



# **Unpacking the black box of households in times of climate change**

**A TYPOLOGY OF LIVELIHOODS ADAPTING TO CLIMATE CHANGE IN RURAL AREAS  
IN NORTHERN GHANA**

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*June, 2015*



## Colophon

### Title

*'Unpacking the black box of households in times of climate change':*

A typology of livelihoods adapting to climate change in rural areas in northern Ghana.

### Image title page

*'A Ghanaian girl carries water in the northern city of Tamale'* (Finbarr O'Reilly/Courtesy Reuters, 2008). Retrieved on 2 March 2015, from <http://blogs.cfr.org/development-channel/2013/06/28/water-hauling-and-girls-education/>

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## Preface

The start of each research, particularly the start of the Master Thesis, is a very an iterative and complex process full of brainstorming and decision-making. During my bachelor - and master Human Geography many interesting (geographical) topics were discussed. Sustainable development, multiculturalism, globalising cities, geopolitics of borders, rural-urban contradictions, terrorism, migration and mobility, water hegemony, social cohesion and climate change is just a very small selection of the various interesting geographical concepts and approaches discussed in the past five years. The choice for the topic of my Master Thesis fell on one of the most currently interesting (according to me) geographical processes: adaptation to climate change. More specific the extent to which people are able to adapt to irregular rainfall, droughts, floods, rising temperatures etcetera in developing areas. The relation between human beings and their climatic environment repeatedly wonders me, especially how the interaction between both behaves, how we use the climate and how we try to control the climate. This extensive interest eventually led to choice for this topic. I went for this research to the northern part of Ghana in the summer on 2014. This three-month trip not only enriched my necessary professional expertise, but also influenced the approach of facing dilemma's, contradictions and situations in general. At the same period of the fieldwork in the Savelugu-Nanton district did I also do my internship at Royal HaskoningDHV in Accra. A lot of knowledge and working experiences were gathered during my internship at this company. I would like to thank the employees of Royal HaskoningDHV and in particular Willem Kroonen and Herman de Jonge, for giving me the opportunity to do research in Ghana. Furthermore, I would also like to thank my thesis supervisor from the Radboud University, Lothar Smith, for his ideas, inexhaustible knowledge and, most important, his support. I would also like to thank Peter Walraven and Luuk Robers, who invested a lot of time in this master thesis, for their important contributions and critical views. Finally, I would like to thank all the respondents and the field workers in northern Ghana. In particular, Francis Jarawura, who helped me greatly in during my research in Ghana.

Happy and, hopefully, profitable reading,

Lotte den Boogert

June, 2015



*'Evidence is fast accumulating that, within our children's lifetimes, severe droughts, storms and heat waves caused by climate change could rip apart societies from one side of the planet to the other'*

– Thomas Homer-Dixon, 2007–



## Summary

This study is performed in order to contribute to a more comprehensive understanding of adaptation strategies regarding climate change and the impact of these adaptation strategies on people's livelihoods in rural areas in Northern Ghana. The farmers in the northern part of Ghana suffer from the negative consequences of climate change like irregular rainfall, high temperatures, lots of droughts throughout the year and frequently floods. Former studies have shown several response strategies to these climatic challenges in general yet little is known about the adaptation strategies in the northern part of Ghana. This research investigates the relationship between climate impacts (droughts and floods) and adaptation strategies like migration, diversification and communal pooling. More specifically how households do make their decisions under climate-induced conditions in the villages of Moglaa and Yong in the Savelugu-Nanton district in northern Ghana. In order to investigate this, the following question is central in this study: *What different adaptation strategies to climate change do households in rural areas in the Savelugu-Nanton district, northern Ghana, employ?*

In order to answer the main question and the several sub questions of this research a number of theoretical concepts are applied to the two case studies. The adaptation strategies of local households and/or their strategy to reduce the vulnerability of biological systems to climate shocks are analyzed by the five adaptation practices of Mearns and Norton (2010). Their practices include mobility, storage, diversification, communal pooling and market exchange as key concepts in this study linked to the theoretical concept of livelihoods. This study has been performed by examining the farmer's perceptions on climate change impacts, the reasons for adaptation to become less vulnerable to climate and the various manifestations of climate-related adaptation focused on households as unit of analysis.

Study results show that farmers do value climate change effects like an increase in irregular rainfall, higher temperatures, and increasing droughts and – floods in the same manner as the IPCC does in this area. Nonetheless, while the experienced effects of climate change by both the IPCC and local respondents is rather similar, the appointed reasons behind climate change differs between both. Farmers attribute droughts, floods and irregular rainfall to three main factors; human activities (for instance the deforestation and bushfires), the inability of farming practices (an example is farming close to water log areas) and religious reasons (such as the natural powers or caused by god). Despite some irrational explanations for climate change farmers act mainly rationally to the changes in their area. Understanding the perceptions of respondents is important because of the fact that a farmers' perception on climate change impacts influences the adoption of livelihood adaptation strategies.

The analysis of this research shows the two most commonly used adaptation strategies in the research area, namely migration and diversification. Migration is used by the farmers as an adaptive response to climate change, especially a response to the increasing drought in an area. About half of the respondents knew someone in their household who migrated or migrated self. A lot of these respondents mentioned climatic changes like droughts, floods and a poor harvest as reason to migrate. In addition to this outcome, the study reveals climatic-related migration to be partly influenced by socio-demographic factors (for instance the size of the household, age of the household members and the gender of the respondent) and geographical factors (for example push – and pull factors, keep – and repel factors and the distance to a city). The adaptation strategy migration occurs mainly seasonally; seasonal migration to urban places during the dry season to find



another non-farming job or seasonal migration to other rural areas to explore farming activities somewhere else. The main reason for the migration of several members within one household is to be more secure of income. Households often receive remittances from related migrants and have to depend less on positive weather conditions regarding their farming activities. The migration of members of households has large effects on the livelihoods of the remaining people in the household. The processes of the increasing seasonal migration, dependency on remittances and migration of young people raises questions about the sustainability of the livelihoods. A corollary of this research is to do more research on the perception of the migrant and the migrant's motives to migrate in times of climate change. What are the motivations of migrants and what role do household play in the process of migration. Furthermore this research recommends more study towards the rise of a 'migration culture' and the consequences of a changing household composition after the departure of the migrant. Following these recommendations one could find out how sustainable livelihoods remain after migrating household members.

The second noticed adaptation strategy in a response to climate change is the 'diversification' of livelihoods in a farming and non-farming way. One aspect that is coming forward in this study is the changeover from an entire agricultural existence into a non-farming livelihood, called deagrarianisation. The prospect of a secure income compiled out of non climate depending jobs as well attracts people to diversify their income by different farming - and non-farming activities. A diversification of the household income is mostly realized by using migration as adaptation strategy. Several members of the household are selected to migrate in order to enhance and assure the household income. Another often used non-farming adaptation strategy is the diversification of jobs. Many respondents had besides their income, derived from farming activities, another income generating job too, usually of life importance. The diversification of crops, the diversification of farming techniques and the diversification in production technologies is often mentioned by farmers in order to cope with the climatic changes. One of the main recommendations of this research is that the concepts of mobility and diversification should be integrated and not be discussed separately. That both concepts overlap and that households use both migration and diversification to adapt to their livelihood fulfills a leading role throughout this study. Not a single household consisted of members that migrated in order to adapt the failed agriculture only. Neither there was a household where just diversification as adaptation strategy was used.

The third process in this study is the continuity of the household in the Savelugu-Nanton district (known as the practice communal pooling). Sharing, helping and cooperating are important aspects in times of crop failure, low yield and difficult farming conditions. Maintaining people's networks was found to be one of the most important aspects in order to be able to survive climate change. Nonetheless, the importance of high social capital as adaptation strategy raises some highly necessary questions as well; to what extent is this adaptation strategy a sustainable solution to climate change? Are the relationships resistant to multiple years of climate change impact? Will there be no fragmentation between the members of the households or between the households themselves? In order to answer this questions this study needs further research to be able to establish an overview of the perceptions of migrants, how do they look towards other members of the household and how other members of the household view the migrants. To conclude adaptation to climate change impact in northern Ghana is takes places to a large extent and in totally different ways. Especially migration, diversification and communal pooling are the adaptive livelihood strategies that locals deploy.

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## Chapter 1: Introduction

Mariama Yalwa, 65 years old, has lived her entire life in a small farming village in northern Ghana. The old lady is living with her son and his nine other family members in one compound house. Mariama is retired but is able to stay alive through the farming activities of her son. Her son, however, has not been able to harvest any maize, groundnuts or rice in the last three years because of changing climatic conditions in their village. *'The rainfall has changed'* (Mariama Yalwa, 13 July 2014). The increasing irregular rainfall patterns and the decreasing amount of rainfall are striking and are currently changing their environment. The increasing heat, the growing hours of intense sunshine and the rising number of droughts during the rainy season create an even tougher environment to survive for farmers, with crop failure, soil degradation and many more problems as a result. *'This is not the time for sunshine, because of the lack of rain, the sun has taken over the season and all are suffering under its intense radiation and heat'* (Mariama Yalwa, 13 July 2014). She and her son's family do not have the agricultural resources to adapt to these environmental changes, which makes them vulnerable to - and dependent on - the climatic conditions. *'When the harvest fails again this year, my family and I will not make it another year'* (Mariama Yalwa, 13 July 2014). The future does not look good for them at all considering the fact that the rainy season of 2014 is almost over, the fact that they did not have any of their crops growing well and the prospects of more climate changes in this area of Ghana in the future. This makes the adaptive behavior to climate changes of Mariama and her son's family a highly relevant and a contemporary topic for research in order to help these people with their farming livelihoods in a changing environment.



Figure 1. Mariama Yalwa (Yong, 13 July 2014).



## 1.1. Climate change impact in Africa

*'Climate change is one of the most important global environment problems with unique characteristics'* (Ravindranath & Sathave, 2002, p. 247). It has become increasingly apparent that world environments have been subject to frequent and massive changes during the course of the latest period of geological time, the Quaternary. Even in the past 20,000 years the overall temperature has been rising; the size of the glaciers has been reduced to one-third; the ocean levels raised over a hundred meters, causing flooding of low-lying areas and other devastation; the land unburdened from the weight of overlying ice, has locally risen by several hundred meters, causing earthquakes: desert had advanced and created more droughts; inland lakes have flooded and shrunk (Goudie, 2001, p. 65; Winkler, 2005). If climate change continues at this rate, it will have a major influence on communities and people. They will have to adapt to the changes in their environment caused by the changing climate (McCarty, 2001).

*'Climate change is widely recognized and will become a more serious problem in the near future'* (Sawai et al, 2014, p. 432). According to the Intergovernmental Panel on Climate Change (IPCC) the global mean surface temperature will rise from 0.3°C to 4.8°C in the year 2100, causing different climatic changes (IPCC, 2013). Mertz et al. (2009) sheds light on the fact that the general impact of these climatic changes will cause more severe problems in poor developing countries than in more developed countries. Numerous reasons can be given for this: the physical impact of climate change are expected to be relatively big in several developing regions; many developing countries rely heavily on agriculture, which will directly be affected by climate change; the large number of poor people, whom are in general more vulnerable to the negative effects of climate change and the economic and the technical capacity of these vulnerable people to adapt to climate change is very limited (Winkler, 2005). In order to reduce the impact of climate change and the vulnerability of people in developing countries, research on 'adaptation strategies and the determination of the effectiveness of the various strategies' is needed. The IPCC Fourth Assessment Report (AR4) states that adapting to climate change is the key to survive its impacts (IPCC, 2007). A proper adaptation strategy can minimize the impact of climate change (Sawai et al., 2014).

Africa is one of the most vulnerable continents to climate change and climatic variability's (Boko et al., 2007). The vulnerability is primarily caused by the high number of developing countries that are located in this continent. Africa has the largest number of developing countries in the world, 53 African countries are defined as 'developing country' according to their Gross National Income (GNI) per capita per year (World Bank, 2012). Furthermore, the impact of climate change on Africa is likely to be more severe than the impact on other continents in the world (IPCC, 2007). Primarily because there is evidence that the surface temperature of Africa is rising faster than the global average and this is likely to continue (Yonazi et al., 2012). Secondly, Africa is an enormous landmass, causing the climatic effects to be very different from location to location, which makes it difficult to use a general approach. In the third place agriculture is the largest economic activity in Africa, on which climate change has a direct impact (Collier et al, 2008). A couple of areas in Africa are expected to get wetter, but most regions will become drier and hotter (Sawai et al., 2014). The growing impact of climate change in Africa makes it a suitable continent to study the adaptability of human beings to a changing climate. The study area of this research is located in Sub Saharan Africa, where adaptation to climate change in rural areas in northern Ghana will take the centre stage in this study.

Ghana is a country in which the economy mainly relies on agriculture, particularly cotton and cacao. Inatsu et al. (2014) classify the climate, based on satellite observations, as a tropical climate with a limited dry season for the coastal areas (The circle of latitudes of the north of Earth's equatorial plane are 5°N to 6°N) and an arid climate with a rainy season for the inland area (~10°N). These features are common to countries facing the Gulf of Guinea, like Togo, Nigeria and Cote D'Ivoire (Inatsu et al, 2014; Antiwi-Agyei et al, 2012). The annual amount of rainfall decreases from south to north. The northern border of Ghana is located at the southern fringe of the Sudan-Sahel region (Inatsu et al., 2014). The climate in Ghana is strongly influenced by the West African Monsoon, which basically controls the common features of the climates of the countries along the Gulf of Guinea (Inatsu et al., 2014). The rainfall seasons in Ghana are controlled by the movement of the tropical rain belt (Inter-tropical Convergence Zone (ITCZ)), which fluctuates between the northern and southern tropics (McSweeney et al., 2011). In Northern Ghana, is a single wet season that occurs between May and November. From December to March the wind blows because of the ITCZ from north-easterly direction, bringing hot and dusty air from the Sahara desert (known as the 'Harmattan'). The southern part of Ghana has two wet seasons, one from March to July and a shorter wet season from September to November (McSweeney et al., 2011). Temperatures are typically high, ranging from 24°C to 30°C (Brown & Crawford, 2008).

