Statistical Service, 2014). Ghana has the population of 25 million people (2012) and the annual average intercensal growth rate is about 2.5 %.

Almost all (97.6%) population is Ghanaian. There are several ethnic groups. Akans are the predominant ethnic group (47.5%), followed by the Mole Dagbani (16.6%), the Ewe (13.9%) and Ga-Dangme (7.4%). The Mande forms the smallest ethnic group with 1.1% in Ghana.

Education system shows that majority (74.1%) of the population 11 years and older is literate. How is that majority (74.1%) of the population 11 years and older is literate. A large proportion (67.1%) of the population can read and write in English. In terms of sex, males (80.2%) are more likely to be literate than females (68.5%). Regional variations exist in literacy levels, with the three northern regions having less than 50 percent of the population aged 11 years and older as literate while the other regions have at least 69 percent of their population being literate (Ghana Statistical Service, 2012).

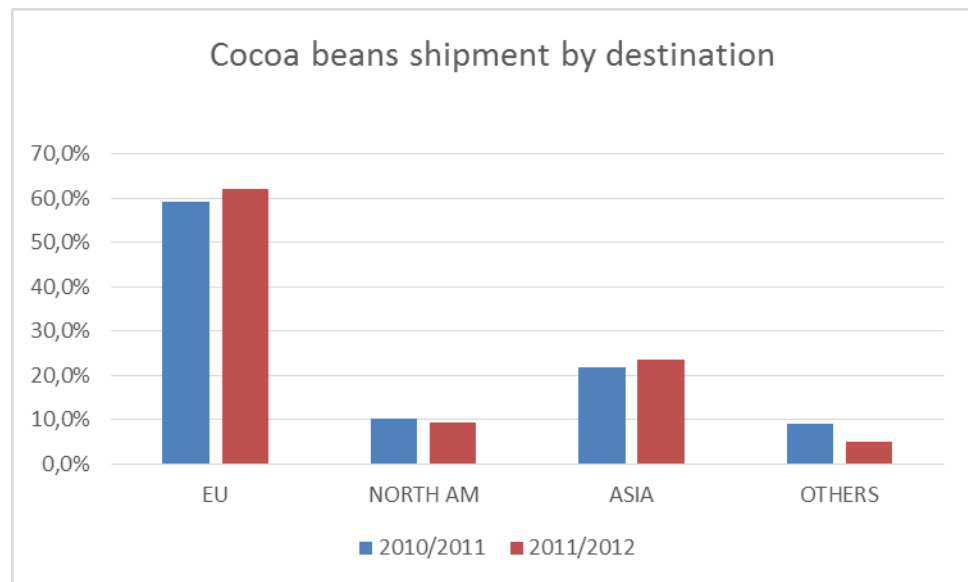
2.1.1 Economic background

The world cocoa production as reported by the International Cocoa Organization was million tons in 2012. Ivory Coast and Ghana have maintained the positions as the two leading producers in the world. They contribute by about 60% to the global production. Global consumption of cocoa beans increased by 2.05% from 3.91 million tons in 2010/11 to 3.99 million tons in 2011/12. This was as a result of a shift in global consumption pattern in emerging countries. The average international cocoa prices as measured by the ICCO daily price for the 2011/12 season settled at US\$2,396, a decrease of 22.81% compared to the 2010/11 price of US\$3,104. This decline might have origin in the unresolved European debt crisis and in good harvest that causes over supply. It means that the demand curve stays the same, but market to be able to absorb

the harvest required the price going down. And then cocoa and its products reached consumers in emerging (transitional) economies (COCOBOD, 2012).

The total amount of cocoa beans that was shipped to overseas destinations during 2010/11 crop year was 773,389 tones and during 2011/2012 713,849 tones. Deliveries to local cocoa processing companies was 30,000 tons during 2010/2011 compare to 41,975 tons during 2011/2012. The direction of trade for beans shipments is shown in Figure 1. The major export destination for Ghana’s cocoa beans is still the European Union that accounts for about 55.70% of total cocoa beans exported in 2011/12 (COCOBOD, 2012).

Figure 1: Cocoa beans shipment by destination



Sources: COCOBOD (2012)

Cocoa is the highest export crop earner for Ghana accounting for 8.2% of the country’s GDP and 30% of total export earnings in 2010 (Ghana Statistical Service, 2010).

2.1.2 Geography

Ghana is located on West Africa's Gulf of Guinea only a few degrees north of the Equator. Half of the country lies less than 152 m above sea level, and the highest point is 883 m.a.s.l. The 537 km coastline is mostly a low, sandy shore backed by plains and scrub and intersected by several rivers and streams, most of which are navigable only by canoe. A tropical rain forest belt, broken by heavily forested hills and many streams and

rivers, extends northward from the shore, near the Cote d'Ivoire frontier. This area, known as the "Ashanti," produces most of the country's cocoa, minerals, and timber. North of this belt, the country varies from 91 to 396 m.a.s.l. and is covered by low bush, park like savanna, and grassy plains (Ghana Statistical Service, 2012).

2.1.3 Climate

The climate of Ghana is tropical, but temperatures vary with season and elevation. Except in the north two rainy seasons occur, from April to July and from September to November. In the north the rainy season begins in April and lasts until September. Annual rainfall ranges from about 1,100 mm (about 43 in) in the north to about 2,100 mm (about 83 in) in the southeast. The harmattan is a dry desert wind, blows from the northeast from December to March, lowering the humidity and creating hot days and cool nights in the north. In the south the effects of the harmattan are felt in January. In most areas the highest temperatures occur in March, the lowest in August (Ghana Statistical Service, 2012).

For cocoa production are characteristic annual rainfall levels of about 1 250 – 3 000 mm, although levels of 1 500 – 3 000 mm are preferred and adequate temperature levels range from a minimum of 18-21°C and a maximum of 30 – 32 °C (FAO, 2013).

2.2 Risk

The term risk has its origins in Arabic, specifically from the word *Rizq*, which means "something of which people has the benefit" or "something that leaves people without benefit." Originally, this word meant both unfavorable and favorable event in a person's life. Later, its use was limited only to adverse events. Italian expression *risico* became the basis for the Czech expression and signified difficulty to which swimmers had to avoid (Smejkal, Rais, 2003). Answer the question, "What is the risk?" is not easy. Although the term is generally known in the literature is not defined by a generic definition. Risk is understood as the possibility of an event with the result of deviating from the target with a certain objective probability (Ducháčková, 2005). Another definition say that risk is a situation in which there is a potential for adverse deviation from the desired result in that we hope or expect it (Smejkal, Rais, 2003). The cause of this, it is impossible to find only one general definition is that the concept of risk is

associated with various disciplinary. This thesis is focused on the risks associated with the farming industry.

2.2.1 Classification of risks

Risks that are dependent on the character relevant phenomenon or process are called net and speculative risks. **Net risk** means the danger of negative deviations from the target. **Speculative risk** describes the possibility of negative and positive deviations from the target.

In addition to the division of risk on net and speculative risks there are also objective and subjective risks. The **objective risk** is independent on the actions and behavior of people. It is for example natural disaster, lightning, etc. Subjective risk is connected with human activity and it is not important if it is conscious or unconscious.

Many risks are among **uninfluenced risk** like political, economic, trade, fiscal and other measures of the state, the political situation and the situation in the world, globalization, etc. These risks can't be affected by an individual entrepreneur or the company. **Modifiable risk** can be conversely reduced or partially removed (Hnilica, Fotr, 2009).

Risks can be also divided on **financial and non-financial**. These risks include the relationship between the entity (individual or organization) and expectations of income that can be lost. Financial risk is generally affected by three factors:

- the entity that is exposed to the possibility of loss (someone will be affected by the occurrence of one events, e.g. floods caused significant financial damage for farmers)
- the assets or income affected by destruction or change of ownership are the cause of financial losses
- threat (danger) that may cause loss (e.g. the risk of secondary payment incapacity) (Smejkal, Rais, 2003).

It is also possible to divide risks on static and dynamic, strategic and operational, systematic and unique (Hnilica, Fotr, 2009).

2.2.2 Agricultural risks

Risk management in agriculture is important for several reasons. But it is also true that reducing farming risk does not always improve farmers welfare, failure to manage risks has direct repercussions on farmer incomes, market stability and potentially food security. It is mostly relevant in developing countries, but also for the most deprived in the EU, in case of temporary short supply leads to dramatically higher prices. Risk category in agriculture covers following risks:

a) Production:

- weather - floods, droughts, hail, frost etc.,
- mass animal diseases, crop diseases and infestation by pests,
- technology - a new crop protection products, plowing, harvesting techniques, fattening, etc.,
- technique - the efficiency of machinery and equipment,
- availability of quality inputs into production.

b) Price:

- rising prices of production inputs,
- agricultural products fluctuations or falls in prices (impact of large natural disaster on inflation, etc.).

c) Commercial:

- other entities agrocomplex,
- consumer demands on food quality and food safety,
- demand on new products.

d) Financial:

- risk of rising capital costs,
- risk of changes in exchange rates,
- risk of insufficient liquidity,
- risk of decline in value of assets used as collateral,
- others.

e) Property:

- risks associated with theft, fire or other loss, depreciation of equipment, buildings or other assets used in agriculture.

f) Institutional:

Policy changes with regard to the regulation:

- production,
- labor law,
- trade,
- tax burden.

g) Environmental:

- risks arising from the negative impact of farming on the environment and the impact of the management of other economic sectors on agriculture (Hardaker, 2009).

2.3 Risk management in agriculture

The principal activity of management is making decisions. Farmers make decisions about crops that has to be planted and seeding rates plus fertilizers. For effective decisions they have to have all the necessary information regarding input prices, output prices and yields, as well as other technical data.

2.3.1 Decision-making process

Main farming decisions are making in the context of the farmer's goals and objectives, which guide and affect the decisions that the farmer is making. Because decisions are making to achieve goals and objectives, it is helpful for farmers to understand the essential elements of decision-making (FAO, 2008). Specifically, it is a complex process of ensuring controlling, elimination and minimization of uncertain events that may influence the business entity (Rais, Smejkal, 2003). The decision-making process is shown in Figure 2.

Figure 2: The decision making cycle



Sources: FAO (2008), Rais, Smejkal (2003)

2.3.2 Steps of risk management

Risk management strategies are used to reduce the chance of a "bad" outcome occurring. Farmers who try to manage the risk should follow another sequence of steps that are shown in Figure 2. At first step it is necessary to identify the possible sources of risk as price, pests, yield, labor. The second step is about realization of a possible outcomes that could occur as a result of weather or price change. In a third step is a risk divided into alternative strategies like packaging, pest control, production plan and new technology. The consequences or results of each possible outcome for each strategy are assessed in fourth step. Finally is need to evaluate trade-offs between the cost of risk and gains that can be made. Figure 3 shows the steps to be followed by farmers in managing risk.

Figure 3: Steps of risk management



Sources: FAO, 2008

Among farmers are differences in the level they accept and estimate risk. It very often depends on personal feelings more than on information presented to them to help them making more rational decisions and it is also associated with the financial ability to accept a small gain or loss.

2.3.3 Risk management techniques in agriculture

Farmers may face risks in a two ways. **On-farm strategies** are used when entities face risks on their own. This strategy includes diversification, selection suitable manufacturing practice, the cultivation of crops less risky, choice of products with shorter production cycle and adherence to the principles of good business practice.

The other possibility is that farmers share risks with other market entities and it is called **risk-sharing strategies**. Risk-sharing strategies includes tools such as insurance, vertical integration, creating joint venture, participation in mutual funds, free association of several companies, making production or marketing contracts or trading in markets futures and options.