Inatsu et al. (2014) discuss the complex geographical characteristics of Ghana. Also Brown and Crawford (2008) argue that Ghana's geography suggests that it will be fighting rising sea levels along the southern coast and flooding of the rivers, while at the same time it will be combating desertification in the north. This complex geography in combination with changing climatic conditions will have severe impact on the lives of the inhabitants in the future. Ghana's climate has already changed over the last decennia. The mean annual temperature has increased by 1.0°C since 1960, an average rate of 0.21°C per decade (McSweeney et al., 2011). The increase in temperature has generally been more severe in the Northern regions of the country than in the south. In the northern part of Ghana this causes severe droughts during the dry and rainy season, severe floods in the wet season and higher temperatures overall (Tawaih, 2013). A good example of these changes in the northern part of Ghana is the significant increase in 'hot' days in all seasons. Between 1960 and 2003 the average number of 'hot' days has increased by 48 (an increase of 13.2%) in the same period the average number of 'hot' nights increased by 73 (an increase of 20%) (McSweeney, 2011). Besides the droughts, northern Ghana also suffers from problems related to too much water. Researchers stated that the predicted drop in rainfall and resulting decrease in water flow would result in floods and other water related problems in the future (Lewis, 2013). The White Volta, the Black Volta and the Volta Basin are a few of many rivers and water basins in Ghana where floods are a common phenomenon in the rainy season. Various changes in water flows in the Volta Basin have a direct impact on the lives of the Ghanaian population in the northern part of Ghana.

Phenomena of climate change, like droughts and floods could be seen as external shock events. External shocks, referring to an exogenous event that alters the overall degree of novelty at a point in time (Dekker, 2004), can have a significant negative impact on developing countries in Africa, because of the higher vulnerability to natural disasters of these low income countries (Raddatz, 2006). Not only countries can be considered to be vulnerable, the vulnerability of individuals should also be taken into account (Adger, 1999). Van der Geest (2010) argues that people in rural areas of developing countries, particularly in Sub-Saharan Africa, are among the most vulnerable (in particular less able to adapt) to climate change in the world. *'Vulnerability is the state of susceptibility to harm*

*from exposure to stresses associated with environmental and social change and from the absence of capacity to adapt'* (Adger, 2006, p. 268). This definition makes clear that a certain capacity to adapt to external shocks will reduce the degree of vulnerability to external shocks (Adger, 1999). The goal of studying climate related problems, adaptation and the connection between them is to identify barriers and strategies for alleviating vulnerability to external shocks. More understanding of the concepts of risks of and vulnerability to climate change in Northern Ghana is needed in order to get a better overview of the processes of adaptation to climate change impacts (Adger, 1999). This overview is necessary to find solutions to the current difficulties with climate change impacts for the local people.

As mentioned before, adaptation to climate change is the central focus of this study. The increase in climate related problems and their influence on people's lives makes that Africa is a continent where adaptation takes place on a large scale. High levels of poverty and high levels of vulnerability to climate change induce human actions to adapt and to justify adaptation strategies (CIFOR, 2012). In short, adaptation is a strategy to reduce the vulnerability of biological systems to climate change effects. Adaptation tries to minimize the impact after the change occurred. Adaptation can on the one hand be seen as direct damage prevention. It usually implies actions that reduce the expected damage of the process, but it also includes actions that pool or transfer the risks (Verheyen, 2005; Perrings, 2005). On the other hand, adaptation may involve actions taken before, during or after the process (Perrings, 2005). To fully understand the combination and the complexity of the concepts vulnerability and adaptation, it is necessary to take into account the concept of 'livelihoods'. A person's livelihood refers to their 'means of securing the basic necessities' (Blaikie et al., 2004). For instance in Africa, people's livelihood mostly consists of rain-fed agriculture, which makes people vulnerable to influences of environmental and climatic changes (Van der Geest, 2010). High levels of poverty limit their capacity to cope with or adapt to extreme weather events. However, in risk-prone environments where the state has little to offer, surprisingly adaptable livelihood systems can evolve. To reduce the vulnerability and poverty of people, livelihoods have to change constantly and adapt to external (climatic) shocks (Davies & Hossain, 1997; Van der Geest, 2010).

This thesis will link the concept of adaptation, in the context of climate change and other environmental risks, to livelihoods. Mearns and Norton (2010) created five analytical risk management categories, adaptation practices, which show the link between livelihoods and adaptation. The first adaptation practice is *mobility*, the distribution of risks across space. Mobility is perhaps the most common and seemingly natural response to negative climatic impacts. For example people living in drought affected regions have to migrate involuntarily because of food shortage, water stress and crop failure. The second practice is *storage*, the distribution of risks across time. Mearns and Norton (2010) call storage an effective measurement against complete livelihood failure. For instance the storage of food gives communities more 'food security' during droughts or dry seasons. Also *diversification* is an adaptation practice, the distribution of risks across asset classes. For example people diversify their income through having multiple jobs besides their main farming activities. Diversification for households is sometimes combined with giving up some income in return for greater security provided by this diversifying strategy. In some cases people are willing to live in some level of poverty in exchange for a reduction of vulnerability. The fourth adaptation practice is *communal pooling*, the distribution of risks across households. *'This communal pooling involves joint ownership of assets and resources; sharing of wealth, labor, or incomes from particular activities across households; and/or mobilization and use of resources that are held collectively during*

*times of scarcity*' (Mearns & Norton, 2010, p. 184). This practice spreads the risks over different households. The last adaptation practice that Mearns and Norton describe is *market exchange*. This market exchange is not specifically a response to climate change and its use is not limited to adaptation to environmental risks. Market-exchange-based adaptation practices can substitute for the other four practices when rural poor people have access to markets. The concepts of vulnerability, adaptation, adaptation practices and livelihoods will be described in detail in the second chapter.

Thus far the literature on climate change does not reflect sufficiently the circumstances under which households manage climatic stressors, the resulting societal impacts and the consequences of not being able to adapt to these negative impacts (Warner et al., 2012). The managing of climatic stressors and the consequences of not being able to adapt are an important thing to study in order to come with solutions for these climatic problems. For that reason focuses thus research on the description and analysis of the adaptation to climate change of households and thus contribute to other research that focuses on the managing solutions for this problem. Although the concept of household strategies has been criticized in former research, for being an approach that emphasize on the agency rather than on the structure, the household rather than the individual as unit of analysis and informal work rather than formal employment alone (Wallace, 2002). Households have nevertheless remained an important 'unit of analyses' or empirical tool in understanding the everyday behavior among the poor population in urban and rural areas, and is often a key indicator of the emerging social structure (Hart, 1973; Castells and Portes, 1989; Roberts, 1991; Wallace, 2002). In this research the concept of household (strategies) is used in order to understand the foundations of economic and social behavior in transitional societies, which makes households a useful tool for the comparative analysis of different societies and social groups. In northern Ghana the realization of household strategies often is based on multi sided involvement of actors in a household, on agrarian activities of a household and on non-agrarian activities of a household. Thus, in order to create a better understanding of household strategies in northern Ghana will the unit of analysis of this research is 'farming households'.

Besides the contribution to the 'household' related research, this study contributes also to other fields of research. A lot of research has been done to get a better understanding of past and current climatic impacts in developing countries. Many of these evaluations are econometric and socio-metric exercises. This type of research is very useful but it will not tell the whole story (Dietz et al., 2013). This study will focus mainly on the local perceptions of climate impacts, local coping capacities and existing adaptation strategies in order to tell the whole story. Though this study also adds to the recent work of Yaro (2006); Warner and Van der Geest (2013); Jarawura (2013); Jarawura and Smith (2015) by focussing on the perspective of affected people in vulnerable countries, on the reversibility between farm and non-farm livelihood strategies and on the role that migration plays as adaptive response to climate change.

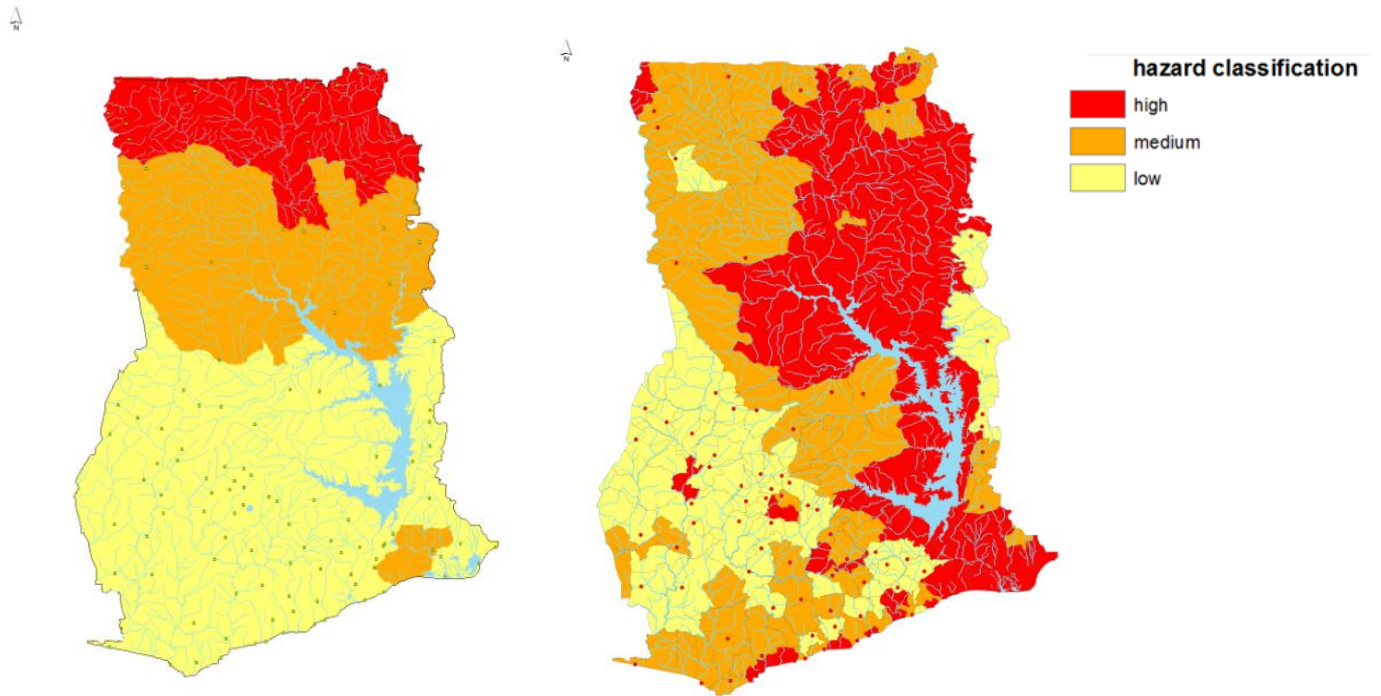
## **1.2. Area of research: northern Ghana**

Ghana is located in West Africa on the Guinea Coast, adjacent to Burkina Faso, Côte D'ivoire and Togo. This country has approximately 25 million inhabitants and has been considered to be a regional leader as regards to its economy in West Africa (Antiwi-Agyei et al., 2012). Ghana has a relatively peaceful history and a stable economy, which results in higher 'Human Development Index' than other West African nations. Also life expectancy rates exceed those of the other countries in the sub-



Saharan Africa region by almost 10 years (Brown & Crawford, 2008). The country's economy depends on rain-fed agriculture. Agriculture provides employment to about 57 percent of Ghana's labor force (Antwi-Agyei et al., 2012). Despite Ghana's relatively strong economic position in the region, the country will face social, economic, political and environmental challenges caused by climate change (Brown & Crawford, 2008). In spite of the huge variation in predictions of the impact of climate change, it is almost certain that it will have a negative impact on the livelihoods of the local people (Avornyo et al., 2014). Climate change will impact key resource-dependant sectors and livelihoods in Ghana, such as agriculture, stability, incomes, food production and food security (Kunateh, n.d.; Tawaih, 2013; Antwi-Agyei et al., 2012). The World Food Program (WFP) states that more than 680,000 people (16 percent of all households) are considered to be either severely or moderately food insecure in Ghana (Tawaih, 2013; Antwi-Agyei et al., 2012).