The objective of risk management tools in agriculture is primarily to increase income stability farmers

Diversification

Diversification is a frequently used risk management strategy that involves participating in more than one activity. The motivation for diversifying is based on the idea that returns from various enterprises do not move up and down in lockstep, as when one activity has low returns, other activities likely would have higher returns. A crop farm, for example, may have several productive enterprises (several different crops or both crops and livestock), or may operate on divided parcels so that localized weather disasters are less likely to reduce yields for all crops simultaneously (FARMD, 1999).

The theory is distinguished among the following three basic types of diversification of business activities:

- **concentric** diversification is typical for new activity that builds on existing business activities,
- **horizontal** diversification, where the production expansion of other different kinds of goods intended for the same customer's group,
- **mixed** of diversifications with completely different goals

At the farming level can be used diversification within the agricultural activities and also into non-agricultural activities. Generally, the diversification is particularly suitable for small family farm. For farmers and their families is diversification helpful during year for relatively stable income in the longer term and engage whole family in work activities. Among non-agricultural activities is included agro-tourism in a form of accommodation on the farm including local food, horseback riding, running and other activities and also direct selling their agricultural products. For diversification in agricultural activities is possible to use different kinds of crops, a combination of crop and livestock production, animals with better genetic potential improvement market adjustment of final products, different varieties of a crop.

The basis for successful implementation of the diversification strategy is creation of methodology and identification of activities suitable for diversification.

However, in our particular case the use of diversification strategy is very limited. Cocoa production is very specialized; there are undoubted benefits of it, even at the level of cocoa varieties.

Insurance

Insurance is one of the possible financial management instruments, resp. risk reduction in agriculture. The principles of insurance are to transfer the risk to the insurer for payment. Insurance companies regularly concentrate resources from insurance that are then used as compensation for damages incurred under the conditions specified in the insurance contract.

Among basic principles of insurance agriculture risks are included following:

- **Yield Insurance** - eliminating the risks associated with the manufacturing process.
- **Price Insurance** - through this insurance the farmer protects some possible fluctuations in commodity prices.
- **Revenue Insurance** - is combination of two previous insurances.

The reason why the insurance of farmer's revenues is not widespread is the problem of moral hazard and adverse selection. Potential damages are not caused by unexpected incidents, but also depend on the management skills of farmers. One problem is the agricultural risks often involve a large numbers across the board farms (systemic risk) and risks are dependent on each other. Nevertheless, the conclusions of scientific studies show that the most comprehensive and viable form of insurance income for farmers could be insurance that combines two modules: revenue insurance for crops and reliable statistics of crop yields.

Vertical integration

The aim of this strategy is reducing the risks threatening the agricultural entities and it is about integrating the different phases of agricultural production within one company. In practice, vertical integration in agriculture often involves ownership of both farm production and processing activities and is much more common in a certain livestock and in a special crop industries than in a field crops. The incentives for the vertical integration can arise either from producers or from buyers further down the marketing chain which realize an opportunity to enhance their potential profits or reduce their risk (Grega, 2005).

Production and marketing contracts

Production contracts typically give the contractor considerable control over the production process. In this context the contractor means the commodity buyer. These contracts usually detailed specify the production inputs supplied by the contractor, the quality and quantity of a particular commodity that is to be delivered, and the compensation that is to be paid to the grower. The benefits associated with integration typically increase as production and marketing relationships become more complex and then are breakdowns on marketplace competition most likely. Production contracts is most found in the broiler, egg, and hog industries.

Marketing contracts are either verbal or written agreements between a buyer and a producer who set a price and output for a commodity before harvest or before the commodity is ready to be marketed. Since ownership of the commodity is generally retained by the grower while the commodity is produced, management decisions (such as varieties or breeds, or input use and timing) typically remain with the producer (FARMD, 1999).

Forward pricing

Forward pricing is a practice where the buyer and producer agree on a price for the sale of crops or livestock in advance of delivery. An agreement is reached when the crop is delivered at an agreed price, quantity, quality and time. These practices enable farmers to reduce the risk when the price they receive for their output might not cover production costs (FAO, 2008).

2.4 Organizational structure of the cocoa supply chain

The cocoa value chain has many actors at the local and also international level. Among key players at the local level are included farmers, COCOBOD, Produce Buying Company, haulers, warehousing and logistic service providers, domestic chocolate manufacturers, domestic grinders, distributors, retailers and local consumers. Among key actors and stakeholders at the international level are included multinational

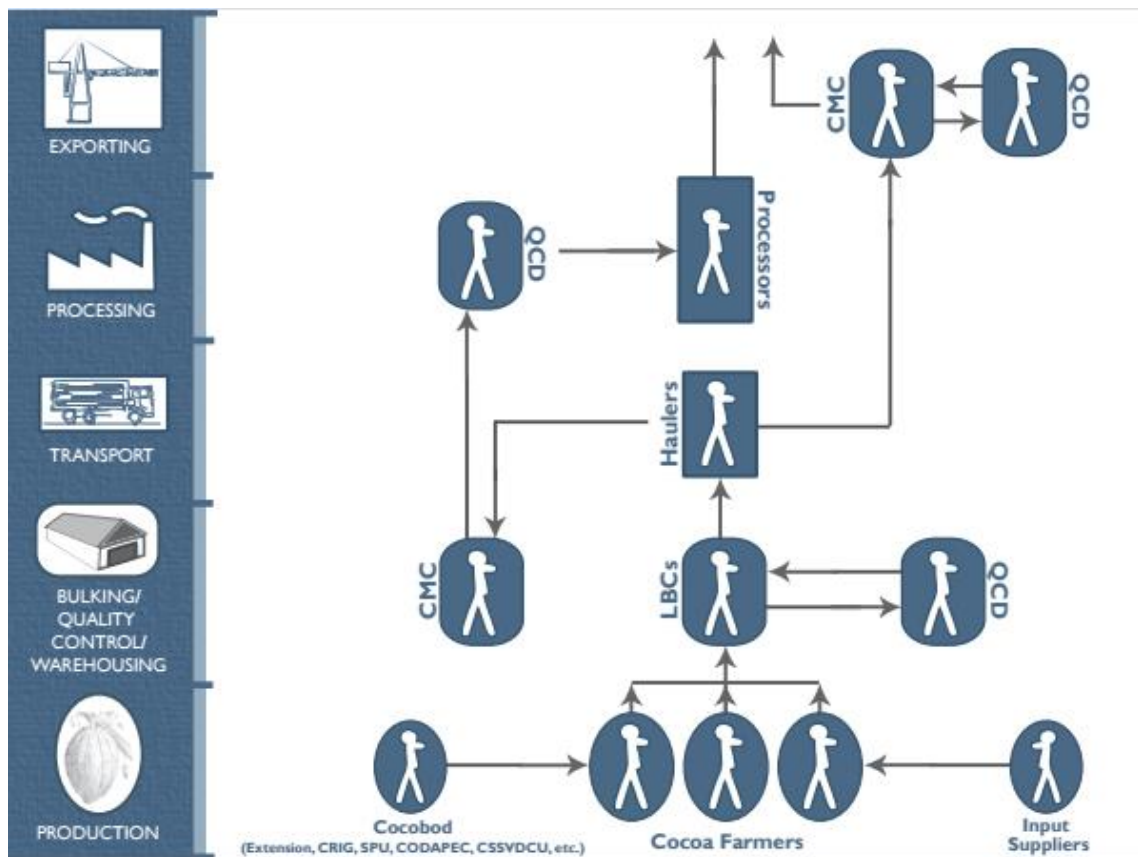
brokers/traders, shipping lines, international warehouses, international grinders and manufacturers and international consumers.

Cocoa farming is mainly done by smallholders. There is no competition among Ghanaian cocoa farmers as buyers because the prices are fixed. The competition is more important among LBCs that have to reach a threshold volume to be able to export. The International Cocoa Organization made the observation that, “A lack of competition along cocoa supply chain means that farmers capture very little share of the retail price of final cocoa products. However, Wilcox & Abbott count the argument and add competition that could actually make farmers more vulnerable; farmers who are mainly situated in remote areas where trade information flow (prices, etc.), where a limited number of buyers are willing to travel to, could also be taken advantage of and not benefit if market competition exists. However, the price uniformity allows that farmers all over the country benefit equally (that is if transportation costs are not taken into account). However, in Ghana, farmers have the advantage in a large number of LBCs to choose from and as such farmers tend to choose LBCs that offer cash and credit facilities (Asante-Poku, Angeluccia, 2013).

This section describes the organizational structure of the cocoa supply chain in Ghana based mainly on sources of Ghana Cocoa Board, World Bank and also shown on Figure 4. It identifies the key actors and principal factors that influence behavior and drive decision-making. The cocoa supply chain can be divided into four major product categories that are based on the stage of processing. These categories involved the following:

1. cocoa beans (raw),
2. semi-finished cocoa products (cocoa paste, butte or powder),
3. industrial chocolate,
4. finished chocolate confectionary products.

Figure 4: Cocoa supply chain in Ghana



Sources: WORLD BANK, 2011

2.4.1 Ghana Cocoa Board

The cocoa supply chain in Ghana combines elements of private business with a strong government presence. The Ghana cocoa board regulates the activities of all stakeholders in the industry. The cocoa marketing process begins with the farmers and ends with government export.

The main functions of the Ghana Cocoa Board are focused on the production, research, extension, internal and external marketing and quality control. The functions are classified into two main sectors, pre-harvest and post-harvest that are performed by specialized divisions of the Board. The pre-harvest sector functions that are performed by the Cocoa Research Institute of Ghana (CRIG), the Seed Production Unit (SPU) and the Cocoa Swollen Shoot Virus Disease Control Unit (CSSVDCU) deal with fundamental issues in cocoa production at the farm gate level. The post-harvest sector functions are undertaken by the Quality Control Division (QCD) and the Cocoa

Marketing Company (CMC) Limited. The Post-harvest activities of COCOBOD start with quality control measures of QCD that farmers must observe to facilitate the acceptance of their produce at the buying centers by the licensed buying companies engaged in internal marketing of cocoa at the time. COCOBOD's policies are implemented through the specialized divisions:

1. Quality Control company (QCC)

The main function of Quality control company is a maintaining quality standards and overseas quality control measures at all stages. The responsibility involves grading, sealing and disinfestation during the period. The Company also inspect and certificate the storage facilities of Licensed Buying Companies (LBC) where cocoa is bulked and stored. It includes sampling of cocoa on arrival at port warehouses and prior to export to determine whether a particular consignment meets local and international standards and inspection and fumigation of storage sheds, warehouses and shipping vessel sand all cocoa consignments prior to shipment. Also there are responsibilities in intensified education of farmers on the best known agronomic practices in order to maintain the premium quality of Ghana's cocoa. QCC has staff operating in all the 67 cocoa districts located in the seven cocoa regions and at the three takeover centers.

2. Cocoa Marketing Company Limited (CMC)

The main function of government owned cocoa marketing company is continuation of cocoa beans to the national market and to foreign buyers at Takoradi and Tema ports. Its responsibilities includes: procurement of graded and sealed cocoa beans from the LBCs at the three takeover centers, stocking of cocoa prior to shipment, securing optimal prices and maximizing foreign exchange revenue, managing sales and collecting receipts; and settling of any disputes via direct arbitration. CMC is located in Accra and has a satellite office in London

3. Seed Production Unit (SPU)

The Seed Production Unit (SPU) produces and distributes hybrid cocoa seed pods and seedlings to farmers. SPU maintains seed gardens at 23 cocoa stations in the seven cocoa-growing regions. The Unit multiplies high-yielding, early-bearing hybrid cocoa types and distributes them to farmers as seed pods and saplings at a subsidized cost. The Seed Production Unit produces about 3 million hybrid pods band raises about 2 million cocoa seedlings per annum.

4. Cocoa Swollen Shoot Virus Disease Control Unit (CSSVDCU)

The main function of The CSSVD Control Unit is survey and control the cocoa swollen shoot virus disease during crop year. The unit also removes diseased cocoa trees from farms and supplies disease-tolerant hybrids (pod and saplings) for replanting. Many of the farmers in spite of the supply of seedlings and cash rewards were refusing to allow the destruction of their infected farms. How do farmers cooperate with it?

5. Cocoa Research Institute Of Ghana (CRIG)

The main function of Cocoa research of Ghana is undertaking research into challenges relating to the production, processing and utilization of cocoa and other tree species that includes providing cocoa farmers with technical innovations that improve yields, identifying new processing techniques and marketable consumer products and by-products and ensuring effective transfer of research findings, new technologies, and agronomic practices to farmers established.

6. National Cocoa Diseases and Pest Control (CODAPEC)

The popularly known program of National Cocoa Diseases and Pest Control is “Mass Spraying”. This program was reintroduced in the 2001/02 cocoa season to assist cocoa farmers across Ghana to combat cocoa mites and black pod diseases. The main function of CODAPEC is training farmers and technical personnel on the cultural and chemical methods of pests and diseases control and training local sprayers on safe pesticides usage. In nowadays, around 67 cocoa districts are benefiting from the program. This includes 21 districts being treated exclusively for black pod disease; 35 districts being treated exclusively for mites; and 16 districts covered for both.

2.4.2 Cocoa farmers

Smallholder farmers in Ghana are the eminent part of the cocoa supply chain. Their main activity is a year-round production of cocoa that involves also process as harvesting, fermentation and drying the cocoa beans. According to COCOBOD estimates, there are approximately 800,000 cocoa producing households.

Input supply is mainly in the hands of the private sector. GoG through COCOBOD is trying to be active through subsidized input distribution programs targeting cocoa farmers, but farmers bear the bulk of the cost, in line with its strategy to raise productivity and output. Input suppliers procure for farmer fertilizers, insecticides,

farm equipment and tools. The majority are small-scale suppliers who are operating at the local level. Many of them are independent but there are some licensed distributors for larger wholesale imports or manufacturers.

2.4.3 Licensed Buying companies (LBCs)

Licensed Buying Companies buy cocoa from farmers. It is regulated by Ghana Cocoa Board. This business is private and responsible for purchasing the cocoa at farm gate at a guaranteed floor price and for transporting it to one of three takeover points to sell at a fixed price to COCOBOD for export. They also share responsibility that the cocoa has quality standards that are defined by COCOBOD. The rules are strict and through this way can govern buying activities. These rules includes size and quality of beans. That beans have to be properly dried after fermentation. When the bag is packed once, the cocoa lies in the custody for the buyer until it is taken over by COCOBOD. LBCs' revenues are focused on volumes of cocoa market. LBCs faces a floor price for farmers and a fixed sale price from COCOBOD and for that reason they effectively receive a set amount of revenue per quantity of cocoa delivered.

By beginning buying season each member of Licensed Buying Companies obtains a subsidized rate-loan that are dependent on the market share from COCOBOD to be used exclusively for cocoa marketing purposes. In nowadays there are around 35 registered LBCs (COCOBOD, 2012).

2.4.4 Haulers

The transport service companies are private and their main function is picking up cocoa consignments from LBCs located at the district levels and delivering QCC certified and sealed cocoa to Tema, Takoradi or Kaase port. For an exportation the cocoa, haulers receive payments that are based on fixed rates determined by the Producer Price Review Committee (PPRC). The PPRC's annual meeting determines how resources will be allocated and fixes new prices, fees, and rates for the coming season.

2.4.5 Domestic Processors

Nowadays there are eight cocoa processors. Their main responsibility is securing a reliable supply of affordable, quality cocoa without hazardous substances. All rely on COCOBOD to supply them with cocoa beans to support their domestic processing activities. Growing competition for low-grade, discounted beans have been on the rise amid declining availability; this is partly a result of quality-enhancing on-farm investments such as better tree husbandry and increased fertilizer use (World Bank, 2011).

2.5 Cocoa

Cocoa (*Theobroma cocoa*) is an evergreen tree of the family mallow (Malvaceae), which is classified in the subfamily Byttnerioideae. Originally comes from the tropical regions of South America, where it was already grown probably in the 5th century. Nowadays it is cultivated in the tropics of all over the world. The largest producers of cocoa are Ghana, Ivory Coast, Nigeria and Brazil (Novák, 2005).

2.5.1 Characterization of cocoa

Cocoa measures 5-8 m and has a strong trunk with felt-like branches. Leaves are dark green, shiny and are grown up to 30 cm long. When leaves are sprouting they have red color. Hermaphroditic flowers, where the calyx is pink and crown is white, are growing directly on the trunk or on the strong branches. This is technically called Cauliflory (Michalec, 1977). The flowers have ten stamens in two circles. The cocoa tree flowers have two major period, but the flowers are formed in small amounts throughout the year. The fruit is up to 30 cm long berry in yellow, brownish to red color. The surface is slightly bumpy, and divided into ten longitudinal furrows (Valíček, 1989). Cocoa needs a high temperature, plenty of water, and air that is always moist. Therefore, cocoa is grown in the hot and humid regions of Africa, especially in forest regions.

2.5.2 Species of cocoa

Species of cocoa are divided into three groups – forastero, criollo and trinitario. For **forastero** is typical that the pods are short, yellow, smooth without warts, with shallow furrows. This variety produces quiet good, but the quality is not as good as Criollo. It is grown a lot in Africa. The other type is named **criollo**. These pods are ripe, they are long, yellow or red, with deep furrows and big warts. Criollo does not produce as much as the others but the cocoa is of very good quality. It is grown mostly in America. **Trinitario** is a cross between Criollo and Forastero. The pods of this variety are long or short, red and yellow. It yields cocoa of fairly good quality (FAO, 1977).

In Ghana there are also used **hybrid** cocoa varieties that were introduced by the government's Cocoa Rehabilitation Project (CRP) in 1984. This variety outperforms the older "Amazons" and "Amelonado" by producing more pods per tree and coming to bear fruits in three years compared to at least five years for the older varieties. But hybrid cocoa trees perform only under optimal weather conditions and when the application of chemical inputs, the adoption of new planting procedures, pruning and spraying are carried out. There is also necessary to make more harvest rounds at the beginning and at the end of the season. Despite this by 2002 57% of farmers were growing hybrid trees in comparison with 10% in the late 1980s Traditional varieties may have disappeared entirely from all fields planted after 1995 since yield is approximately twice as much cocoa per ha as similar-aged fields planted with traditional trees (Kolavalli, Vigneri, 2011).

2.5.3 Processing of cocoa

The first phase of the cocoa processing is removing the seeds from the berries and then fermenting them. It takes around 1-6 days. It depends on type and the conditions. The fermentation is carried out by high temperatures and acetic acid. Further, under continuous stirring, the seeds are dried at temperatures of 80-130 °C (Kybal, Kaplický, 1988). This is done on farm. After drying are grounded to cocoa mass, from which are separated fat by pressing - cocoa butter. The remaining material provides a cocoa powder which is the starting material for the production of chocolate. This is done by processors. Cocoa contains the alkaloid theobromine that is related to caffeine and has a stimulant similar effects. Pressed fat (cocoa butter) is a solid,

yellowish, with specific flavors and aromas by normal temperature. It is used in the manufacture of chocolate confectionery. The seeds are also valued as a spice for flavoring some meat and fish dishes (Kybal, Kaplický, 1988).

In Ghana for cocoa harvesting it is important to cut the pods carefully from the tree to avoid damaging the entire tree. Pods also have to be cut open carefully to avoid damaging the beans. There have been developed also mechanized systems to make the labor burden easy, but they are not popular among farmers because of damages of the beans (ICCO, 2012). After the pulp and seeds have been removed and they are put together to ferment. The fermented pulp is left to trickle away leaving the seeds. THE Cocoa research institute has started distilling the liquefied pulp into alcohol (FAO, 2013). The fermented seeds are then dried to reduce the moisture content to about 7.5 percent of its original moisture content (ICCO, 2012). At this stage, the beans are exported or processed via sorting, cleaning and roasting (at temperature of 120° C to 149° C) to develop the color and flavor (ICCO, 2012). The beans are then crushed to release the nib from the shell and then winnowed (blown) through a tunnel to separate the nib and shell. After this, the nibs are crushed into a mass, which is then heavily pressed until the mass is separated into butter (55- 60 percent) and a powder (COCOBOD, 2012).

2.5.4 Production of cocoa

The cocoa production accounts around 9% of agriculture GDP (Ghana Statistical Service, 2012). Smallholder's farms are typical for Ghana. Cocoa production provides income for 800,000 cocoa farmers. In most cocoa-producing households, cocoa accounts for over 67% of household income (Kolavalli and Vigneri, 2011). Production of cocoa in Ghana was 1 004 000 MT in 2011 compared to 710 000 MT in 2009 and 904 000 MT in 2010. The planted area fall from 1.82 million ha in 2008 to 1.63 million ha in 2010. Only 10% of the processed cocoa is used for the production for the local market.

Cocoa is growing in six out of the ten regions of Ghana. The greatest production of cocoa is on Western region that represents 56,5% of all cocoa production. The next one is Ashanti region followed by the Ashanti region with 15,4% and Eastern together

with Brong Ahafo regions account for about 19% of total production (COCOBOD, 2012). For Ghana cocoa production are typical forest agro-ecological zones.

Ghana's cocoa yield has been on 25% less than the average yield level of the ten largest cocoa producing nations. It could be influenced the relatively old age of Ghana's cocoa trees, pests and diseases such as black pod and mistletoes, and low investments into cocoa farming and the absence of widespread row planting (Mohammed, 2011).

2.5.5 Policy

The supply of inputs to producers is carried out by COCOBOD. There were subsidized inputs but by 1993 were withdrawn. Government intervenes by subsidizing the price of insecticides and fungicides. In 2002/2003 was introduced "Cocoa High-Tech" programme in that fertilizers were supplied to farmers on credit so as to encourage farmers apply a minimum of two fertilizer bags per acre of land cultivated (COCOBOD, 2012) but the programme failed because of low repayment rate by farmers.

A privately - funded programme known Cocoa Arabopa Association was introduced to offer input packages and monetary loans to farmer groups on revolving credit terms, with education and training as part of the package (Asante-Poku, Angeluccia, 2013). But in 2008 nearly half of farmers from totally 10 000 registered members dropped the programme (World Bank, 2011).

The Cocoa National Disease and Pest Control Committee developed disease control strategies, mainly for control capsid and black pod disease that includes sprays all cocoa fields free of charge for producers (COCOBOD, 2012). COCOBOD attributes the 2003/2004 and subsequent years production success to the programme. The programme has also been said to encourage farmers to take up additional pest control measures.

COCOBOD also try to reduce transportation costs through providing infrastructure to farmers by constructing feeder roads that connect to major roads for the transport of produce to transit points and for that reason is pricing uniformity ensured among farmers (COCOBOD, 2012).

The Ghana Strategy Support Programme from 2005 introduced a high tech package of hybrid seeds, fertilizers, pesticides and fungicides, which is also in line with

the 2001 COCOBOD strategy (GSSP, 2005). It has shown remarkable success in increasing production and incomes for farmers. Average farm production increased by 20% as a result of the programme Policy conclusion (CSA, 2009). In order to improve market measures, the GSSP has also put in place a policy to develop a comprehensive value chain for cocoa.

In trade policy there is defined export tax for cocoa that represents 25% and is established annually by the Minister of Finance. Taxes are collected by the COCOBOD and then transferred to the government (FAO, 2013).