As mentioned above, Ghana suffers from rising temperatures, increasing droughts and a growing number of floods especially in northern Ghana. Northern Ghana is often portrayed as being a poor, underdeveloped, food insecure and a risk prone area, especially when contrasted with southern Ghana (Dietz et al., 2013). These expected climatic effects in Northern Ghana will continue to have a negative impact on small scale agriculture in this part of the country (Nyantakyi-Frimpong, 2013). Northern Ghana will also be more vulnerable to volatile weather patterns caused by climate change when compared to the rest of the country because it is poorer, drier and more heavily dependent on the subsistence of agriculture (Darto & Arizona, 2013). The aspect of a relatively high vulnerability to climate changes is one of the reasons for selecting 'northern Ghana' as the research area. This study will only cover a small part of northern Ghana: the Savelugu-Nanton district in the northern Region. The reason for choosing this area is based on the fact that this area is one of the most climatic affected areas in northern Ghana. This place is orientated in the northern part of Ghana and it is suffering from several changes in climate in the past few decades. Higher temperatures, changing rainfall patterns and the increase in floods and droughts, result in decreasing yield, crop failure and land degradation in this area (Laube et al., 2011) (see map 1 and map 2). These climatic related problems caused further impoverishment of one of Ghana's poorest region, where agriculture is the main source of income. These seriously threatening climatic problems make it necessary that Ghanaians in the northern part learn how to adapt to the impact of these changes and they are supported in adopting new practices for maintaining their livelihoods. The specific social and physical features of the area of research will be discussed in chapter 4, descriptive analysis. As well as a more detailed description of the Savelugu-Nanton district and the local climate related problems.



Map 1. Drought hazard risks Ghana (RHDHV, 2014).

Map 2. Flood hazard risks Ghana (RHDHV, 2014).

### 1.3. Relevance

The changing climate creates a growing awareness among people around the world. This has multiple reasons, but one of the primary reasons is that the impact of climate change affects a growing group of human beings. The emphasis of this study is on the relation between physical climatic changes and the ability of people to adapt to this 'new environment' in Northern Ghana. This paragraph will discuss the relevance of this research, which is subdivided into a societal relevance and a scientific relevance.

#### 1.3.1. Scientific relevance

This study aims to provide a contribution to the theory and the scientific debate about adaptation to climate change in northern Ghana. A lot of different literature has been published on the adaptation to climate change in Ghana. However, a lot of this research focuses on flooding and sea level rise in Southern Ghana (McSweeney et al., 2011). Still relatively little is known and written about the effects and impact of climate change in northern Ghana. However, recently a lot of researchers are interested in and working on studying adaptation in northern Ghana. First because of the actually measured climatic changes in the northern Ghana, which create opportunities to study the reactions of people on relatively fast climate impacts. Besides that will the topic of adaptation to climate change become more important because of global warming and the associated climate change. The recent interest in the topic of adaptation in northern Ghana is shown by the 'international conference on Enhancing Resilience to Climate and Ecosystem Changes in Semi-Arid Africa' in August 2014 in Tamale, where the main focus is adaptation to climate change in northern Ghana. A second example of the increasing interest in this topic is the 'Journal of Disaster Research' released in August 2014. This issue is completely dedicated to ecosystem change adaptation and resilience studies in Semi-Arid-Africa. Also the recent work of Francis Jarawura and Professor Yaro Joseph Awetori on

adaptation to climate change discuss this subject<sup>1</sup>. This study integrate seamlessly with their research at the points of Jarawura's climate induced migration and Yaro's description of deagrarianisation. These recent developments raise the question; how to find and fill the gap in the literature about climate change adaptation in northern Ghana? To make a theoretical addition and an enrichment of the existing literature, this study focuses on the local perceptions of the adaptation strategies of the local people in areas affected by climate change. This aspect of the perceptions and adaptation strategies is not very often used in adaptation focused research (Warner & Van der Geest, 2013). Only Warner & Van der Geest (2013) and Jarawura (2013) started with this aspect of perceptions, which makes it not studied very often. Information about the perceptions of local people are necessary to examine how farmers perceive and are able to understand the effects of climate change on their livelihood (Warner & Van der Geest, 2013). Their point of view could help create strategies for responding to climate and ecosystem changes in an appropriate and also practical manner (Kusakari et al., 2014). This study attempts to provide insights in the local perception of adaptation, adaptation practices and changes in livelihoods caused by climatic impacts. The goal is to create a better understanding of adaptation strategies to climate change. This might therefore be considered as a theoretical addition and enrichment to the existing literature.

### 1.3.2. Societal relevance

The growing awareness on the impact of climate change creates the foundation of the societal relevance of this research. The rising temperatures and the increase in floods and droughts in northern Ghana (McSweeney et al., 2011) creates a sense of urgency in Ghana on the impact of climate changes on their livelihoods (Van der Geest, 2010). Van der Geest (2010) points out that the environment in Ghana plays an important role and that climatic changes leads to several outcomes and impacts (p.88). A better understanding of adaptation to climate change in northern Ghana could be used as a platform to assist achieving the goals of the current government policies of president Mahama in Ghana. The president of Ghana states that climate change is a national priority, especially in the northern regions of the country. One of the most important consequences of climate change is that the peasant farmers who are relying on the weather for farming, experience an unpredictable weather conditions and ever changing weather patterns which hampers their activities (Graphic Online, 2014). This Ghanaian president has appointed several scientists to develop solutions to the changing environment in the northern areas, especially in relation to the food security of the local people. This study may contribute to this research by providing additional information and new insights of the situation in the northern areas. Providing information about the state of affairs in northern Ghana could be relevant for the governmental policies and for the legitimizing of these policies. In addition, this research attempts to boost and reinforce the attention of the importance of including the perceptions of local people in scientific research on climate change adaptation. The perceptual insights provided by this study can boost the still ongoing (local, regional and national) societal debate about the climate change impact in northern Ghana. This study will also highlight the aspects of adaptation specifically in rural areas in northern Ghana, an aspect that in policy currently plays a subordinate role. The aspects of 'overlooking the rural areas' is a topic that is mentioned by

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<sup>1</sup> Francis Jarawura is specialized in subjects as: the perception of drought in the Savelugu district in the northern Savannah of Ghana (2015) and in climatic induced migration in the northern part of Ghana (2008, 2013 and 2014). Yaro Joseph Awetori has studies topics like food insecurity in Northern Ghana and livelihood strategies and the deagrarianisation of the northern part of Ghana. This study integrates seamlessly with the topics of these scholars.

different critics as a response to the policies of the current government (Okoama-Ahoofe, 2014). The depth in rural areas in this research will be required in a later section. The additional insights in the situation of rural areas makes that this study could provide specific information for policymakers about the situation of agriculture in rural areas, this can be of great value for policies that are made by the ministry of agriculture. The information about adaptation strategies in northern Ghana retrieved from this study could be used in order to study policy reports of this government afterwards. Furthermore, policymakers have a need for better information, empirical data and analysis of the impact of climate change (Warner et al., 2012).

A second societal relevance of this study is related to non-governmental and private organizations. These organizations have a shared concern for the impact of climate change and participate in the ongoing debate about adaptation to climate change. A better understanding obtained from this study could also benefit those organizations. Their perceptions on adaptation to climate change could be changed or affected after reading the outcomes of this study. For example private organizations, which are using very technical strategies or improvements (for instance 'Early Warning Systems') to adapt to climate change could benefit from a better understanding of the 'social' aspects of adaptation to climate change. This gives the opportunity to build some bridges between very technical and social approaches, in order to underpin possibilities for companies and NGO's. Finally, the recommendations of this study will be helpful for or changing their approach in the northern part of Ghana.

#### **1.4. The purpose of this study**

The impact of climate change will become more apparent in the future and an increasing number of people will have to adapt to climatic changes. Because of this situation provides this enough space to contribute to the concepts of adaptation strategies. The former paragraphs describe different concepts related to adaptation strategies, for example climate shocks, vulnerability, adaptation and livelihoods. This study attempts to develop these concepts further, by testing these concepts in an empirical way. This results in the following research objective:

*The goal of this study is to contribute to a more complete understanding of the role of adaptation to climate change and the impact of these adaptation strategies on the livelihoods of people in rural areas in the Savelugu-Nanton District, northern Ghana.*

The focus of this research is limited to rural areas in the Savelugu-Nanton district in northern Ghana. This geographical limitation is necessary to be able to gain a more in-depth understanding of adaptation strategies in this specific district in limited amount of time. This district has its own social and physical characteristics, which makes it easier to compare the results. In addition, this study starts by determining to what extent adaptation to climate change is taking place. After which, it will provide a better understanding of the impact of climate change and adaptation strategies on the livelihoods of people in the rural Savelugu-Nanton district.

#### **1.5. Central questions**

Research questions help to focus the study and they provide better grounding of construct measures (Eisenhardt, 1989). To achieve the objective of this study the following guiding central question and sub questions are established:



### Central question:

*What different adaptation strategies to climate change do households in rural areas in the Savelugu-Nanton District, northern Ghana, employ?*

Key concept in the established central question is 'adaptation strategies'. This aspect will be elaborated in detail later in this research. For now, it is important to notice that this study is to a large extent performed according to the five 'adaptation practices' designed by Mearns and Norton (2010), the concept of vulnerability and the livelihood approach. In addition, the main question clearly identifies the unit of analysis 'households' of this research. In order to provide an answer to the central question, the following sub-questions are created and will be answered during this study.

### Sub question 1:

*How do households experience the specific climate change problems in rural areas in the Savelugu-Nanton district in northern Ghana?*

This sub question will focus on the perceptions on climate change impacts of households in the two case studies in Northern Ghana. To answer this sub question it is necessary to get a better understanding of their perceptions and thoughts on the possible problems. Do they experience the impact of climate change as a problem? In what way do they experience climate change as a problem? Do they connect climate change to physical changing of their environment? Or are there some other explanations (for instance religion) for these changes in their perceptions? Furthermore, we need to know how people are organizing their farming-livelihoods. Experiences of the past could be helpful in order to combat problems in the future (Warner & Van der Geest, 2012). So the perceptions of farmers could help to solve problems in the future. This sub question will be answered in the chapter 'Descriptive analysis', which gives an overview of the objective and the subjective climate change in the district of Savelugu-Nanton.

### Sub question 2:

*Which adaptation strategies or practices are suitable in order to adapt to climate change related problems in the Savelugu-Nanton district in northern Ghana?*

This question also focuses on the perceptions of inhabitants of the two villages used as case studies. To understand their way of preventing and protecting themselves against the negative impact of climate change it is necessary to understand which strategies they use now and have used in the past. This sub question is partially about the scientific suitable practices but mainly about the perceptual best strategies to adapt to climate change. So what adaptation strategies are best in the view of the local people? This can be achieved by asking if there is a change in their farming skills and is there a difference between their way of adaptation and the way of their ancestors? And if there is a difference, what is the difference and why is that? According to these answers, links can be made between the literature and practice. So if they speak about a change, their livelihood will possibly change, this will be discussed in the next sub question.

### Sub question 3:

*To what extent does adaptation to climate changes, change the livelihoods of households in rural areas in northern Ghana?*

After collecting the data of the previous questions, conclusions can be drawn. This last sub question is also based in the perception of the inhabitants of the villages in both case studies. It could be that there is no physical change of adaptation visible, but the mindset of people towards the problem has changed. It could also be that there are lots of adaptation strategies, but no change in the livelihood of people.

These three sub questions will result in an answer to the main question of this research, because it will reveal what different adaptation strategies to climate change impact households in rural areas in Northern Ghana employ. In addition it gives a better understanding whether adjustments are temporary or structural. Also it will also reveal certain patterns/flows of adaptation to climate change, which might be useful for further research.

### **1.6. Thesis outline**

The research is presented in the following structure. Chapter 2 describes the theoretical concepts of this research: shock events, vulnerability, adaptation strategies, adaptation practices and the livelihood approach. This theoretical chapter ends with the conceptual model of this research. Chapter 3 gives an oversight of the methodology that is used in this study. The research strategy, the research methods and the case studies in the Savelugu-Nanton district will be discussed in this chapter. Chapter 4 gives an analysis of the perceived climate change and the factual climate change in Northern Ghana. This 'descriptive analysis' gives an analysis of the identity of the Savelugu-Nanton district and is the starting point for establishing the adaptation strategies and practices. Chapter 5 discusses the appearance of the diversification of livelihoods in Northern Ghana, which is to some extent the result of a changing climate. Subsequently, chapter 6 provides conclusions and recommendations about the adaptive capacity of people in northern Ghana in times of a changing climate.

## Chapter 2: Discussing theories about climate shocks, adaptation strategies and the livelihood approach.

This chapter forms the theoretical framework of this study, which is set up in pursuance of the research questions. This chapter will discuss the theoretical concepts and the relation between various concepts in order to create a conceptual model. The main concepts in this chapter are climate shocks (paragraph 2.1), adaptation strategies (paragraph 2.2) and the livelihood approach (paragraph 2.3). It is necessary to discuss the concept of climate shocks because concepts like climatic 'shock events' and climate related vulnerability are needed to create a context where strategies to adapt to climate change can be developed (Adger, 1999). The second theoretical concept 'adaptation strategies' is discussed to be able to answer the main question and sub questions of this study. This paragraph 2.2 will discuss several adaptation strategies and practices in detail. Finally, a better understanding about the theory of the livelihood approach is needed in order to observe changes in the local living environment of people in times of climate change (Davies & Hossain, 1997). These concepts will be discussed individually and in detail. Subsequently, the different concepts will be connected to each other in the conceptual model (see paragraph 2.4).