2.5.6 Quality of cocoa

The characteristics of quality cocoa are following: size of beans, moisture and fat content and fat quality. These determine the quality of cocoa butter and cocoa liquor that add texture, aroma, color and flavor to chocolate. Through appropriate fermentation of seeds and storage and evacuation practices is quality obtained. Ghana sells most of its cocoa production (Kolavalli, Vigneri, 2011). The International Cocoa Standards require fermented, thoroughly dried, free from smoky beans, abnormal or foreign odor and free from any evidence of adulteration. The beans must be without living insects, broken beans, and fragments. The Ghana cocoa beans are most valued for their flavor (GAIN, 2012).

Over 90% of cocoa production that Ghana sells through forward contracts, is of grade 1. Selling the crop up to a year in advance allows the marketing board to fix in advance the price it can offer to farmers for the entire crop year. Ghana has a price premium for cocoa in the world market due to higher fat content, lower levels of debris and the lower level of bean defects (Kolavalli, Vigneri, 2011).

2.5.7 Price of cocoa

The price of cocoa is fixed in Ghana. The Ghana Government fixes the producer price upwards by making adjustments to the price of cocoa each time there is an improvement in the world market price. The objective is for the farm gate price of cocoa beans to be at least 70% of the Free On Board (FOB) price. The government announces a new producer price of cocoa beans by beginning every season that means on the 1st of October (GAIN, 2012). The peak shipping season is from November to April (Kolavalli

and Vigneri, 2011). The farm gate producer price of cocoa beans per metric ton was \$2,133 in 2010/11 up from \$1600 2009/10 and achieved producer price levels of 70% of the FOB (COCOBOD, 2012).

2.5.8 Sustainability of cocoa

The productivity of Ghana cocoa sector is low compared to its leading competitors, Cote d'Ivoire and Indonesia. The technologies that would be attractive to the farmers are not yet known. Farmers may not have much motivation to use fertilizers to even hybrid trees as the returns to fertilizer applied to mature these trees may not be any higher than those achieved on traditional varieties. But there are experimental farms in Ghana that shows that the application of fertilizers on young trees can triple yields (Gockowski, Sonwa, 2007). The other problem with sustainability is low level of replanting. From Farmers view is more economical to expand the cocoa farm than replant old and diseased trees (Kolavalli, Vigneri, 2011). It takes more time to clear to than to clean new forest land around an old farm and labor requirements may be higher.

The sustainability of price premium for its quality can be also threatened because of technological advances in processing. But the current quality control processes in Ghana guarantee some minimum parameters that are especially important to large industry players like Cadburys that is exclusively used Ghanaian cocoa beans in all UK retailed chocolate products. Cocobod's divisions in charge of quality controls that are called the Quality Control Division and the Cocoa Marketing Company (Shepherd, Farolfi, 1997).

And what about competitiveness on farm? Cocoa is a mixed crop system in which are provided for example to plantain and cocoyam early returns. Many farmers also shift to producing other crops independent of cocoa because they may get greater income through the whole year, perceived higher returns relative to coco, especially when significant problems with the rehabilitation of the existing cocoa tree stock exist (Kolavalli, Vigneri, 2011).

Finally Ghana is well positioned to expand its position in high-value markets, with Cocobod proving to be responsive to the changing trends in the international markets. The chocolate industry has been expanding into secondary markets such as Fair Trade (FT) in the late 1980s, and more recently into organic certification.

3 Aims of the thesis

The **main aim** of the thesis is an investigation of risk sources and risk management practices of cocoa producers in Ghana.

Particular aims of the thesis are following:

- to review literature about risk and risk management in cocoa production
- to prepare, conduct and evaluate interviews with cocoa farmers in a particular region in Ghana on perception of risks by farmers.
- to discuss the current practices of farmers in Ghana and the ways how these could be improved

Main hypothesis were defined as:

- The risk of diseases is a dominant factor over all other risks.
- Despite all the governments and other organizations known steps are the conditions for cocoa farmers insufficient.

Particular hypothesis are described in analytical part of the result.

4 Methodology

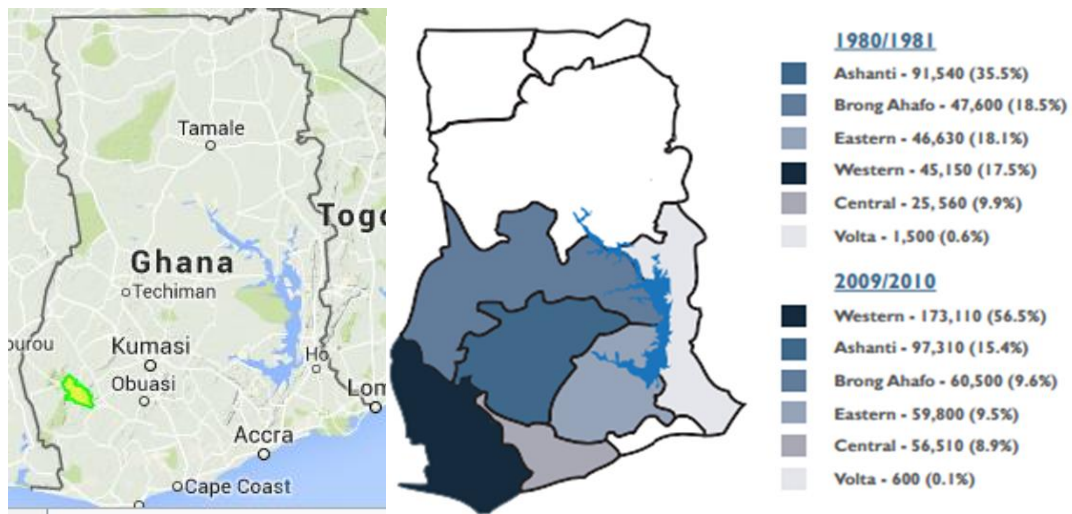
4.1 Study area

Research took place in Adiembra and Boako, the district Sefwi Wiawso that belongs to Western region of Ghana (see on Figure 5). The Sefwi-Wiawso District is one of twenty two districts in the Western Region of Ghana. The capital city is Wiawso. Total area of the Western Region 23,921 km² that is 9,6% of Ghana's total land surface. The location is in the south-western part of Ghana, bordered by Ivory Coast on the West, Central Region on the East, Ashanti and Brong-Ahafo Regions on the North and on the South by 192 km of coastline of the Atlantic Ocean.

The region has about 75% of its vegetation within the high forest zone of Ghana. The south-western areas of the region are noted for their rain forest, interspersed with patches of mangrove forest along the coast and coastal wetlands, while a large expanse of high tropical forest and semi-deciduous forest is also found in the northern part of the region. The Western Region has 24 forest reserves, which account for about 40% of the forest reserves in the country.

The area of Sefwi Wiawso is 1,280 km² that represent 7% of land area. According to the final results of Ghana's Population and Housing census, the population is 139,200 in that males represent 69,753 and females 69,447 females. Sefwi Wiawso falls within the tropical rainforest climatic zone with high temperatures throughout. The zone has also a moderate to heavy rainfall. Humidity is relatively high, which is about 90% at night falling to 75% during the day. There are two long wet seasons separated by short relatively dry season. Sefwi-Wiawso is one of the largest producers of cocoa in the Western Region and has potentials of expanding. Livestock farming is carried out on a limited scale as compared to cash crop farming.

Figure 5: Cocoa production by region



Sources: COCOBOD

4.2 Timeframe

Total time earmarked for preparation and data collection in Ghana was one month and half since 25th of June till 7th of August 2014. Theoretical preparation for data collection started in the beginning of year 2014. Questionnaire structure and composition was delineated in the same time. Final preparation started by the end of June 2014 in Ghana, when realization of research has been started. Selection of the most suitable area for data collection was done during June 2014 in cooperation with PhD candidate Ing. Momo Amadu Alhassan. Visiting selected areas and cocoa institutions were taking place in the second half of July and general observation was doing during same time as well. Collecting of data by structured questionnaires was implemented by the end of July 2014.

4.3 Research design

Selection of Adiembra and Boako, the district Sefwi Wiawso that belongs to Western region of Ghana refers the high concentration of cocoa farms in this district and also the possibility to have local support over there. Selection of mentioned area was also influenced by other significant factors as a) promising cooperation with local people and agreement of a king to do research there c) opportunity of utilization of a local interpreter d) accessibility i.e. relatively good roads to this district and to a cocoa

farms e) the fact that the most important institution leading cocoa production - Ghana Cocoa Board (COCOBOD) is located in this district.

4.4 Sample size

The sample size considered appropriate and available respondents who were willing to cooperate. Also there was necessary agreement of the king in the village to make the survey and the local interpreter because the majority of farmers do not speak English. For that reason were respondents randomly selected but farmers have to be minimum 18 years old and have to working on cocoa farms. The total size of the sample was 100 respondents. Gender distribution was almost equal, concretely 52% of respondents were males and 48% were females.

4.5 Data sources

The diploma thesis contains primary and secondary data. In a literature review that was performed before the research was used technical and scientific literature in printed and electronic form. For sources of the secondary data that created the background for primary data collection were mostly used following – Google Scholar Science Direct and the websites of Ghana Statistical Service, Ghana Cocoa Board, The International Cocoa Organization, Food and Agriculture Organization, World Trade Organization and World Bank. The primary data was created from the research in Ghana.

4.6 Data collection methods

The main objective of the survey was to determine the main risks in cocoa. First, pilot questionnaire interview was conducted on 3 respondents and then discussed with representatives of Ghana Cocoa Board. From the COCOBOD we also obtained information about production of cocoa, especially about problems with diseases and the usage of pesticides. There were not found the significant weaknesses of questionnaire. The questionnaire contains 29 questions, mainly close-ended, where the respondent had to choose the answer, open-ended as well, which gave possibility to express the own subjective points of view. There were also carried out group discussions (focus groups)

which actually emerged to be spontaneously on the side of farmers. The focus group discussion provided some additional details about the cocoa production and its risks. Questions 1-4 are descriptive and relate to general information about the farmers like gender, age, and time spending on the farm. Questions 5-9 are describing the farm (size, location, availability). The main part of the questionnaire is about problems and risks that are on farms and there are also 4 optional questions about tariffs, controlling, processing and consumption. The field and observation trips to cocoa farmers were very useful for getting more accurate information.

Surveyed data were transcribed into Microsoft Office Excel, coded and prepared for further analyzing. For analysis is used a simple calculation of frequencies to illustrate the distribution of opinions of farmers on risks and other farming problems. We used contingency table and χ^2 test to assess the relationships between characteristic of respondents and their perception of risks and problems. We used literature / theory to explain price risks which might be presented in spite of the fact that the price is fixed for all sales in the season.

5 Results

5.1 Descriptive part

This part of results is describing the most important research questions and the farmer's answers. All of these questions are shown in percentage and somewhere were allowed more than just one answer. The mentioned questions are divided into following groups – identification of farmers, characterization of farm and the description of risks and problems on cocoa farm.

5.1.1 Primary data connected to identification of farmers

These questions identify cocoa producers in a term of gender, age and the years of working on farm.

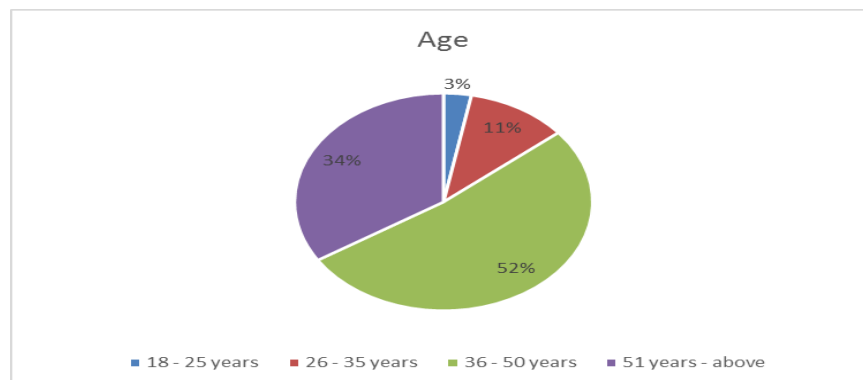
Gender distribution

The amount of male and female was almost equal. In the questionnaire was participated 48% male and 52% of female.

Age

This question was asked because there could be some differences in perception the risks between younger and elder farmers. There was one criterion the respondents have to be minimum 18 years old. From the figure 5 can be clearly seen the biggest part of all farmers is a group between 36 – 50 years with 52%. The second biggest group with 34% is created by farmers in age 51 years and above. There is quiet small number of respondents between 26 – 35 years with 11%. The lowest contribution represents youth group with 3% (see Figure 6).

Figure 6: Age of respondents

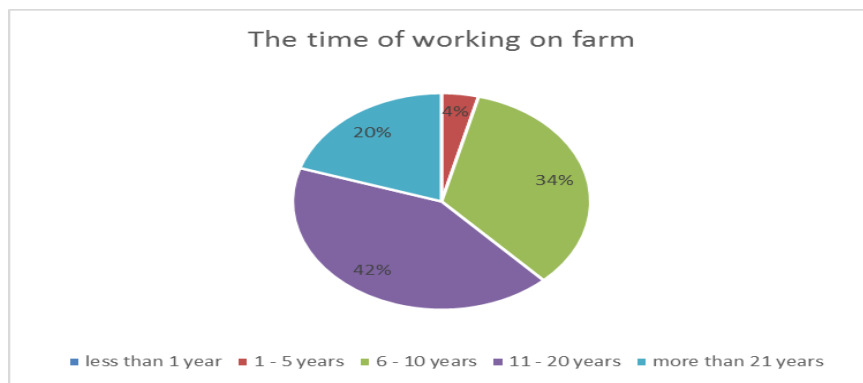


Sources: Author's research

The time of working on farm

The question about farmer's spent years on the farm was asked because there could be some differences between farmers who have more experiences on a farms than farmers who are working on the farms just a few years. This questions can be also influenced by fact that the majority of respondents was quit elder. In the following figure 7 is represented percentage of the time that the farmers are working on the farm. More experienced farmers creat bigger part of respondents, especially farmers working on the farm more than 21 years are represented by 20%, between 11 – 20 years by 42%, between 6 – 10 years by 34% and between 1 – 5 years by 4%. There is no representatives with little experience less than 4%.

Figure 7: The years of working on farm



Sources: Author's research

5.2 Primary data connected to the indentification of farm

The second part of questionnaire survey is focused on the identification of farm. There are questions about size, location and accessibility to the farm.

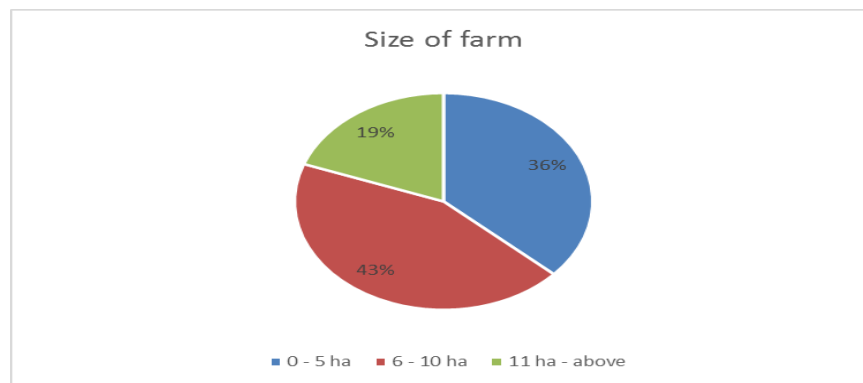
Type of farm

There were also questions about the type of farm – if there exists any influence of foreign company, here all respondents agreed they are working for a locals – Ghanaian farm and there are just local owners.

Size of farm

Figure 8 shows farm's sizes where the farmers working. Just 19% of respondents are working on a farm with a size area of more than 11 hectares. The most farmers are working on a farms with size area between 6 – 10 hectares represented 43% of all respondents. The size of farm with less than 5 hectares represents 19% of all responses.

Figure 8: Size of farm

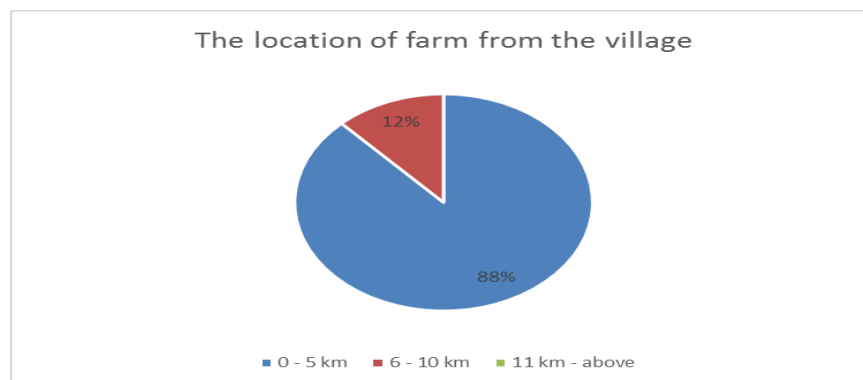


Sources: Author's research

The location of farm

This question is about distance between the farmers where they are working and where they are living – how far are located these two places from each other. The most of responders answered the farm is located less than 5 kilometers from their homes and that part represents 88%. The other part describes farmer's home locations between 6-10 kilometers far away from the farms - there were no responses with distance over 11 kilometers (see Figure 9).

Figure 9: The location of farm

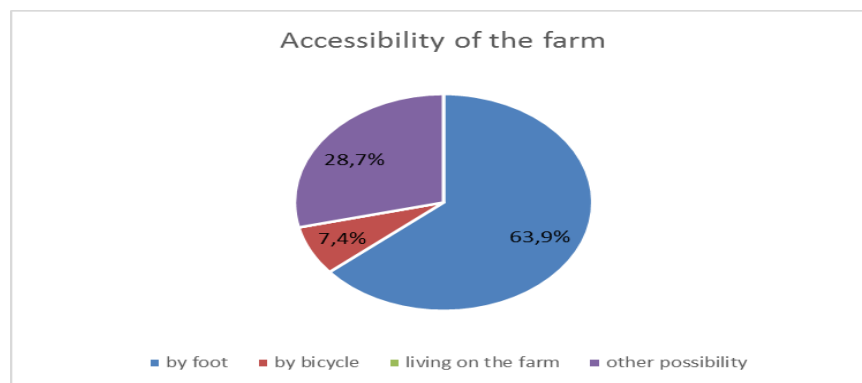


Sources: Author's research

Accessibility of the farm

Figure 10 describes the ways of transport the farmers use to get to their farms. Here can be chosen more than one way. The most preferable way is by foot with 63,9% of answers. It is also connected with the previous questions and the fact that the farms are located between 6 – 10 kilometres from their home town. For 28,7% of respondents there are also interesting the other options namely car-transport with 21,9% and motorbike by 6,8%. About 8% of the interviewed farmers also ride bicycle to their farms.

Figure 10: Accessibility of the farm



Sources: Author's research

5.3 Primary data connected to the risks and problems on cocoa farm

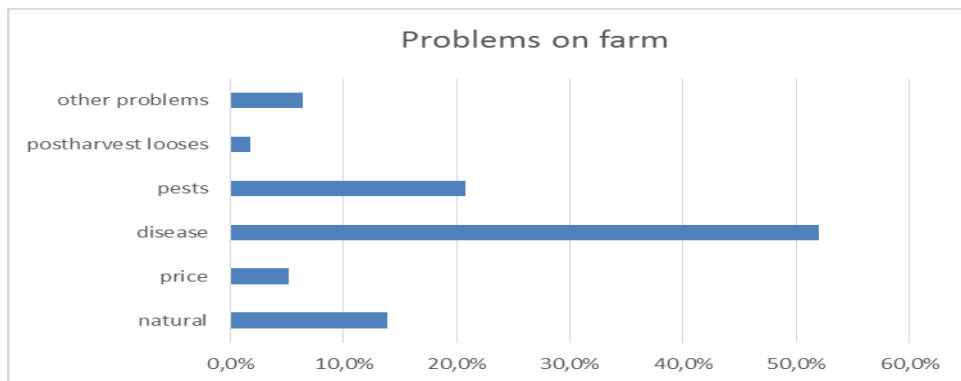
The main part of questionnaire survey is related to problems and risks on a farm. There are also some questions about consumption of cocoa in Ghana and open-ended optional questions which are focused on controlling, quotas and production of cocoa.

Problems on farm

This questions is multiple choice and investigates a range of serious problems that occur on a cocoa farms. All possible answers / predetermined problems are found on a farms but the most frequent problem with 51,4% are diseases (black pod, capsids). There are also significant problems with pests that were marked by 20,6% farmers and natural problems accounting for 13,7%. Most of Ghanaian farmers do not think there exist any bigger problems with postharvest loses (1,7%). Price risk is mentioned by

5,1% of respondents. Farmers has also problems with high grass and for that reason they must cut the grass, weeding a lot and there appears stone area. The problems with transport and financial support is also included. These mentioned problems represent 6,3%.

Figure 11: Problems on farm

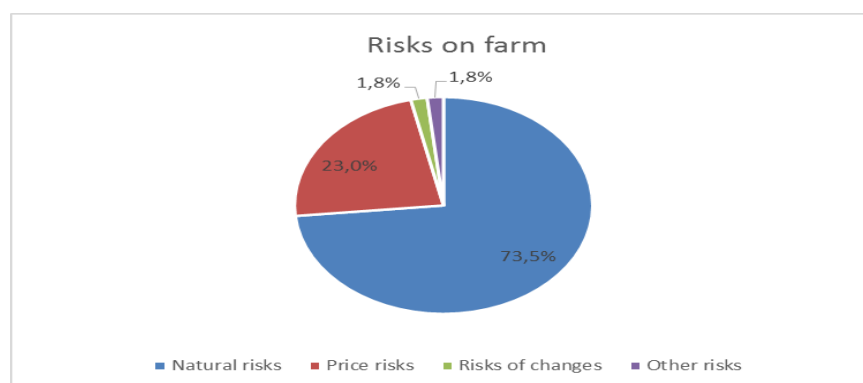


Sources: Author's research

Risks on farm

This question is about type of risks that appear on a farms. The risks are divided into three main groups – natural, price and risks of changes. Nearly $\frac{3}{4}$ of all farmers answered that there is the biggest problem with natural risks and nearly all of the rest of respondents answered that there is problem with higher prices (see Figure 12).

Figure 12: Risks on farm



Sources: Author's research

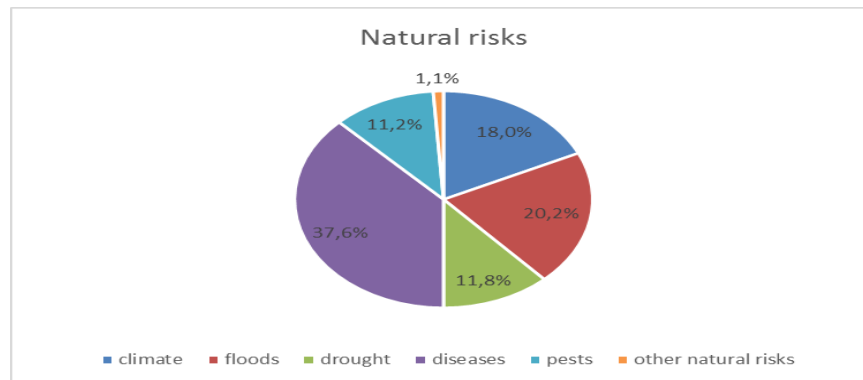
The main risk

In this question was to select just one possibility to answer i.e. was confirmed by 82% that there is main problem with natural risks and price risks represent 18%.