### 2.1. Climate shocks

People all over the world face risks and uncertainties that affect their lives and livelihoods. Examples of these uncertainties are the risks of natural hazards like floods, droughts and earthquakes (Dekker, 2004). Risks with regard to extreme climate events are a source of concern across the world. In recent decades, the number of people affected by climate disasters such as droughts, floods and storms has been rising (Human Development Report, 2008). Some authors find it useful to make a distinction between *risks* and *shocks*, as well as implying that shocks do not take into account the likelihood of an event when compared to risks which takes into account both the consequence and the likelihood of an event. Risks and shocks are defined as the realizations of highly unexpected events that cause welfare losses. Risks refer to possibly occurring events that can damage the well-being of people (Dercon, 2001). In other words, risks are prospects of a shock or, alternatively, shocks can be thought as the realization of risks (Fafchamps, 2004; Sinha and Lipton, 1999; from De La Fuente, 2007). According to Sinha and Lipton (1999) the term of climate 'shocks' implies: I) unexpectedness, II) size, III) high damage due to concentration on persons with high vulnerability and low resilience, IV) exogenousness in the source and V) physical or psychological strain to one or more individuals due to that stress (De La Fuente, 2007, p. 1). Thus, according to these scientists the concept of climate shock already covers what the disaster literature considers to be a natural disaster (De la Fuente, 2007). This definition of climate shocks is not clear about duration of the climate change, only about the unexpectedness of a shock event. What means that it excludes climatic changes which could be associated as long term environmental change. Shock events and long term environmental changes will be discussed in paragraph 2.1.1.

Adger (1999) argues that a better understanding of the concept of shocks and vulnerability to climate change is needed in order to get better understanding of the processes of adaptation to climate change impacts, particularly in rural agrarian societies, by examining present day vulnerability to extreme events. *'Obviously, the type of risks and uncertainty that people face and the way they experience and respond to these risks once they occur differ immensely from place to place and from time to time'* (Dekker, 2004, p. 13). Besides the fact that shocks and reaction to shocks

differentiate, shocks can be used for explaining behavior. For example '*studies on risk and insurance in development economies argue that risk is central in explaining household behavior*' (Dekker, 2004, p. 13). Due to the fact that risks can be a motivation, the behavior of households will be shaped by strategies to prevent, mitigate and cope with shocks through self-insurance or risk sharing arrangements (Dekker, 2004; Adger, 1999). Therefore the concept vulnerability, which also can be a determining factor in people's choice for a specific adaptation strategy, this will be discussed in paragraph 2.1.2.

#### 2.1.1. Shock events

Shock events have been classified in various ways, related to their frequency, their intensity and the level at which they occur (Buchanan-Smith & Maxwell, 1994). These dimensions of shocks, will each affect the possibilities to deal with shocks. For example the effect of shocks can repeat over time (*dimension frequency*), such as drought years. These dry years are more difficult to deal with compared to a single dry season, because households may have depleted their assets in coping with the initial shock, making it more difficult to absorb subsequent shocks (Dekker, 2004). However, there is no linear relation between frequency of shocks and the degree of impact. Some events occur with a low frequency but have severe effects for example death (*dimension intensity*), while other events occur with a higher frequency, but have less severe impacts (temporarily illness) (Dekker, 2004; Mearns & Norton, 2010). The third distinction is the *level* at which the shock occurs. An individual shock affects a particular individual or household, for example the death of one person, while a common shock affects a substantial number of individuals or households in the same community at the same time (for example weather risks) (Dekker, 2004).

In contrast to climate shock events (short term environmental change) there are also long-term environmental change associated with climate change (Adger, 1999). Brien et al. discuss the exposure of long-term climatic changes. Some examples of long-term environmental changes are rising air temperature, melting of sea and land ice, changing vegetation and the disruption of the oceans temperature and salinity (NOAA, 2013). Just like short term climate shock events, long-term changes in the environment have an impact on households. An example of the impact of long-term environmental change on a household is the El Nino phenomenon which is growing stronger. Rising air temperatures ensure that this phenomenon is becoming fiercer, which creates more risks for households at the present time and in the future (IPCC, 2013).

#### 2.1.2. Vulnerability

*'A natural hazard becomes a disaster when it hits vulnerable people'* (Van der Geest, 2004, p. 8). To be able to investigate climate shocks (for instance tsunamis and earthquakes) and their impact, it is important to be aware of people's vulnerability. Vulnerability is the degree to which a system is susceptible to and is unable to cope with adverse effects (of climate change) (McCarthy et al., 2001). Vulnerability is not only determined after the mitigating measures, but it could also be present before climate shocks take place. Adger (1999) describes the concept of 'social vulnerability' which is *'the exposure of groups or individuals to stress as a result of the impacts of climate change and related climate extremes'* (Chambers, 1989, p. 249). This definition shows the value of social impacts of climate change, rather than the impacts of climate change which only concentrate on the physical dimensions of the issue. In all formulations of vulnerability the key parameters are: the stress level a system is exposed to, the sensitivity of a system and the adaptive capacity of a system (Adger, 1999).

*'Thus, vulnerability research have common elements of interests – the shocks and stresses experienced by the social ecological system, the responses of the system and the capacity for adaptive action'* (Adger, 2006, p. 269). This results in the three key elements in this study: climate shocks, adaptation strategies and the livelihood approach, which will be linked throughout this research. A large number of researchers have focused on the socio economic processes that constrain the ability to cope with climatic hazards. Sen's work (1990), Bohle et al. (1994) and Adger & Kelly (1999) emphasize the social construction of vulnerability (Ford & Smith, 2003, p.392). This social construction of vulnerability will also play a role in this research. Adger and Kelly (2000) define 'social vulnerability in terms of *' the capacity of individuals and social groupings to respond to, to cope with, recover from and adapt to any external stress placed on their livelihoods and well-beings, focussing on socio-economic and institutional constraints that limit the ability to respond effectively'* (p. 347). To investigate this social vulnerability it is helpful to make a distinction between individual and collective vulnerability in order to clarify the scale issue and the unit of analysis. Household's which are the unit of analysis exists of individuals who interact collectively. This explains the choice for the distinction between individual and collectively vulnerability. *Individual vulnerability* is described as the access to resources, as well as the social status of individuals or households within a community. *Collective vulnerability* of a nation, region or community is determined by institutional and market structures, such as the occurrence of formal and informal recurrence (Adger, 1999). Additionally, the two aspects of vulnerability are obviously connected with each other.

Ford and Smith (2004) use a different kind of subdivision in vulnerability. They describe they concepts current vulnerability and future vulnerability. *Current vulnerability* is about analyzing and documenting communities' past experience and present experience with climate risk (current exposure) and the adaptive options employed to address these risks (current adaptive capacity). Observations, experiences and local knowledge are central to assessing the current vulnerability. *Future vulnerability* is about analyzing how climate change will modify the nature of the climate-related risks and what capacity communities will have to deal with these risks through adaptation. Past responses to climate variability and extremes on communities can be studied, which will be useful for adaptive strategies in the future. The future adaptive capacity concerns the degree to which the community can deal with the estimated future exposure to climate change (Ford & Smith, 2004). Ford and Smith developed a model that describes the relation between vulnerability and adaptive capacity to climate change (see figure 2). This model describes the link between two main concepts in this study; vulnerability and adaptation.

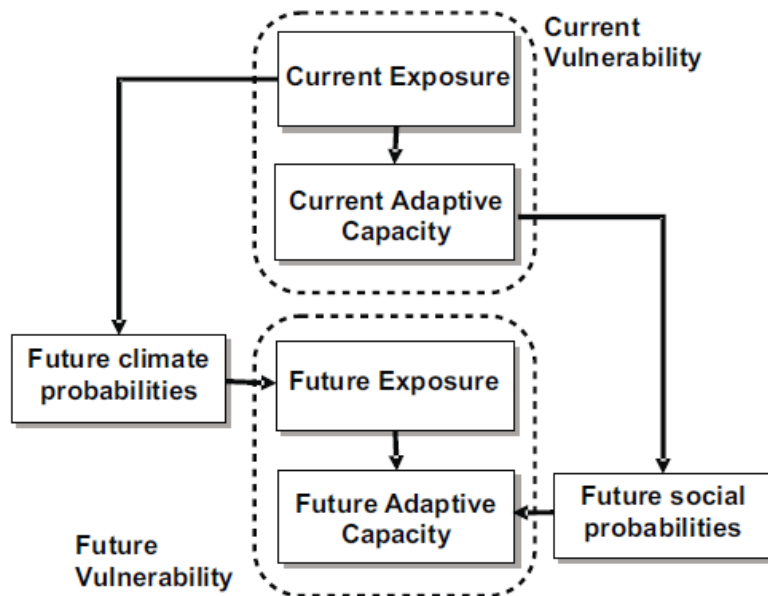


Figure 2. Current - and future vulnerability (Ford & Smith, 2004, p. 396).

Vulnerability is often confused with poverty, however it is a fact that poor people are usually more vulnerable than rich people, the two concepts are not the same. To distinguish vulnerability from poverty, it could be stated that vulnerability is *'not the lack of or the lack of willingness to adapt, but the defenselessness, the insecurity and the exposure to risks, shocks and stress'* (Van der Geest, 2004, p. 8). However it can be stated that poor people in general are more vulnerable when it comes to climate change impacts. So those who are initially the most vulnerable in the world will suffer also the most of the changing climate and become even more vulnerable in the future (Mearns & Norton, 2010). Furthermore vulnerability also correlates with the profession of people, subsistence farmers are more vulnerable to food insecurity caused by drought than teachers for instance (Van der Geest, 2004). When considering climate impacts and vulnerability, it is necessary to adhere to the three dimensions of shock events (frequency, intensity and level) to understand how they affect adaptive capacity and create adaptive responses to climate change. Furthermore the long-term environmental changes (discussed in paragraph 2.1.1) are to some extent related to future vulnerability. The expected long-term climate change will alter the future vulnerability (Ford & Smith, 2004). The next paragraph will discuss the previously mentioned adaptation strategies.

## 2.2. Adaptation strategies

The global climate change impact leads often to a response from people in the affected area, which is called adaptation. In the previous paragraphs about climate shocks and vulnerability is adaptation to climate change was also discussed. Adaptation is a strategy that seeks to reduce the vulnerability of biological systems to climate change effects. Adaptation tries to minimize the impact when the change already occurred. Adaptation can be seen as direct damage prevention (Verheyen, 2005). This should not be confused on mitigation strategies. *'Mitigation strategies are procedures or activities that help prevent or minimize the process of climate change'* (Nyong et al., 2007, p 791). Some examples of mitigation are creating additional room for rivers, creating barriers to prevent flooding and create natural basins to buffer rain water. Mitigation accordingly implies action before



the event or process, while adaptation strategies may involve actions taken before, during or after the process (Perrings, 2005). Some of these earlier mentioned measures in front will also be defined as being 'adaptation strategies' to climate change. Climate change mitigation involves also the reductions of emissions (Nyong et al., 2007). This research will only focus on adaptation strategies of households in rural area in Northern Ghana. The reason for adaptation instead of mitigation is that societies across the world have a long record on adapting and reducing their vulnerability to the impact of climate related events. These adaptation measures will be required at regional and individual level (level of households) to reduce impacts of climate change, regardless of the number of mitigating measures that will be undertaken over the next two to three decades (IPCC, 2007). Because of the fact that mitigation measures only take place in front of climatic changes and a large part of this research is about the reaction of people after that the climatic change had taken place, is the chosen for the use of the concept adaptation strategies. This means that only adaptation strategies are used for this research. Adaptation is defined by the Intergovernmental Panel on Climate Change (IPCC) (2001, p. 365) as:

*'Adjustment in natural or human systems to a new or changing environment. Adaptation to climate change refers to adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.'*

Adaptation usually implies actions that reduce the expected damage of the process, but it also includes actions that pool or transfer the risks (Verheyen, 2005; Perrings, 2005). Adaptation strategies enable individuals, households or communities to cope or adjust to the impact of the climate change in the local areas. Such strategies could include the adoption of efficient environmental resources management practices such as migration, customized agriculture production and diversification of livelihoods (Nyong et al., 2007). Important in this research is the adaptation to climate change in agriculture production, which is the adjustment of farming activities or methods to suit the changes in climatic conditions in order to lessen the potential damage that is caused (Mabe et al., 2012). Any examples of this adaptation of agriculture production are the use of different crops, mechanized solutions for agriculture and the selective keeping of livestock in arid areas (Nyong et al., 2007).

As mentioned before, increases in environmental risks as a result of climate change can be classified in short-term versus long-term. *'Those resulting from sudden disasters versus those resulting from slow but secular changes in trends, predictable versus unpredictable'* (Mearns & Norton, 2010, p. 181). Thinking of adaptation in relation to these four forms of climate risks enables an analytically connected approach to classifying adaptation practices (Mearns & Norton, 2010). Mearns and Norton have conceived five different adaptation practices (mobility, storage, diversification, communal pooling and market exchange); these five practices are used often in this research. Next paragraph will discuss these adaptation practices.

## Adaptation practices

The five adaptation practices described by Mearns & Norton in 2010 are mentioned in the introduction of this study. In this paragraph these five analytical risk management categories (adaptation practices) will be discussed in detail. The effectiveness of these five classes of adaptation practices is partly a function of the social and institutional context in which they are pursued. In general is this classification of adaptation practices different from other classifications, which are often less measurable in practice. Although this distinction in adaptation practices is useful, this is not related to the basic types of adaptation strategies, which ensures that adaptation to climate change is viewed in a different way (Mearns & Norton, 2010). Furthermore these practices are chosen based on the fact that they show a link between livelihoods and adaptation in changing climatic circumstances.