Natural risks

In Figure 13 are the natural risks divided into five groups – climate, floods, drought, diseases and pests. There is also mentioned other natural risks by 1,1%; it includes problems like big trees shadowing cocoa trees reducing cocoa yields, because the beans are small and often infected. Nearly half of farms (48,8%) have problems with diseases (fungal diseases and other pests are counted together). The changes of weather also influence the cocoa production – climatic effects (floods, droughts) was indicated by 18% of respondents, floods by 20,2% and drought by 11,8% (see Figure 13).

Figure 13: Natural risks

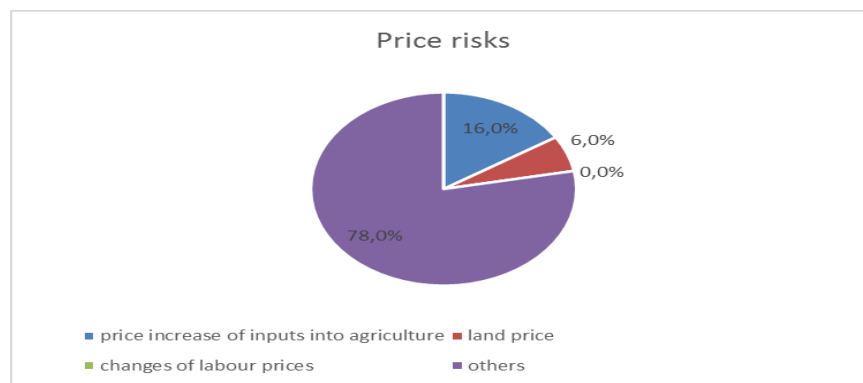


Sources: Author's research

Price risk

For most the farmers, exactly 78%, the price is not a risk because the prices are fixed. However some farmers responded that there are certain risks which influence the price. Land price was answered by 6% of respondents and input price increase by 16%. There is no answer that would be considering changes of labour prices as a risk.

Figure 14: Price risks

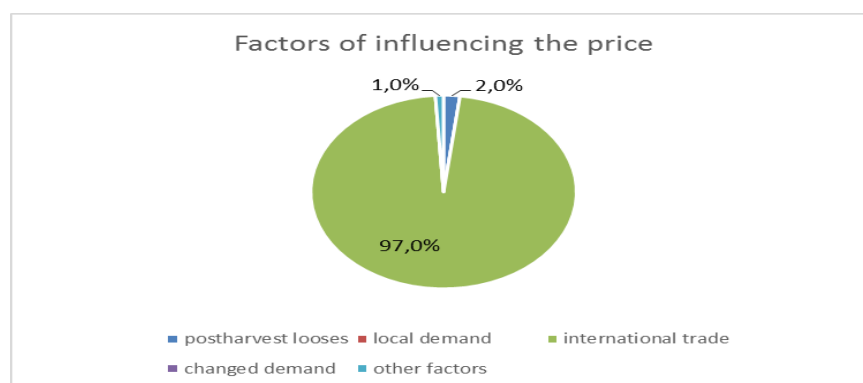


Sources: Author's research

Factors of influencing the price

On Figure 15 are shown factors that influence the price. These factors includes postharvest losses, local demand, international trade, changed demand and others. Majority of respondent (97%) agreed on international trade. This is influenced by low consumption of the local people because they can not afford it due to high prices of cocoa products for them i.e. the prices are fixed. Other option as postharvest losses were mentioned by 2% of respondents and only one answer the prices are influenced by government.

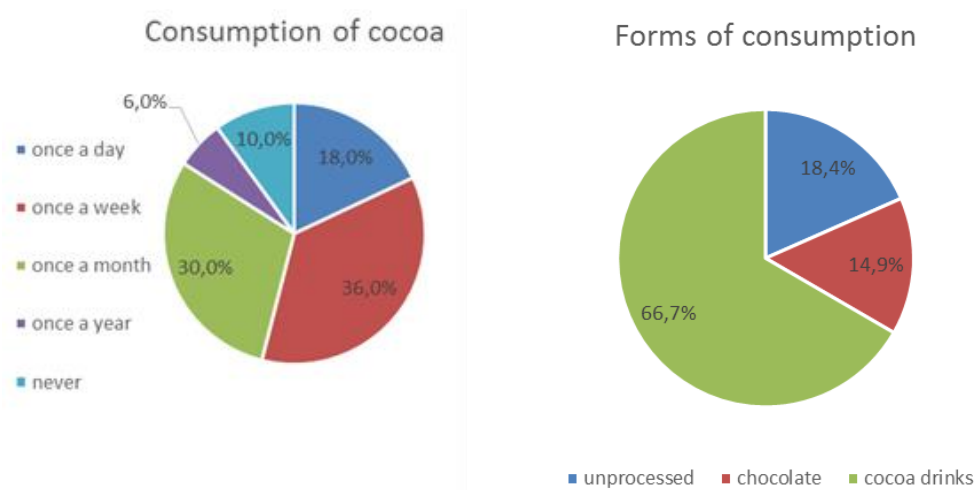
Figure 15: Factors of influencig the price



Sources: Author's research

Figure 16 describes one factor from previous Figure 15 that can influence the price and it is local demand. For that reason is mentioned consumption of cocoa and also form of consumption. But it is true that local consumption has really small influence on cocoa price risks because just 10% of all production stay in Ghana for next processing (COCOBOD). There is noticed that just 10% never tried the cocoa in any forms. The every day consumption of cocoa is represented by 18%, once a week by 36%, by 30% once a month and once a year by 6%. The majority consumed cocoa in form cocoa drinks (66,7%). There is the most popular cocoa drink named „Milo“. Others also consumed cocoa in form chocolate by 14,9% and unprocessed cocoa by 18,4%. Most of consumers expressed that they have not had enough money to buy it every day. The cocoa is too expensive for local people and it does not support the local demand but nevertheless the cocoa products are selling on local market.

Figure 16: Consumption of cocoa

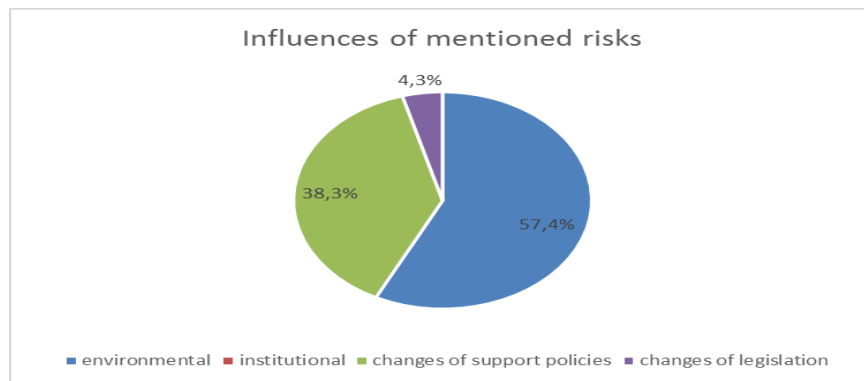


Sources: Author's research

Other risks

Figure 17 shows which other risks can influence the cocoa production. For most of farmers (57,4%) is important enviromental risks, the second place is risk connected to changes of support policies and changes of legislation has 2,3%. There is any answer with institutional risk.

Figure 17: Other risks

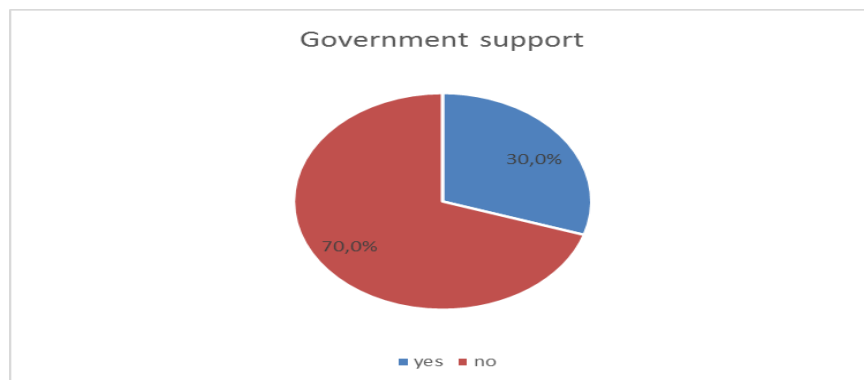


Sources: Author's research

Government support

For 70% of farmers is missing government support or the support is too small so they answered "any". For 30% responders any certain support exists in form mass spraying, application for chemicals, fertilizers for farmers and finance for fungicide. This questions is influenced by fact that the farmers think they do not have enough support for cocoa production and for that reason selected answer „no“.

Figure 18: Government support

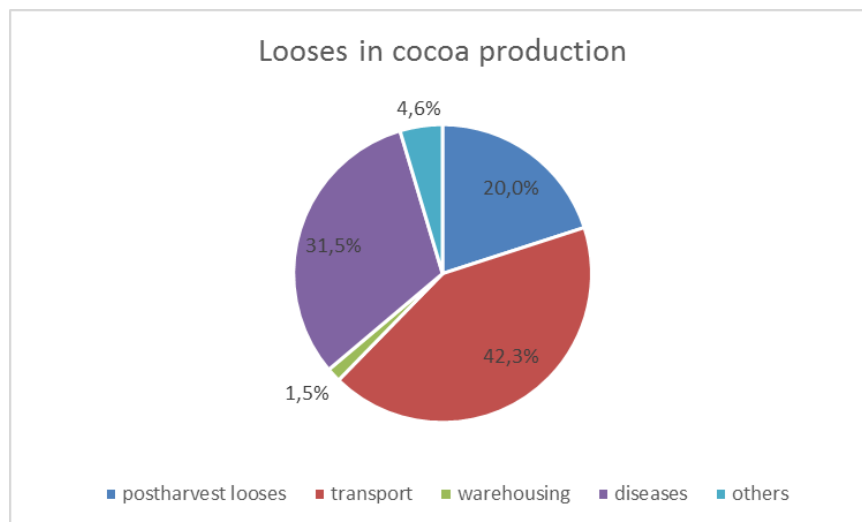


Sources: Author's research

Looses in cocoa production

The Figure 19 represents responses of farmers connected to loses in cocoa production. The farmer's loses are diseases (31,5%) then there are big loses during transportation that represents 42,3%. Other loses are in postharvest loses (20%), warehousing (1,5%) and others (4,6%) such as financial loses for farmers because the price is fixed, problem with pests, droughts and finance at all. Just one respondent mentioned that there are not any bigger loses in cocoa production.

Figure 19: The biggest loses in cocoa production



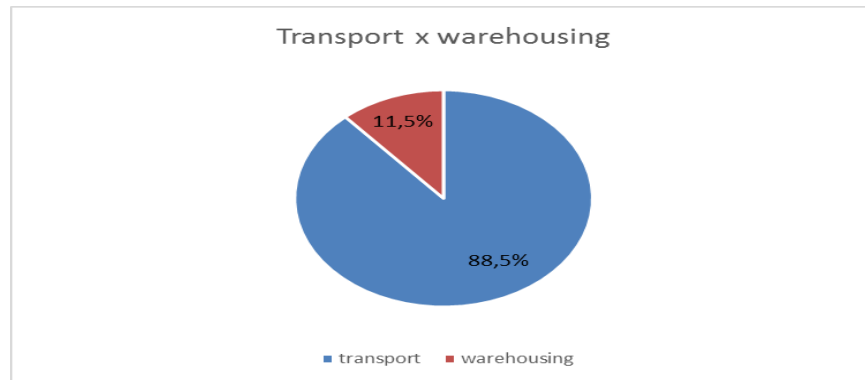
Sources: Author's research

Transport x warehousing

The Figure 20 is focused only on problems connected with transport or warehousing and confirm the previous Figure 19 that shows there is a noticeably bigger problem with transport than warehousing. The transport represents 88,5% and warehousing 11,5%. The main problem of transport is that they have to go on foot and carry cocoa on head. In many cases is too heavy for them and they have to go a long distances. They can not afford car transport because is too expensive for them. Some of the farmers have problems with finance. Others are sharing the car and use bonus system divided by 3 or 2. The main problems of warehousing are thefts, problems with drying because farmers do not have money for fertilizers and taking care about black

pod (changed cocoa beans into black) or the cocoa beans can get brown inside because there is no access of a sun. Some farmers are drying cocoa exactly on a farm or in a town and they can not complain about it. The rest of farmers, i.e. the biggest part, do not have any problem with warehousing because another company is taking care about it.

Figure 20: Problems transport x warehousing

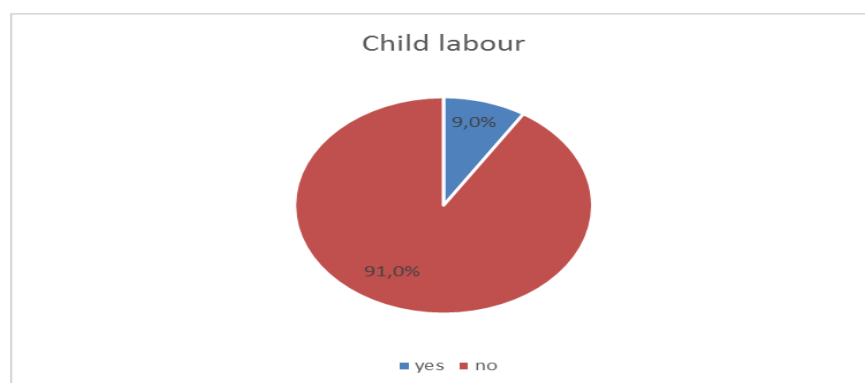


Sources: Author's research

Child labor

Figure 21 is about child labor. Total 91% of interviewed respondents do not have problem with child labor. Those who chose answer „yes“ thought about the risk in child labor in the way that the children have to go to school and that is why they could not help their parents working on a farm. These rules are set by government. But the children normally help through the weekend their parents on a farm and some of them also through week after the school ends.

Figure 21: Child labor



Sources: Author's research

5.4 Analytical part

This part is about partial hypothesis that were defined and includes relations between two indicators. The hypothesis are focused mainly on perception of risks by factors as age, gender, governmental support and some relation between mentioned factors.

Hypothesis 1 – 3 includes the main cocoa farm risk as natural and price risks. For following hypothesis 4 - 6 is chosen the other perspective of risks. After reclassification were the risks divided in two groups. The first group includes external risks like environmental, natural and price. The second group called institutional risks includes changes of price policies, subsidies and legislation. The rest two hypothesis are interested in governmental support and relation to chosen factors.

H1: Age and main farm risk are independent.

This hypothesis was rejected which means the perception of types risks depends on farmer's age. The result of testing dependency is $\chi^2 = 13,11$ and $P = 0,001$ on significance level 5%. The table 1 is showing those young farmers who have less than 35 years and they are more concerned on price risks in comparison compared to older farmers that are afraid of rather natural risks. The influence can have ambition of young farmers and better understanding cocoa policy in wide context due to better education and maybe for that reason young farmers can interest in other crop.

Table1: The dependency of age and main cocoa farm risk

age		Main cocoa farm risks		
		Natural	Price	Total
<35	obs. Freq.	7	7	14
	exp. Freq.	11,5	2,5	14
	LR	-6,9	14,3	7,4
35 to 50	obs. Freq.	43	9	52
	exp. Freq.	42,6	9,4	52
	LR	0,7	-0,7	0
50<	obs. Freq.	32	2	34
	exp. Freq.	27,9	6,1	34
	LR	8,8	-4,5	4,3
Total	obs. Freq.	82	18	100
	exp. Freq.	82	18	100
	LR	2,6	9,1	11,7

Sources: Author's research

H2: Governmental support and the perception of risks are independent.

This hypothesis can not be rejected. Governmental support does not depend on the perception of risks. The result of testing dependency is $\chi^2 = 0,116$ and $P = 0,773$. For more details see Annex 1. Due to negative answers of farmers when the government does not support cocoa producers by 70% was included dissatisfaction with the steps of government to face the main problems on the farms.

H3: The perception of risks does not depend on the gender of respondents.

This hypothesis can not be rejected. The perception of cocoa farm risks and the gender of respondents are independent. These risks involves price and nature risks. The result of testing dependency is $\chi^2 = 0,111$ and $P = 0,739$ (see Annex 2).

H4: Age and the perception of risks are independent.

The hypothesis 4 can not be rejected. There is no dependency among the perception of institutional and external risks and gender of farmers. (see Annex 3).

H5: Gender of respondents and the perception of risks are independent.

The hypothesis is rejected according to χ^2 value at the significance level 5%. The result of testing dependency is $\chi^2 = 5,21$ a $P = 0,022$. There exists gender dependency on the perception of external and institutional risks. Table 2 shows that women are more afraid of changes of policies and legislation than men.

Table2: The dependency of gender on the perception of risks

Gender		Type of risks		
		External	Institutional	Total
male	<i>obs. Freq.</i>	28	23	51
	<i>exp. Freq.</i>	33,3	17,7	51
	<i>LR</i>	-9,7	12	2,3
female	<i>obs. Freq.</i>	34	10	44
	<i>exp. Freq.</i>	28,7	15,3	44
	<i>LR</i>	11,5	-8,5	3
Total	<i>obs. Freq.</i>	62	33	95
	<i>exp. Freq.</i>	62	33	95
	<i>LR</i>	1,8	3,5	5,3

Sources: Author's research

H6: Being beneficiary of the support and the perception of risks are independent.

The hypothesis is rejected according to χ^2 value on significance level 5%. The result of testing dependency is $\chi^2 = 5,31$ a $P = 0,021$. There exist dependency between beneficiary of the government support and external or institutional risks. Beneficiaries are more afraid of changes of policies and legislation (see Table 3). It can be influence by satisfaction of beneficiaries by government support in form of subsidies or price policy and they can afraid some changes.

Table3: The dependency of the government support and risks

Beneficiary of the govt. support		Type of risks		
		External	Institutional	Total
No	obs. Freq.	48	18	66
	exp. Freq.	43,1	22,9	66
	LR	10,4	-8,7	1,7
Yes	obs. Freq.	14	15	29
	exp. Freq.	18,9	10,1	29
	LR	-8,4	11,9	3,5
Total	obs. Freq.	62	33	95
	exp. Freq.	62	33	95
	LR	2	3,2	5,2

Sources: Author's research

H7: Gender of respondents and receiving governmental support are independent.

The hypothesis is rejected according to χ^2 value on significance level 5%. The result of testing dependency is $\chi^2 = 7,814$ a $P = 0,005$. There is a relation between gender and receiving governmental support. Women-farmers receive more support than men-farmers that is shown on Table 4.

Table4: The dependency of gender on receiving governmental support

Beneficiary of the govt. support		Gender		
		Male	Female	Total
No	obs. Freq.	30	40	70
	exp. Freq.	36,4	33,6	70
	LR	-11,6	13,9	2,3
Yes	obs. Freq.	22	8	30
	exp. Freq.	15,6	14,4	30
	LR	15,1	-9,4	5,7
Total	obs. Freq.	52	48	100
	exp. Freq.	52	48	100
	LR	3,5	4,5	8,1

Sources: Author's research

H8: Age of respondents and receiving governmental support are independent.

The hypothesis is rejected according to χ^2 value on significance level 10%. The result of testing dependency is $\chi^2 = 5,058$ a $P = 0,08$. There is a weak association between age and governmental support. On table 5 is shown that the middle category, farmers between 35 – 50 years, differ from other two. There are probably pessimistic about the governmental support and the influence on it can have enough experience together with education to evaluate the current situation.

Table5: The dependency of age and receiving governmental support

Beneficiary of the govt. support		age			Total
		<35	35 to 50	50<	
No	obs. Freq.	7	41	22	70
	exp. Freq.	9,8	36,4	23,8	70
	LR	-4,7	9,8	-3,5	1,6
Yes	obs. Freq.	7	11	12	30
	exp. Freq.	4,2	15,6	10,2	30
	LR	7,2	-7,7	3,9	3,4
Total	obs. Freq.	14	52	34	100
	exp. Freq.	14	52	34	100
	LR	2,4	2,1	0,4	5

Sources: Author's research

6 Discussion

The first main hypothesis says that the risk of diseases is dominant over all other risks. The result of dependency testing shows that for mainly part of cocoa farmers respondents are diseases significant problem compared to others. Black pod diseases was chosen as the most significant and on the second place is capsids. “Black pod disease is the most destructive of a number of diseases, which attack the developing or ripening cocoa pod” agreed various authors like for example Anim-Kwapong, Frimpong, 2006, Asante-Poku, Angelucci, 2013 and Kolovalli, Wigneri, 2011. Capsids are sucking insects that make cocoa difficult to establish and can cause tree death. The research of World Bank adds the third place with swollen shoot virus disease. The interviews with representatives of Ghana Cocoa Board just confirmed big problems with diseases, especially with already mentioned ones. This hypothesis is confirmed because of mentioned arguments from primary and secondary data collection.

The diseases are closely related to weather and climate because of high sensitivity of cocoa to climate changes mainly in form floods or droughts. There are three main technological approaches to reduce the risk of diseases and pests largely available from 1999 (Gockowski, Sonwa 2007) (Kolavalli, Vigneri, 2011). These are: i) increased use of fertilizers, ii) the adoption of cocoa hybrid varieties and iii) the greater control of pests and diseased trees. Farmers use mass spraying system for protection coca trees what is provided by the Cocoa National Disease and Pest Control Committee. This program is supported by COCOBOD. The research shows that the Cocoa producers are not satisfied with spraying the pesticides because it is not effective due to small range of application and they do not have enough money for more sprays. Nevertheless the study by CSAE shows that the initial design of the Ghana Strategy Support Programme from 2005 was successful but it is confirmed that inconsistent use of fertilizer remains a common problem in the cocoa sector in Ghana.

Due to previous mentioned factors it is necessary to make any others protection because the diseases remain then main problem for cocoa producers, especially for cocoa tree hybrid. This hybrid has large yields of cocoa but is vulnerable to cocoa diseases and thus needs more application of pesticides than the traditional species. According to our results effective information system of the spreading of diseases and

with recommendations for actions (plant protection advisory system) is lacking or inefficient. It is highly recommended to make some good information system including early warning for the government and farmers. In this way, should be reduce the amount and diseases and also decrease necessary amount of pesticides. According Asante-Poku and Angelucci the limitation is also seen in the partial information on the amount of fertilizer and pesticide subsidy given to farmers by the COCOBOD. This is confirmed by our research that some farmers have lack of knowledge about the support of the government.

The dependency testing shows that age or experiences of farmers have relation with perception of risks, in this case with natural and price. The young farmers up to 35 years are more concerned with price risks than the older farmers. This result can be influence by less working experiences on cocoa farm or by more motivation to discuss about problems due to education and due to trying to reach higher profit. Nevertheless that the farmers don't evaluate the price risk as significant as natural risk is given by fixed price while undervaluing the effect of inter seasonal price changes and limited or no capacity of output price adjustment if input prices rise, These limits (risks) are perceived by young farmers.