### 2.2.1. Mobility

The Intergovernmental Panel on Climate Change gave the following warning: *‘The gravest effects of climate change may be those on human migration as millions are displaced by shoreline erosion, coastal flooding and severe drought’* (IPCC, 1990, p. 20). In 1990 a serious concern for climate change and migration emerged (Van der Geest et al., 2010). Although the fact that human mobility is a complex social phenomenon and that explaining the link between migration and climate change is even more difficult, the concern about migration and climate change still exists (Mearns & Norton, 2010). Estimates of the number of people who will be displaced due to adverse effects of climate change vary widely (Van der Geest et al., 2010). Brown (2008) and Van der Geest et al. (2010) label such estimates of climate migrants as ‘well-educated guesswork’. It is a fact that climate change will influence the distribution of populations within countries and between countries, but it is impossible to achieve any degree of accuracy in the predictions (Brown, 2008). According to Van der Geest et al., (2010) the present data and level of knowledge about the complex relation between climate change and human mobility is too limited. In addition, climate change is not the only threat facing millions of people, examples of other environmental hazards that influence the livelihoods of rural people are: deforestation, land degradation, biodiversity loss and pollution (Jarawura, 2013). Moreover, climate change may play a role in migration decisions, but is usually not the main driver for a migration (F. Jarawura, personal communication, 17 February 2014). Van der Geest (2010) emphasizes this by saying that; the environment is often a push or pull factor, which can contribute to migration flows (Van der Geest, 2010).

The impact of climate change on population distribution and mobility is gaining more attention. Frequently cited ‘well-educated-guesswork’ figures estimate that by 2050, the number of people forced to move primarily because of climate change will range between 200 million and 1 billion (Myers, 2005). Tacoli (2009) argues that underlying these predictions, it is perceived that migration is a reflection of a failure to adapt to changes in the physical environment and that migrants are a relatively uniform group which all make similar decisions in disaster situations. This is somewhat contradictory to the more nuanced views of migration as a key adaptive response to climate change (Tacoli, 2009). Migration and mobility had become an important strategy in adaptation variability (Mearns & Norton, 2010). It is even so that mobility is *‘the most common and seemingly natural response to environmental risks’* (Mearns & Norton, 2010, p. 183). The relation between climate change and mobility shows many different sorts of mobility or migration. First, climatic stresses lead

to *involuntary migrations* (Mearns & Norton, 2010), also called environmental/climate refugees. Involuntary migration is the result of local environmental disruption (for instance earthquakes or floods), environmental degradation undermined livelihoods or unacceptable risks to health or health degradation as result of a permanent untenable change in a habitat (Renaud et al., 2007). Involuntary migration is sometimes caused by a short/recent disaster, however most of migrations are caused by long term disasters (Van der Geest, 2010). Two examples of mobility caused by long term disasters are 'agro-pastoral migration' and 'wage labor migration'. *Agro-pastoral migration* indicates for example the migration of poor people due to crop failure in their area (Mearns & Norton, 2010). The rich are more likely to have the resource to adapt successfully to environmental changes than poor people, which would make it unnecessary for rich people to migrate (IPCC, 1990). *'Migration is more likely to be an effective long-term strategy for pastoralists and agro-pastoralists confronting lower rainfall or range productivity, in contrast to settled agriculturists'* (Mearns & Norton, 2007, p. 185). Pastoralism is the branch of agriculture concerned with the raising of livestock. The third form of mobility is *wage labor migration*. People move away to places where they find paid jobs, because these migrants are interested in a better life for themselves (F. Jarawura, personal communication, 17 February 2014). An increase in employment opportunities, the development of industry and higher wages, especially in urban areas, created an attractive (pull) area, which induce rural-urban migration and sub-regional migrations (Awumbila et al., 2008).

Mobility, the ability to move about, does not come naturally to everyone. Being able to be mobile allows a person to perform their daily tasks and engage in social life; however this is not available to everybody (Tabernacle et al., n.d.). People, who aspire to migrate, but who for political, economical, social or other reasons are unable to do so, are experiencing '*involuntary immobility*' (Jónsson, 2008). This involuntary immobility in relation with climate change can also be called '*climate immobility*'. This climate immobility concerns populations affected by climate change or environmental changes which may not have the means (or the ability) to move to less vulnerable places, even when their survival depends on it (Werrel et al., 2011). In this study it is important to incorporate climate immobility because it '*may reduce the adaptive capacity of people in the region and put an end to customary livelihoods*' (Werrel et al., 2011, p. 1). Jarawura (2013) distinguishes climate immobility, as the lack of the ability to move at all, for instance the immobility of people who have previously experienced drought and crop failure making them immobile because of their lack of money caused by the climatic circumstances. He also demonstrates how age and status in the household are crucial factors at influencing migration during climate stress and can result in immobility of some members of the affected households (Jarawura, 2013). Looking at the characteristics of individual members of the household can be explanatory for the strategy of the entire household. Although the fact that climate immobility is not an adaptation practice of Mearns and Norton (2010), it will give a better understanding of climate immobility and will present a broader view on the adaptive mobility of people. This study will therefore also look at climate immobility as well as the adaptation practice of mobility as presented by Mearns and Norton (2010).

Mobility is especially important as an adaptation practice for people in sub-Saharan Africa who are affected by drought (Mearns & Norton, 2010). The links between drought, desertification and migration are complex. Much of the existing literature describes the link by comparing the dry land areas of Africa and the numbers of migration, where climatic fluctuation, as well as a widespread of mobility, have always been a defining feature (Guzmán et al., 2009). A study in Mali and Burkina Faso

suggests that drought affected local migration patterns, with an increase in temporary and short-distance movement and rural-rural temporary migration (Guzmán et al., 2009). *‘On the other hand, migration to urban centres and abroad, which entails higher costs, is more likely to take place after normal rainfall periods and is influenced by migrants’ education, the existence of social networks and access to transport and roads’* (Henry et al., 2004; in Guzmán et al., 2009, p. 108). This shows that migration is more likely under specific conditions, whence can be concluded that migration patterns could differ from place to place. One aspect that is discussed in the literature a lot is the influence of push and pull factors on migration. This will be discussed in the following text.

### Push and pull model

Neo-classical and historical-structural theories of migration generally fail to explain why some people migrate in a certain country or region and others do not (Massey et al., 1993), and why people tend to migrate between particular places in a spatially clustered, in a concentrated and in a non-random manner (De Haas, 2008). Therefore, it is useful to look at some spatial models developed by geographers, for instance the push and pull model. Most researchers who have used the push-pull framework have assumed that various environmental, demographic and economic factors determine migration decisions (De Haas, 2008). Rural population growth causing pressure on natural and agricultural resources, economic conditions (poverty, unemployment and landlessness), political repression, low social status and negative climatic circumstances pushes people out of marginal rural areas. Better economic opportunities, more jobs, better education, land to settle and farm, the promise of a better life and good environmental and living conditions often pull people towards a new place. Sometimes this ‘pull factor’ is encouraged by the destination, causing migration flows often into cities and industrialized countries (De Haas, 2008; Riley, 2011; King, 2013).

The relevance of this push and pull model to this study is based on the fact that it gives a broad overview of the influencing factors in migration patterns. This model will give more insight in the overall actions and motivations of migrants. However, this structural approach at the macro level is very economic-orientated and gives little value to the process of decision-making of migrants. Other approaches, in contrast to the push and pull model, takes the migrant as an actor within a social environment as the level of analysis and argue that the existence of social aspects (networks or family) has impact on migrants’ decision-making (Naerssen & Van der Velde, 2015). To explain the migration flows more deeply another migration model (Threshold model) is added to this study. This threshold model will give a better description of personal motivations migrants and the (personal) influencing factors on the decision to migrate.

### Threshold model (keep & repel factors)

As mentioned before some scholars believe that the traditional push-pull models have a strong focus on economic aspects, even if social factors are taken into account. Various other theories introduce the notion of ‘bounded rationality’ or the idea of ‘transaction costs’ still fall within the framework that considers migrant behavior to be guided by rational decision-

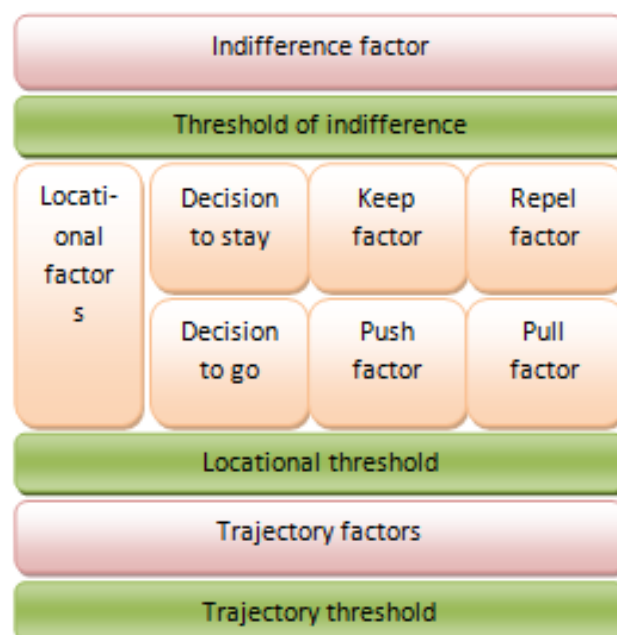


Figure 3. Threshold model (Van der Velde & Van Houtum, 2003, p. 11).

making processes based on structural economic differences between areas (Nearssen & Van der Velde, 2015, p. 1). In other words, the push and pull model has limited value to explain the choices of migrants. The threshold model sees the migrant as an actor whose decision will be influenced by other actors and the social environment. Several migration approaches explain the main factors that have an impact on an individual's decision to migrate but they tend to focus on why people move and why they do not. The decision to stay or not to move is often underexposed. This latter aspect is much more important for the threshold model in describing why people do not cross borders even if their living circumstances are unfavorable (Van der Velde & Nearssen, 2015). This is to some extent directly related to the transaction cost theory and the concept of bounded rationality. People do not know what to expect and have limited information for migration. Furthermore it could be possible that the costs of moving and giving up what they have can be too high compared to the uncertainty of possible improvement in another area. Some scholars believe that the traditional push-pull approach should be extended to include the active decision of 'not to become mobile'. *'These 'stay'-factors would encompass not only keep-factors, like the ones introduced in the 'insider advantage approach but also what could be indicated as the repel-factor'* (Van der Velde & Van Houtum, 2003, p. 10). These factors, which influence the movements of people, describe the attachment of people to a possible destination or about the prevention of going to a specific place. However, this process only takes into account people that are actively involved in a process of decision-making. This approach focuses on the different motivation for people to be mobile or immobile. Furthermore it gives an explanation for non-action and the mental passiveness of people which relates to immobility (Van der Velde & Van Houtum, 2003).

The threshold model distinguishes three thresholds – the mental, the locational, and the trajectory threshold – that a person has to overcome in the process of migration (Van der Velde & Nearssen, 2015). The following figure 3 shows the three different thresholds. The first, the threshold of indifference, indicates a border that people have to cross mentally before migrating. In order to clarify this, an attitude of indifference helps to explain why people do not consider migration or commuting to cross a (national -, regional – or local -) border. Active decision making is necessary to cross the threshold of indifference. In general, the majority of the actors in migration processes never surpass the threshold of indifference, only a small group will 'enter' the bottom part of this model. This next part of the model, after crossing the threshold of indifference, is based on actors with an active attitude towards migration. This section symbolizes 'rational' decision-making (Van der Velde & Van Houtum, 2003, p. 11). The active decision making process is influenced by different aspects like: locational factors, the decision to stay, the decision to go and several keep -, repel -, push – and pull factors. Once the migrant has decided on the destination of migration, he or she passes the second 'locational' threshold (Nearssen & Van der Velde, 2015). Another stage in migrant decision-making concerns the route to the destination. A potential migrant should think carefully how he or she will reach a chosen destination. For instance, a migrant can change the route from a safety perspective or to lower trajectory costs. This will influence mechanisms which assist in the decision to stay or to deploy a new destination. Once the decision is made on the trajectory, the trajectory threshold of a migrant is passed (Nearssen & Van der Velde, 2015).

The threshold model is relevant for this study in order to give an extensive explanation of the migrants' decision to leave or to stay. Specifically, the distinction between several influencing factors of a migrant's decision will give a more accurate clarification of migration as adaptation strategy to climate change. In addition, this threshold model takes also into account the aspect of 'immobility' or

the decision not to migrate, which could play an important role in the possibilities for adaptation and the adaptive response of people (Brooks & Adger, 2003).

#### 2.2.2. Storage

The second adaptation practice of Mearns and Norton (2010) is storage, the distribution of risks across time. Storage is the semi-permanent or long-term, containment - and holding of goods or materials, usually with the intention of retrieving them at a later time. Storage is an effective measure against complete livelihood failure (Mearns & Norton, 2010). The storage of water and food give communities that deal with droughts, more certainty in their subsistence and livelihood (Adger et al., 2007). Mearns and Norton (2010) make a distinction between different types of storage: water, food and animal/livestock storage. *Water storage* and saving are often the most effective way to tackle increasing weather variability (Mearns & Norton, 2010). Water is a scarce resource, but often in many river basins and other watery areas it is an inefficiently and under-used resource that can be better utilized to offset climate change and ensure food security (Smith, 2013). The challenge of water storage in general is that complex solutions must be tailored to local situations. *Food storage* can be established to prepare for droughts, hunger and malnutrition (UNEP, 2010). For instance *'grain storage provides an adaptation strategy for climate change by ensuring nutrition is available for livestock and seed stock is available in the event of poor harvests due to droughts'* (UNEP, 2010, p. 62). Also innovations for reducing waste of agricultural production could create a greater food quantity or quality (FAO, 2010). Finally, *animal/livestock storage* is about the regulation of livestock, a key asset for poor people. The impact of climate change is expected to heighten the vulnerability of livestock systems (Mearns & Norton, 2010). For instance irregular rainfall can translate into increased spread of existing diseases and macro parasites. The loss of livestock assets could trigger a collapse into chronic poverty and could have a lasting effect on livelihoods (IFAD, 2009). So the regulation of livestock can result in less vulnerability to climate change. Mearns and Norton (2010) also describe pest control; the regulation of species defines as a pest, as an adaptation strategy. Climate change can also result in the emerging of species defined as a pest, which can damage lots of crops (IFAD, 2009). A better control of these species reduces crop failure and creates a better resistance to climate change.

#### 2.2.3. Diversification

The third adaptations practice that Mearns and Norton (2010) mention is 'diversification'. Diversification is the distribution of risks across assets and resources of households and collectives. In Africa earn very few people their income from a single source of income. Many people earn their income by farming and non-farming sources at the same time, making that diversification as adaptation strategy the norm. People have obtained their wealth in the form of any single asset or use their assets in just one activity (Barret et al., 2001). These households and individuals have multiple motives to diversify assets, incomes and activities. The first motive for diversification is, just like migration, 'push factors':

*'risk reduction, response to diminishing factor returns in any given use, such as family labor supply in the presence of land constraints driven by population pressure and landholdings fragmentation, reaction to crisis or liquidity constraints, high transactions costs that induce households to self-provision in several goods and services, etc'* (Barret et al., 2001, p. 2).



The second set of motives comprise of the 'pull factors' which contains the realization of strategic complementarities between activities, such as crop-livestock integration or different more specific productions and specialization according to comparative advantage accorded by superior gifts etc (Barret et al., 2001). Income diversification is often undertaken for the following reasons: to reduce income risk by diversifying preliminary; to maintain food security in times of low farming productivity and climate related income shocks like droughts, by diversifying afterwards, when facing insurance market failure and when facing credit market failure by using their own income to finance farm investment (Hooks & Johnson, 2002). Several studies show that, in Africa, rural nonfarm activity tends to be fairly evenly distributed over commerce, manufacturing and service sectors. This is often linked directly or indirectly to the local agriculture in small towns (Hooks & Johnson, 2002, Barret et al., 2001; Reardon et al., 1994).

Diversification can occur in various forms. It can occur as production and non production assets, consumption strategies, employment strategies and crop diversification (Mearns & Norton, 2010; Adger et al., 2007). *'Diversifying households typically give up some returns in exchange for the greater security provided by diversification'* (Mearns & Norton, 2010, p. 184). People try to reduce their vulnerability by diversification and in exchange they accept to live in some level of poverty. For rural households in Africa diversification is a strategy for adapting to environmental shocks (Anderson & Deshinkar, 2005). Table 1 in paragraph 2.2.6. shows various sorts of diversification as described by Mearns and Norton (2010), namely: asset portfolio diversification, skill and occupational training, occupational diversification, crop choices, production technologies and consumption choices. The first three forms of diversification are related to the process by which households construct a diverse portfolio of activities and social support capabilities for survival in order to improve their standard of living (Motsholapheko et al., 2013). The last four practices of diversification could spread the risk of, for instance, crop failure and reduce the people's vulnerability, furthermore it could create a better future for people. An example of this diversification is the plantation of five different crops on a subsistence basis (Motsholapheko et al., 2013).

#### 2.2.4. Communal pooling

The fourth adaptation practice is communal pooling, which describes the distribution of risks across households. This communal pooling involves joint ownership of assets and resources; sharing of wealth, labor, knowledge or income from particular activities across households; and/or mobilization and the use of resources that are held collectively during times of scarcity' (Mearns & Norton, 2010, p. 184). Risks are spread out over different households, so the load of the risk is lower per household. Households benefit from the fact that they share the risks. Although when a region is affected, for example in the case of a flood or severe droughts, communal pooling is less likely to be an appropriate or often used adaptive response (Mearns & Norton, 2010). Mearns and Norton (2010) describe four examples of communal pooling: forestry, infrastructure development, information gathering and improved market access. All of the four examples will divide risks over household, which means lower risk levels per household. Forestry and infrastructure development will improve the habitat and livelihood of people in rural areas. Information gathering has been mentioned before; shared knowledge will reduce the vulnerability of people (Mearns & Norton, 2010).

In addition to communal pooling this research also applies the concept of 'social capital' in order to create a better analytic framework with regard to the aspect of communal pooling in this study. The aspect of social capital looks more at the social network of individuals and households in

comparison with the more general view that is provided by the concept of communal pooling. The concept of social capital can be used in several different ways, this study uses the following definition: '*social capital refers to social resources (networks, social claims, social relations, affiliations, associations) that people rely upon in their daily tidings and in times of trouble*' (Jarawura, 2013, p. 26). Unlike when using the market, in which there are a large number of organizations that can be a supplies, social capital could be created out of formal and informal associations between people; starting with the family, the neighborhood, local communities, political and voluntary organizations (Fine, 2003). Social capital is crucial to the sustenance of livelihoods based subsistence agriculture as people tend to depend on each other, not only to conduct their activities but to absorb frequent shocks (Bebbington, 1999). It is understood that the failure of social capital when dealing with these outcomes and the lack of non-farm jobs, often results in migration being the only option to survive (Jarawura, 2013). The concept of social capital will be further discussed in the paragraph that discusses the livelihood approach.

#### 2.2.5. Market exchange

The last adaptation practice that Mearns and Norton (2010) describe is *market exchange*. This market exchange is not a direct adaptive response to climate change and this is not perceived as being limited to being a risk reduction tool for the adaptation to environmental risks. Market-exchange-based adaptation practices can substitute the other four practices when rural poor people have access to markets. Because of the fact that this adaptation practice is not limited to being only a response to climate change and is not seen as a direct form of an adaptation practice, this practice will be given little attention in this study.

#### 2.2.6. Framework adaptation practices (Mearns & Norton, 2010, p. 187)

Mearns and Norton (2010) created a framework, in which they discuss all of these earlier mentioned concepts of the adaptation practices. The following table provides a schematic overview of the concepts. This framework will be used in this study to determine the ratings per case study. In order to understand the combination and complexity of the concepts of climate shocks, vulnerability and adaptation, the concept of 'livelihoods' should also be taken into account. The next paragraph will discuss the livelihood approach.

Table 1. Adaptation Practices (Mearns & Norton, 2010, p.187).

Class of Adaptation Practice	Corresponding Adaptation Strategies
Mobility	1. Agro pastoral migration
	2. Wage labour migration
	3. Involuntary migration
Storage	1. Water storage
	2. Food storage (crops, seeds, forest products)
	3. Animal/ livestock storage
	4. Pest control
Diversification	1. Asset portfolio diversification
	2. Skill and occupational training
	3. Occupational diversification
	4. Crops choices
	5. Production technologies
	6. Consumption choices
Communal pooling	7. Animal breeding
	1. Forestry
	2. Infrastructure development
	3. Information gathering
Market exchange	4. Disaster preparation
	1. Improved market access
	2. Insurance provision
	3. New product sales
	4. Seeds, animals and other input purchases

### 2.3. Livelihood approach

*‘Climate change is considered to have aggravating effects on the security and quality of livelihoods of people around the world’* (Jarawura & Smith, 2015, p. 1). A person’s livelihood refers to their ‘means of securing the basic necessities’ (Blaikie et al., 2004). The livelihood approach concerns individuals, households or communities. These draw upon different assets, capitals or resources to make a living (Dekker, 2004). To reduce the vulnerability and poverty, livelihoods have to change constantly and adapt to external shocks (Davies & Hossain, 1997; Van der Geest, 2010). In many cases reference is made to a sustainable livelihood. *‘A livelihood is sustainable which can cope with - and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation’* (Krantz, 2001, p.1). In this study it is important to establish to what extent livelihoods are sustainable in a context that is influenced by climate change.

Sustainable livelihood analysis has become a dominant approach since the 1990s. The concept of sustainable livelihood was developed in 1998 (Morse et al., 2009). This livelihood approach is based on a livelihood framework. The sustainable livelihood approach is a way to improve understanding of the livelihoods of poor people. *‘This framework highlights that livelihoods are constructed from assets and activities and the differential access to these based on institutional and social considerations’* (Dekker, 2004, p. 23). The different assets are generally disaggregated in five categories: natural, physical, financial, human and social capital (see figure 4). These different types of capital are the conceptualization of stress factors which play an important role (Krantz, 2001). Natural capital is related to the access to natural resource stocks (soil, water, air, genetic resources, etc.) and environmental services (hydrological cycle, pollution, sinks, etc.)(Krantz, 2001).

## Sustainable livelihoods framework

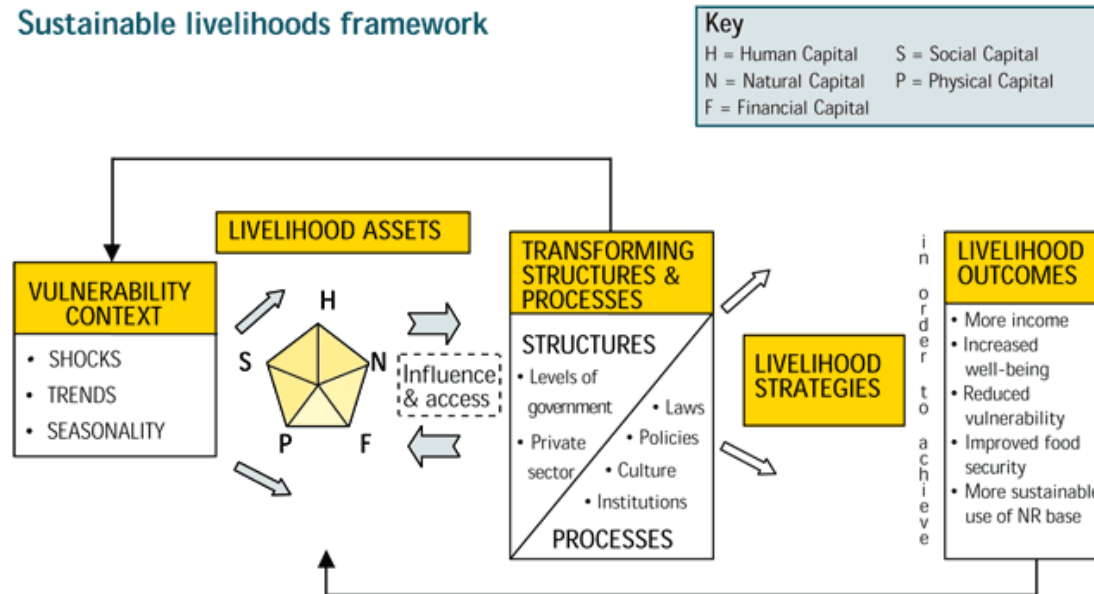


Figure 4. Sustainable livelihood framework (DFID, 1999).

The second form of capital is physical capital, which is based on the access to infrastructure (roads and buildings) and to production equipment and technologies (Morse et al., 2009). Thirdly, financial capital is capital based assets (cash, credit/debit and savings) which are essential for the pursuit of any livelihood strategy. The fourth capital is human capital, which means the assets to skills, knowledge, ability to work and good health. These assets are important for the successful pursuit of different livelihood strategies. Finally, social capital is related to social resources (networks, social claims and social relations) (Krantz, 2001).

The sustainable livelihood framework (figure 4) describes the context in which individuals or groups acquire, maintain or modify strategies towards achieving sustainable livelihoods (Jarawura, 2013, p. 24). The figure shows that other concepts are also included, such as vulnerability and shocks. One key concept that is mentioned in this figure is the role of institutions and politics, this role will be discussed in detail in the next paragraph.

Figure 5 shows the relationship between the three key concepts of this study: vulnerability, adaptation and livelihoods. The relationship between the concept vulnerability and the other two concepts will be discussed first. After which the relationship between adaptation and livelihoods will be discussed. The model consists of the interaction of factors that produce variations of vulnerability (Jarawura & Smith, 2015). This study considers that vulnerability is based on current – and future vulnerability. Current vulnerability will have a direct influence on adaptation strategies and livelihoods strategies, while future vulnerability could have an indirect influence on both other concepts (paragraph 2.1.2.). Jarawura and Smith (2015) considers that vulnerability takes place at two different levels, namely at a macro and a micro level. In which trends, shocks and seasonality are considered as macro level factors, in contrast to aspects like age, household composition, land quality and livestock numbers which define the opportunities and constraints at the household level (p. 8-9). The model assumes that vulnerable households (box of livelihoods) respond to climate change induced perturbations in various adaptive ways (box of adaptation) (Jarawura & Smith, 2015). If the vulnerability of a household increases then the need for adaptation will also increase, because

households will otherwise not survive and their livelihood will change negatively. On the other hand vulnerability relates to household assets and characteristics of livelihoods (see box vulnerability and livelihoods). The livelihood assets: human, physical, natural, financial and social capital could help to reduce or increase the level of vulnerability of individuals (Islam et al, 2014). For instance the physical environment or economic factors affect the vulnerability of natural resource based livelihood systems. People living in rural areas of developing countries depend often on climate-sensitive occupations (Islam et al., 2014). The livelihood aspects are relevant in mediating the threats of current climate change and climate change in the future (Jarawura & Smith, 2015). On the one hand adaptation strategies (box adaptation) could reduce the vulnerability (box vulnerability) of households and livelihoods (box livelihoods). But on the other hand vulnerability can also be determined by the level of adaptation (see paragraph 2.1. and 2.2.). A proper adaptation strategy, like migration for instance, could reduce the level of vulnerability of individuals and households.