Young farmers up to 35 years see also limitation in transport system and transport costs that contributes to the costs at farm level by 25% (FAO, 2013). Particularly, the car transport is expensive and because of it lot of farmers have to carry cocoa produce on their head. In many cases they have to pass long distances before they reach a collection point of a Licensed Buying Company. Farmers in general have no problem with warehousing because LCB mostly take care about it. In rear cases thefts of cocoa production can happen or the cocoa gets brown because of no access of the sun in warehouse.

Due to mentioned risks is recommended to support accessibility of cocoa farms and by this way also the transport for cocoa producers. In general is necessary to improve infrastructure and provide organized collection on farms. It is true that the COCOBOD has cocoa value chain at good level but it will be more profitable if they minimize mentioned losses.

The second main hypothesis says that despite all the governments and other organizations known steps are the conditions for cocoa farmers insufficient. The government support and perception of natural risks or price risks are independent but exist dependency between government and external or institutional risks. Beneficiaries of the government are more afraid of changes of policies and legislation. Women are more afraid of changes of policies and legislation than men despite that that have receive more support than man. The age group between 35 – 50 years is different from rest. They are probably pessimistic about the governmental support and the influence on it can have enough experience together with education to evaluate the current situation. This hypothesis is confirmed due to research and χ^2 test.

7 Conclusion

Ghana Cocoa represents the main exporter commodity and covers together with Cost Ivory 60% of global production. Nevertheless the agriculture sector is risky and is necessary to face to main risks. Despite the leading position of Ghana is still necessary some innovation to maintain among three main cocoa producers. Nearly 60% of cocoa trees are of species hybrid.

The main aim of the thesis was to identify major risks for cocoa producers in Ghana and to identify the protections the farmers and the government use or should use against mentioned risks. The research shows that the natural risk is significant. Cocoa producers have mainly problem with diseases and pests connected with changing of climate through floods or drought. Price is not as significant as natural risk but there is still some dependency between age and perception these. Transport is also a significant risk compare to warehousing due to transport costs and long distances for cocoa producers.

Government provides through the Cocoa National Disease and Pest Control Committee control of the diseases and support the cocoa producers by mass spraying that is free of charge for producers but the research showed that it is not sufficient and farmers do not afford to invest to fertilizers more. Ghana Cocoa Board is also interested in reducing the transports cost that can be really threaten in situation that the price of cocoa decreased rapidly. The price of cocoa is defined annually by beginning season in October through Forward.

Finally the main recommendation is to create information support due to lack of information about the diseases. It should also contain current information about spread of diseases that can be useful due to minimize the risk.

8 References

ANIM-KWAPONG, G.J. and FRIMPONG, E.B. *Vulnerability of agriculture to climate change- impact of climate change on cocoa production*. [online]. 2006 [cit. 2014-05-18]. Available from WWW: <http://www.nlcap.net/fileadmin/NCAP/Countries/Ghana/COCOA_DRAFT_FINAL_REPORT.pdf>

ASANTE-POKU, A. and ANGELUCCI, F., *Analysis of incentives and disincentives for cocoa in Ghana*. MAFAP, FAO. [online]. 2013 [cit. 2014-12-18]. Available from WWW: <http://www.fao.org/fileadmin/templates/mafap/documents/technical_notes/GHANA/GHANA_Technical_Note_COCOA_EN_Apr2013.pdf>

Claire Schaffnit-Chatterjee. *Risk Management in Agriculture*. In: Deutsche Bank Research. 17.9. 2010 [cit. 2014-11-29]. Available on WWW: <http://www.expedition-d.de/PROD/DBR_INTERNET_DE-PROD/PROD0000000000262553.pdf>

COCOBOD. *43rd Annual Report & Financial Statements for the Year Ended September 2012* In: Annual reports. September 2012 [cit. 2014-11-29]. Available from WWW: <<https://www.cocobod.gh/>>

DUCHÁČKOVÁ, E. *Principy pojištění a pojišťovnictví*. 2. vydání. Praha: Ekopress, 2005. 178 s. ISBN 80-86119-92-0.

EDWIN, J. and MASTERS. W.A. *Genetic Improvement and Cocoa Yields in Ghana*. Working Paper, [online]. 2003 [cit. 2014-10-18].

FAO: *Managing risk in farming*. 2008 [cit. 2014-11-10]. Available from: <<http://www.fao.org/uploads/media/3-ManagingRiskInternLores.pdf>>

GAIN: *Cocoa Annual report*. 2012 [cit. 2014-12-10]. Available from: <http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Cocoa%20Report%20Annual_Accra_Ghana_3-15-2012.pdf>

Ghana Statistical Service. *Gross domestic product*. [online]. 2014 [cit. 2014-12-10]. Available from: <<http://www.statsghana.gov.gh/docfiles/GDP/GDP2015/2014%20Q3%20Annual%20GDP.pdf>>

Ghana Statistical Service. *Population and Housing Census Summary Results of Final Report*. [online]. 2012 [cit. 2014-12-10]. Available from: <http://www.statsghana.gov.gh/docfiles/2010phc/Census2010_Summary_report_of_final_results.pdf>

GOCKOWSKI, J. and SONWA, D. *Biodiversity conservation and smallholder cocoa production systems in West Africa with particular reference to the Western Region of Ghana and the Bas Sassandra region of Côte d'Ivoire*. ODI. [online]. 2007 [cit. 2015-02-02]. Available from: <<http://www.odi.org.uk/events/2007/11/19/434-paper-discussion-biodiversity-conservation-smallholder-cocoa-production-systems-west-africa.pdf>>

GREGA, L. *Vertical Integration as a factor of competitiveness of agriculture*. Agriculture Economics. [online]. 2003 [cit. 2015-01-10].

GRINSVEN, P. and TOLEDANO, J. *Agricultural Risks in the Cocoa Sector*. [online]. 2009 [cit. 2015-02-02]. MARS. Available from: <<https://www.agriskmanagementforum.org/sites/agriskmanagementforum.org/files/Documents/Peter%20VanGrinsven%20MARS%20Oct%202009.pdf>>

CSAE: *Fertile Ground: Boosting Cocoa Production among Ghanaian Smallholders* [online]. 2009 [cit. 2015-03-02]. Available from: <

<http://www.csae.ox.ac.uk/output/briefingpapers/pdfs/CSAE-briefingpaper-01-Ghanacocoa.pdf>>

GSSP: [online] 2005 [cit. 2015-01-02]. Available from: <<http://gssp.ifpri.info/>>

HARDAKER, J. B. *Income insurance in European agriculture*. Brusel/Belgie: EC Reports and studies, 1999. ISBN 92-828-6755-2

HNILICA, J. a FOTR, J. *Aplikovaná analýza rizika ve finančním managementu a investičním rozhodování*. Praha: Grada, 2009. 262 s. ISBN 978-80-247-2560-4.

ICCO. [online]. 2012 [cit. 2014-10-02]. Available from: <<http://www.icco.org/>>

ICCO. *Pests and Pathogens Workshop April 2013 Accra* [online]. 2013 [cit. 2014-17-02]. Available from: <http://www.icco.org/about-us/international-cocoa-agreements/cat_view/30-related-documents/34-pests-and-diseases.html>

Institut africain pour le développement économique et social B.P. 8008, Abidjan, Côte d'Ivoire. *Cocoa*. 1.vyd., FAO,1977, 37 s. ISBN 92-5-100623-7
<<http://www.fao.org/3/a-ad220e/AD220E01.htm#ch>>

KOLAVALLI, S. and VIGNERI, M. *Cocoa in Ghana: Shaping the success of an Economy*. WORLD BANK. [online]. 2011 [cit. 2015-02-02]. Available from: <http://siteresources.worldbank.org/AFRICAEXT/Resources/258643-1271798012256/YAC_chpt_12.pdf>

KYBAL, Jan; KAPLICKÁ, Jiřina. *Naše a cizí koření*. Praha: Státní zemědělské nakladatelství, 1988. Kapitola Kakaovník pravý, s. 202.

MICHALEC, Zdeněk. *Člověk a rostliny*. 1. vyd. Praha : Edice Kotva-Práce, 1977. 269 s.

MOHAMMED, D., ASAMOA, D. and ASIEDU, A. F. *Cocoa Value Chain - Implication for the Smallholder Farmer in Ghana*. SWDSI. [online]. 2011 [cit. 2015-02-04]. Available from: <http://www.swdsi.org/swdsi2012/proceedings_2012/papers/Papers/PA157.pdf>

NOVÁK, Jan. *Plody našich i cizokrajných rostlin*. 1. vyd. Praha : Grada Publishing, a.s., 2005. 96 s. ISBN 80-247-1251-2

SHEPHERD, A.W., and FAROLFI, S. . 1999. *Export Crop Liberalization in Africa*. FAO. [online]. 1999 [cit. 2014-11-10]. Available from: <[Rome.ftp://ftp.fao.org/docrep/fao/012/x1214e/x1214e00.pdf](http://ftp.fao.org/docrep/fao/012/x1214e/x1214e00.pdf)>

SMEJKAL, V., RAIS, K. *Řízení rizik*. 1. vydání. Praha: Grada Publishing, 2003. 272 s. ISBN 80-247-0198-7.

VALÍČEK, Pavel. *Užitkové rostliny tropů a subtropů*. 1. vyd. Praha : Academia, 1989. 420 s. ISBN 80-200-0000-3.

WORLD BANK: *Supply Chain Risk Assessment: Cocoa in Ghana*. 2011[cit. 2014-04-10]. Available from: <<https://www.agriskmanagementforum.org/doc/supply-chain-risk-assessment-cocoa-ghana>>

FARMD. *Managing risk in Farming*. 1999 <https://www.agriskmanagementforum.org/sites/agriskmanagementforum.org/files/Documents/managing%20risks%20in%20farming%20USDA_0.pdf>

9 Annexes

List of Annexes

Annex 1: The dependency of the government support and the perception of risks...	65
Annex 2: The dependency of gender on the perception of main risks.....	65
Annex 3: The dependency of gender and risks	66
Annex 4: Drying cocoa	66
Annex 5: Cocoa tree and black pod disease.....	67
Annex 6: Questionnaire survey and focus group discussion	67

Annex 1: The dependency of the government support and the perception of risks

Beneficiary of the govt. support		Main cocoa farm risks		
		Natural	Price	Total
No	obs. Freq.	58	12	70
	exp. Freq.	57,4	12,6	70
	LR	1,2	-1,2	0
Yes	obs. Freq.	24	6	30
	exp. Freq.	24,6	5,4	30
	LR	-1,2	1,3	0,1
Total	obs. Freq.	82	18	100
	exp. Freq.	82	18	100
	LR	0	0,1	0,1

Sources: Author's research

Annex 2: The dependency of gender on the perception of main risks

Gender		Main cocoa farm risks		
		Natural	Price	Total
male	obs. Freq.	42	10	52
	exp. Freq.	42,6	9,4	52
	LR	-1,3	1,3	0,1
female	obs. Freq.	40	8	48
	exp. Freq.	39,4	8,6	48
	LR	1,3	-1,2	0,1
Total	obs. Freq.	82	18	100
	exp. Freq.	82	18	100
	LR	0	0,1	0,1

Sources: Author's research

Annex 3: The dependency of gender and risks

Gender		Type of risks		
		External	Institutional	Total
male	obs.			
	Freq.	28	23	51
	exp.			
	Freq.	33,3	17,7	51
	LR	-9,7	12	2,3
female	obs.			
	Freq.	34	10	44
	exp.			
	Freq.	28,7	15,3	44
	LR	11,5	-8,5	3
Total	obs.			
	Freq.	62	33	95
	exp.			
	Freq.	62	33	95
	LR	1,8	3,5	5,3

Sources: Author's research

Annex 4: Drying cocoa



Sources: Author's research

Annex 5: Cocoa tree and black pod disease



Sources: Author's research

Annex 6: Questionnaire survey and focus group discussion