There is a relationship between adaptation and livelihoods as well. Adaptation strategies can influence the livelihood strategies/outcomes (Agrawal, 2008). For instance climate induced movements of migrants, which is considered to be adaptation, create migration-dependent villages in their home town. On the other hand livelihood strategies can influence the adaptation level of a society (Perrings, 2005). The classification of a livelihood could be crucial in the adaptive response. A farming livelihood would struggle more with the direct impact of climate change than a more service-orientated livelihood.

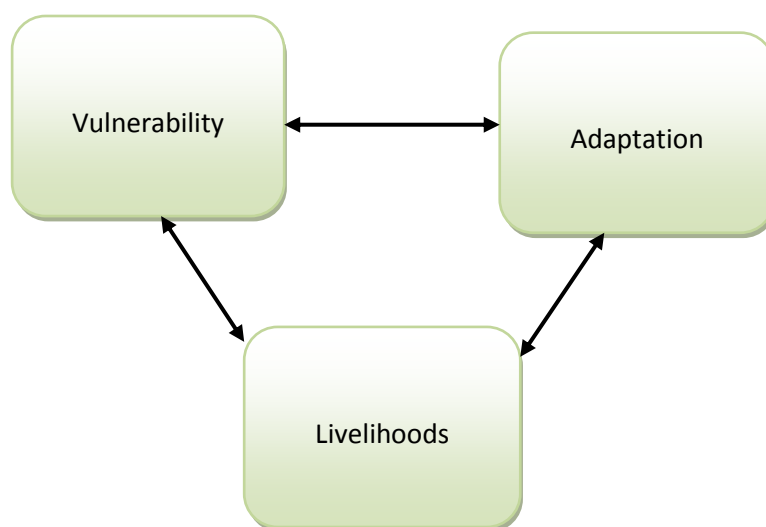


Figure 5. Relationship between vulnerability, adaptation and livelihoods.

## 2.4. The role of institutions and politics

Agrawal et al. (2008) and Mearns and Norton (2010) argue that institutions and politics have a big influence on ‘the level of adaptation to climate change’ of nations, societies, communities and households. This influence of institutions and society has already been discussed in the ‘Sustainable Livelihood Framework’ in the former paragraph. For this study it is important to add the role of institutions and politics, because local institutions have shaped how rural residents responded to environmental changes in the past (Agrawal et al., 2008). Furthermore adaptation to climate change is locally determined, for local institutions can shape the adaptation strategies of inhabitants

(Agrawal et al., 2008). There are three types of local institutions which are relevant to adaptation: civic, public and private in both formal and informal forms. These *local institutions* shape the impact on livelihood of climate hazards and they act only in a rural context. *Civic society institutions* are rural producer organizations, cooperatives, saving and loan groups etc. *Local public institutions* are the local government and local agencies. Finally the *private institutions* are service organization such as NGOs and private businesses that provide loans, knowledge and insurance (Agrawal et al., 2008). All these different sorts of institutions will be used in this study.

Graham and Scoones (1994) argue that there is a need for hierarchy of institutional responsibility for resource management in developing countries, stretching from local to national levels. Some resolutions to perceive this are: the decentralization of power (power to a lower level), harmonizing customary and statutory law (a central legal system and pursuing of it), building pastoral institutions (there is an enormous difference in sorts of pastoralist, which entails that different groups should be represented), dealing with conflict and the support from outside (International help is needed). This research will also take these resolutions into account, so that it can be determined what is missing or what kind of institutions are present in the research area.

## 2.5. Conceptual model

Verschuren and Doorewaard (2007) argue that a conceptual model always consists of two components, namely a set of concepts and the relationships between those central concepts. The central concepts in this research are climate shock events, long-term environmental change, vulnerability, adaptation strategies/practices and livelihood. These central concepts are integrated in the conceptual model below, which is based on the model of Mearns and Norton (2010, p. 175).

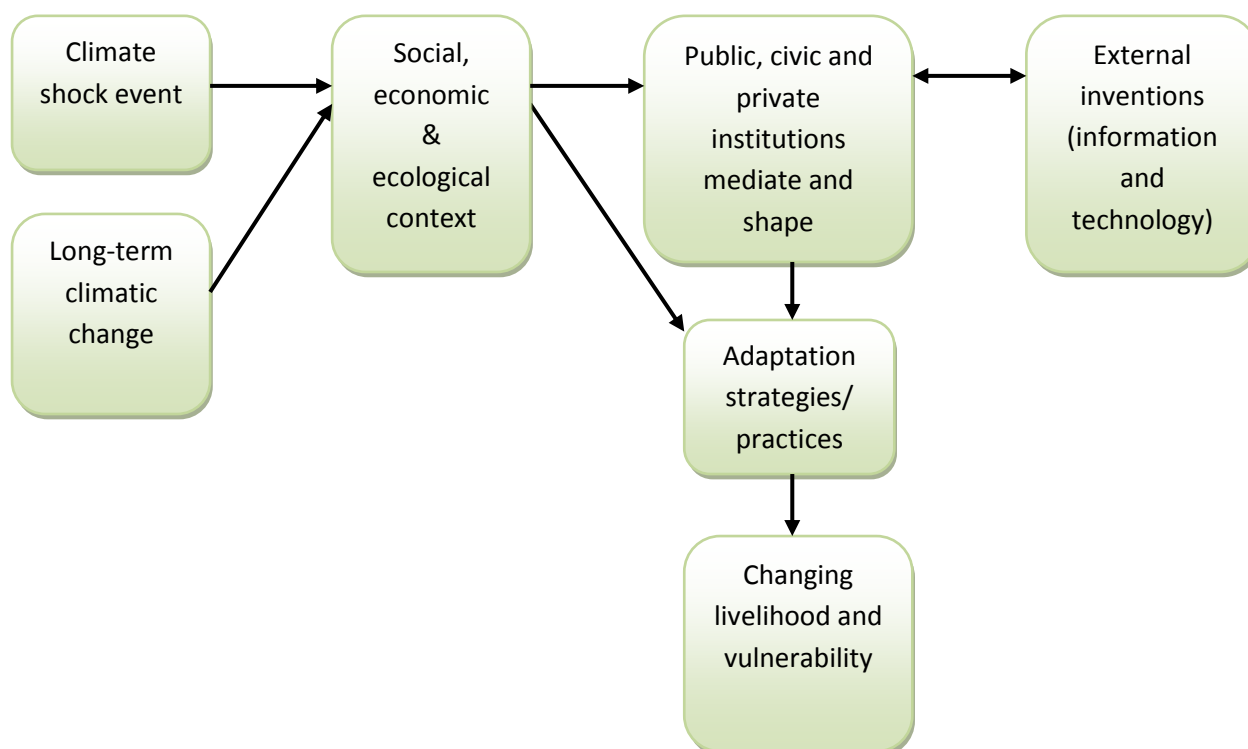


Figure 6. Conceptual model (based on model of Mearns & Norton, 2010).



The model of Mearns and Norton is to some extent adjusted to this research. The addition of the box with 'long-term climatic change' and the additional relationship between the social, economic & ecological context and adaptation strategies/practices are of great importance to this study. The main consequences of climate change due to climate shocks are of physical nature. Although the consequences transcend ecological, social, cultural, political and economic impacts (Adger & Kelly, 1999). Furthermore, the model shows that climate shock events and long-term climatic change create a certain social and ecological context in which public - (individuals, households and communities) civic – and private institutions mediate and shape. *'Adaptation to climate change is highly local, and its effectiveness depends on local and extra local institutions'* (Agrawal, 2010, p.173). Institutions structure the impact of climate risks on households in a given context and they shape the degree to which households' responses are likely to be orientated, individually or collectively. This mediation and shaping of institutions could create possibilities for adaptation strategies for the local people. For instance, the possibility of irrigation in an area sponsored by institutions. Jarawura and Smith (2015) describe the influence of the social, the economical and the political context as an aspect that is of lesser importance than the primary, secondary and tertiary impacts of climate change. This was for instance a reason for creating the direct relationship between the 'social, economic and ecological context' and 'adaptation strategies/practices'. Institutions could be decisive but they do not always play the determining role in the process of adaptation. People's perception (important aspect of this study) can be determined without the influence of institutions (Jarawura, 2008). Hence the direct relationship between the concept of the context and the concept of adaptation.

The second part of the model shows the relation between adaptation strategies/practices and changing livelihood and vulnerability. The adaptation strategies as a result of climate change could have influence on the livelihoods of the local inhabitants (Mearns & Norton, 2010) in the Savelugu-Nanton district, which is the area of research. The conceptual model provides only the one-sided relationship of the concepts adaptation, vulnerability and livelihoods. The versatile relationships between these concepts are already discussed previously in paragraph 2.3. Also Jarawura and Smith (2015) show that all these concepts are not based on one-sided relationships. These concepts affect each other in multiple ways. For instance the adaptation strategy 'migration' has influence on the primary, secondary and tertiary effects of climate change and also the other way around (p.17).

Another aspect of the conceptual model is that the mediation and shaping of institutions could be influenced or influence external interventions. For example technologies can be developed to warn people for flooding (early warning systems) which could be an external intervention which will influence the local institutions to invest in more of these systems. Of course is this a simplified representation of the relationship between the mediation and shaping of institutions and the influence of external interventions. Certainly, this shows that institutions are not static entities; they are likely to change (Agrawal, 2010). There is a reciprocal influence between both concepts.

This conceptual model outlines the framework which shows the relationship between adaptation due to climate change, livelihoods of the rural poor (vulnerability), and the role of institutions in facilitating external support for adaptation (Agrawal, 2008). This framework shows to some extent the critical role of institutions in coping with climate change and adaptation. Institutions structure the impact of climate risks on rural households in a certain context and shape the degree to which the responses are individually or collectively (Agrawal, 2008). As can be seen in the conceptual model

they also mediate the influence of external interventions on adaptation practices. The exact manner to what extent the institutions determine the adaptation strategies depends on different factors and contexts. It is important to understand that this framework only is relevant in an agrarian context. This makes the model limited to specific countries (where a large part of the population lives on agriculture) and regions (agrarian areas).

## Chapter 3: Methodology

The main goal of this chapter is to explain how this study is undertaken in terms of field methods and analyzing data. Furthermore it is important to make a clear distinction between the validity and the reliability of this study. Reliability refers to the fact that the results must be more than a one-off finding and be inherently repeatable. Validity encompasses the entire experimental concept and establishes whether the results obtained meet all the requirements of the scientific research model (Verschuren & Doorewaard, 2007). Validity also entails whether or not the results are unambiguous by comparing with other studies (external validity) and comparing the various results within studies (internal validity). This chapter discusses the research methodology; with a discussion of the research strategy (3.1) and research methods (3.2). Paragraph 3.2 the research methods, highlights the different quantitative and qualitative methods that are used in this research. At the end of this chapter the two different case studies of this research are described.

### 3.1. Research strategy

Given the purpose and the intentions of this study and the relatively limited information available about the local perceptions on adaptation strategies used by Ghanaian people in Northern regions, this study is designed as an *explorative study*. Explorative research aims to study reality in order to discover regularities (Verschuren & Doorewaard, 2007). The study area, northern Ghana, is chosen because many studies on adaptation strategies have been conducted in southern regions of Ghana and only a limited number of studies have been conducted in the northern part of the country. This results in new insights about adaptation strategies in northern Ghana. Another reason for studying the northern part of Ghana is because this topic is rising. Recent research of Francis Jarawura and DR. Yaro (mentioned before) is based on adaptation in northern Ghana. Their research about adaptation in northern Ghana is to a certain extent in line with this study, which makes them highly relevant for this study. This study tries to make an addition to their work in this area. Another example of the recent interest for this topic was the '*International conference on enhancing resilience to climate and ecosystem changes in semi-arid Africa*' in Tamale in August 2014. Many scholars showed at this conference that they are conducting research on adaptation in northern Ghana.

To achieve this goal, an 'explorative design' suits best (regarding the main objective of this study). By using an explorative design more information and insights can be gathered on the basic concepts of adaptation strategies; while taking into account the context of the geographical location. This results in a well-founded description of the situation in two villages (case studies) in northern Ghana. The two case studies were at first examined separately, after which they were to some extent compared. This generated more insights in the phenomena and it provided recommendations for institutions, private parties, NGO's and future research. Furthermore, this research is performed as an in-depth study. The specific situation of two villages forms the central part of this study. Therefore the problems, developments and characteristics are location specific. The reason for in-depth research is chosen because this study is interested in viewing all aspects of a phenomenon limited in both space and time (Verschuren & Doorewaard, 2007). The aim of this study is to create a holistic perspective of adaptation to climate change in both case studies. Furthermore this research tries to give a broad analysis of changes in livelihoods in the north of Ghana based on fieldwork and on recent literature. Following the choice of an in-depth study, information is predominantly derived using qualitative methods. Nevertheless, this research employs a mixed method approach, in which

qualitative and quantitative methodologies are used together to be able to answer the research questions. This will be described in detail in paragraph 3.2.

Qualitative research can be used to gather an in-depth-understanding of human behavior and developments. Therefore the qualitative part of this study is used to get a better understanding of the behavior and perceptions of Ghanaian farmers in the North. Information is largely derived from qualitative information sources. The information that was used came from the library of the Radboud University, the internet and databases of Royal HaskoningDHV. These sources were used to obtain relevant information from theoretical concepts, newspapers and policy documents. Besides this, interviews have been conducted to obtain information. The data that was obtained from these interviews give more insight in the theoretical concepts (interview with experts) and in the real life stories (interviews with residents). An advantage of the use of qualitative data is the fact that the data is collected with a strong relation to a situation, taking into account the local context and the perceptions (Verschuren & Doorewaard, 2007). It is important for the analysis of adaptation strategies of local people in Ghana to specifically focus on two case studies and their specific physical context. The physical context differs a lot in Ghana, which makes it an important factor. This makes it for this study necessary to do research on a small scale, mainly specific information is produced.

Triangulation, or internal validity, is important in a study (Verschuren & Doorewaard, 2007), therefore the choice was made to use mixed methods. Mixed methods are applied in this research in a way that qualitative data plays the main role with quantitative data as underpin. Quantitative research is mostly defined as the numerical representation of observation for the purpose of describing and explaining the phenomenon that the observations reflect (Casebeer & Verhoef, 1997). The quantitative part of this study entails questionnaires.

The collection of data for this study is conducted both empirically and non-empirically. Parts of this research are based on previously collected material in other studies. This is particularly the case in the discussion of theoretical concepts on adaptation strategy, vulnerability, shock events and livelihood. This data is derived from e.g. books, articles and newspapers. Additionally data is collected in an empirical manner as well. This data is used in the analysis of the case studies and is obtained by using surveys and interviews. An important reason for using both primary and secondary data is the increasing validity of the research outcomes (or external validity) (Verschuren & Doorewaard, 2007).

#### 3.1.1. The household as unit of analysis

This study uses a household as unit of analysis and takes into account the motives and the agency of actors in society, by looking at the intersection of different economies in household behavior as a unit of analysis, with a focus on households rather than individuals (Wallace, 2002). *'This implies that the household is not an isolated entity with independence in reproduction and productive activities thus the need to study the household in relation to wider processes of change both in the community and national levels'* (Jarawura, 2013, p.45). Although the concept of household strategies has been criticized, it has nevertheless remained an important tool of investigation in parts of the world. The critics describe that the household approach is based on the fact that it emphasis on agency rather than structure, the household rather than the individual and informal/domestic work rather than formal employment alone. According to scientists this tends to challenge many dominant sociological paradigms of social structure (Wallace, 2002). The main argument for using households as unit of

analysis (despite all the criticism) is that household strategies are mainly used to specify social groups that must draw on a range of resources in a struggle to survive in a risky environment. Hence, people in marginal positions, for example peasants, small business and farm families or immigrant entrepreneurs were said to have 'household strategies' (Wallace, 2002, p.6). These strategies were described as 'survival' or coping strategies. These strategies correspond with adaptation strategies, which make households as the unit of analysis very useful. A household is defined as a group that ensures its support and reproduction by generating and expending a collective income fund and making pertinent decisions for collective welfare (Yanagisako, 1979; in Jarawura, 2013). In this study a household is defined as the social unit that usually eats together, plus the temporary migrants who are linked to the household (Collisson et al., 2003). Jarawura makes a distinction of the different features in a household: spatial, functional and structural. The spatial feature is based on the fact that a household has its own spatial dwelling unit and has its own resource base separately from the rest of the community. Structurally, a household has to deal with problems of production, division of labor and has a mode of conducting inter-household exchanges. The household also has patterns of authority and power. Finally the functional feature, the household is a platform for production, transmission, distribution and co-residence (2013, p.49). These various dimensions of households make it an appropriate unit for the analysis of the phenomena concerning social processes (Yaro, 2004).

### **3.2. Research methods**

The object of this study is adaptation strategies in two villages in northern Ghana. Both case studies and their specific context are described in detail in paragraph 3.3. The required information is tracked in various ways. This is necessary, because certain information is only available through specific sorts of data. Additionally, several data sources are used in this framework to create triangulation (Verschuren & Doorewaard, 2007). The use of multiple data sources increases also the validity and reliability of this research, this is specific for the case of data sources that are related and have some overlap.

The first research method is: the interview. For this study interviews were held for different purposes. For example, to get a better understanding of the theoretical concepts, to analyze these concepts in reality through fieldwork and to outline the context of the situation at this moment. The interviews were held in a semi-structured manner. Semi-structured interviews keep the possibilities open to fetch certain themes in more detail, depending on developments within the interviews and the answers provided (Verschuren & Doorewaard, 2007). Therefore, the majority of the questions were created during the interviews, allowing both the interviewer and the person being interviewed the flexibility to probe for details and to discuss certain facets more specifically.

The interviews considered most important are the interviews with the experts of best practice, or the households. The concepts of adaptation strategies are tested on the inhabitants of both case studies using semi-structured interviews. The information that was gathered was necessary to give more detail in the analysis of this study. The interviews with the so-called experts of best practices are divided in the interviews held in Moglaa and the interviews held in Yong (see table 2 and 3). The experts of best practices are questioned about their adaptation practices in real life, to create an overview of the context in the research area. Initially, the following selection procedure is used: three elderly (50+), one middle age person (40-50), two adults (30-40) and one young adult (20-30).

Attention has also been paid to the sex of the respondents, approximately equally divided. The choice for the larger amount of elderly people in this study is based on the fact that elderly people are able to describe the change in climate and adaption strategies over a long period of time. Besides that it was necessary to speak with one farmer out of every age category to find out whether there were similarities or differences between the different age groups. The interviews were held between the months of July and August of 2014. The respondents are displayed by sex, age and function in the two tables below:

Table 2. Experts of best practice in Moglaa.

Village	Moglaa							
Sex	Male				Female			
Age	20-30	30-40	40-50	50+	20-30	30-40	40-50	50+
Farmer		Osman Haruna			Fati Seidu	Parti Pedro	Awabu Abdulai	
Landlord				-Iddi Ibrahim -Mohammed Yakusu				
Chief				Iddirisu Andani				

Table 3. Experts of best practice in Yong.

Village	Yong							
Sex	Male				Female			
Age	20-30	30-40	40-50	50+	20-30	30-40	40-50	50+
Farmer	Alhassan Abdul Rahaman		Adam Ibrahim	Adam Timoty	Martha Issahaku	Amina Tuahiru		Mariama Yalma
Landlord				Takina Nayi				

These tables give an overview of a cross-section of the people that were questioned during this study. Both tables show the diversity of the population of the respondents and the gaps in the population for which no respondents were found. Moglaa's table reflects the difficulty in finding male farmers between the ages of 20 and 50. During the rainy season the men were not present in the village during the day, because of the necessity to leave the village during the day for their farming activities. The rainy season, however, made it much easier to find female farmers. Because, they were processing the harvest in their compound houses (sheanut processing, drying groundnuts and boiling rice). Another remarkable aspect is the lack of elderly (farming or retired farming) women in Moglaa. They were not present during the fieldwork, while the elderly males were present in large



numbers. Yong's table demonstrates a better distribution of the ages and sexes of the farming population. Although, the same problem as in Moglaa arose, namely the absence of male farmers during the day because of the rainy season.

As mentioned before this is also performed by gathering information about theoretical concepts, information about the context in Ghana and adaptation practices in general. Therefore several experts in these fields are questioned throughout the entire period of this study (see table 4). Francis Jarawura is an expert on adaptation strategies and environmental migration, which made his scientific work, his information and himself one of the most useful experts of this research. Furthermore Francis Jarawura was living close to the research area, which resulted in a lot of help from him on location. The second person that was interviewed was Frits Dirks who introduced the intricacies of fieldwork in Africa. He did not have a substantive contribution to this study, but contributed with respect to the research methods in the beginning of the research. Yaw Agyenman Boafo is working on several themes which are interesting for this study, such as sustainability of agriculture in Semi-Arid Africa. Boafo was also one of the organizers of the *'International Conference on Enhancing Resilience to Climate and Ecosystem Changes in Semi-Arid Africa'* in August 2014 in Tamale. His knowledge about the research area, adaptive responses and climate change were a good addition for this study. Finally Kees van der Geest, one of the leading scientists on climate change, adaptation and livelihood vulnerability in northern Ghana. His work about climate change in Northern Ghana and migration is highly relevant for this research and is used several times. The interviews with the several experts were held in person or via video conference. These interviews were recorded and transcribed afterwards. In order to make a complete analysis of these interviews.

Table 4. Interviews with experts.

Name	Expertise	Date
Francis Jarawura	Ph.D. student. Centre for Migration studies, Ghana.	17/02/2014
Frits Dirks	Expert on fieldwork in Africa, Royal HaskoningDHV.	06/06/2014
Yaw Agyenman Boafo	Ph.D. student. Institute for the Advanced Study of Sustainability (UNU-IAS) United Nations University Japan	26/08/2014
Kees van der Geest	Researcher, United Nations University Institute of Environment and Human Security (UNU-EHS) United Nations University Bonn.	29/09/2014

To link the outcomes of the interviews with the relevant theoretical aspects with the interviews with the experts of best practice, the program 'Atlas Ti' was used. After the transcription of the interviews 'codes' were added to these transcripts. The codes of the household research are coarsely divided into three categories: change in environment (in wind, sunshine, rainfall and temperature), perceived causes for change (for instance bad farming practices, felling of the trees or divine intervention) and the climatic impact (drought, heavy rainfall and drying up of water resources). This makes that every

code represents a certain theme that was discussed during the interviews. The interview with the experts is coded separately and reflects only the parts that are relevant for this research. The use of codes provided a more structured character of the rather chaotically derived information during interviews with experts. In addition, the obtained information could be linked as well to information derived from articles and policy papers.

#### 3.2.4. Desk research

In this study, an important method of deriving information is reserved for desk research. During desk research several forms of literature are studied. Books and scientific articles are studied for the elaboration of the main concepts of this study like 'adaptation strategy', 'livelihood', 'vulnerability' and 'shock events'. During desk research several governmental papers are studied as well, for instance the documents from the Ghana Statistical Service (2005; 2012). These are used to find information about the developments, characteristics and features of the Ghanaian people. Furthermore, websites, policy papers and articles in newspapers are used to find relevant best practices. For instance newspapers could discuss the effects of climate change and reactions to climate change in the area. This concerns regional and national newspapers. Desk research did take place throughout the whole study.

#### 3.2.5. Group discussions

After collecting a lot of data through the earlier mentioned research methods, a third research method was used. Namely the group discussions. A group discussion is a great way to gather people together from various backgrounds or experiences to discuss a specific topic of interest. There are a lot of advantages of a group discussion. It stimulates participants to think in a different (new) way, it helps candidates to think about their own strengths and weaknesses, it expands the knowledge of participants and it helps to analyze problems with different perspectives (Verschuren & Doorewaard, 2007). Another advantage is that people can interact with each other, which could be useful when a difficult subject is considered (Verschuren & Doorewaard, 2007, p. 232). A lot of Ghanaians never thought about climate change, vulnerability and adaptation strategies, which makes that group discussions could be very useful. The fact that people would not think of climate change is a result in itself. Therefore this research method will give a good overview of the perspectives of different actors in the process of adaptation in the Northern region in Ghana.

In a group discussion there is a risk that an 'uncritical group opinion' will arise as result of one or a few dominant individuals that impose their view on the others (Verschuren & Doorewaard, 2007). This problem is dealt with in two ways. First, the appointment of a discussion leader and observant, to create more clarity during the discussions. The second solution is a small size (7 people) of the focus groups and the separation of sexes during the discussions. Both are solutions to prevent the formation of uncritical group opinions during the group discussions. The group discussions of this study are held with multiple actors, with similar backgrounds. In both villages, Moglaa and Yong, the choice was made to perform group discussions with only inhabitants. As mentioned before, the men and women were separate in two focus groups to make the results more reliable. An example of this is that women speak up more in a group with the same sex. The idea behind this is that asking the same questions to the separate sexes will give additional insights. Besides these separate male/female group discussions mixed focus groups were also a part of this research. To become

aware of the cohesion and relationships in both villages it was interesting to form a focus group with 15 men and women.

Just like the interviews the transcriptions of the group discussions were analyzed by the program 'Atlas Ti' to link the relevant aspects with for instance theoretical aspects. Several 'codes' will be added to the transcripts. An example of a code derived from the group discussions is 'drought definition'. During the groups discussions the question was asked several times to describe the phenomenon drought. This use of codes provides a more structural approach to analyze the other interviews.

### 3.2.6. Questionnaires

The fourth research method is conducting questionnaires, survey research, in Moglaa and Yong. This is a type of research that creates a broader overview of a spatiotemporal extensive phenomenon. The defining characteristic of survey research is the large number of research units. In addition, it is typical that the sample is drawn separately to get a representative image of the population (Verschuren & Doorewaard, 2007). The choice for questionnaires is based on the fact that this method is very effective to create a general overview of small villages, which is necessary in this research. The questionnaires will be based on the principles of '*cross sectional research*', for which data will be collected at one point in time at the same group. In both villages 50 questionnaires will be taken, which makes that this research is partially based on 100 questionnaires. The selection of the participants is *random*. The choice for random selection is based on the fact that not everybody in the population can be interviewed, so through random selection has each member of the population an equal and known change of being selected. The questionnaires are mainly used to provide a broader overview of the perceptions of local Ghanaians on the changing climate and their reactions to climate change in northern Ghana. The quantitative data which is obtained will be used in order to compare the characteristics of both villages. The Statistical package of the Social Sciences (SPSS) is used to analyze the quantitative data. SPSS is mainly used to generate frequencies and cross tabulations of the population. This research is not using other functions of SPSS (such as Chi-square or logistic regression models) to analyze, no comparison between the different groups is made by SPSS. This is because the questionnaires were only used to describe the population or their perceptive, however, it was not used for an in-depth analysis of the relationships between concepts (for this purpose data derived from the interviews will be used).

### 3.3. Selection research area

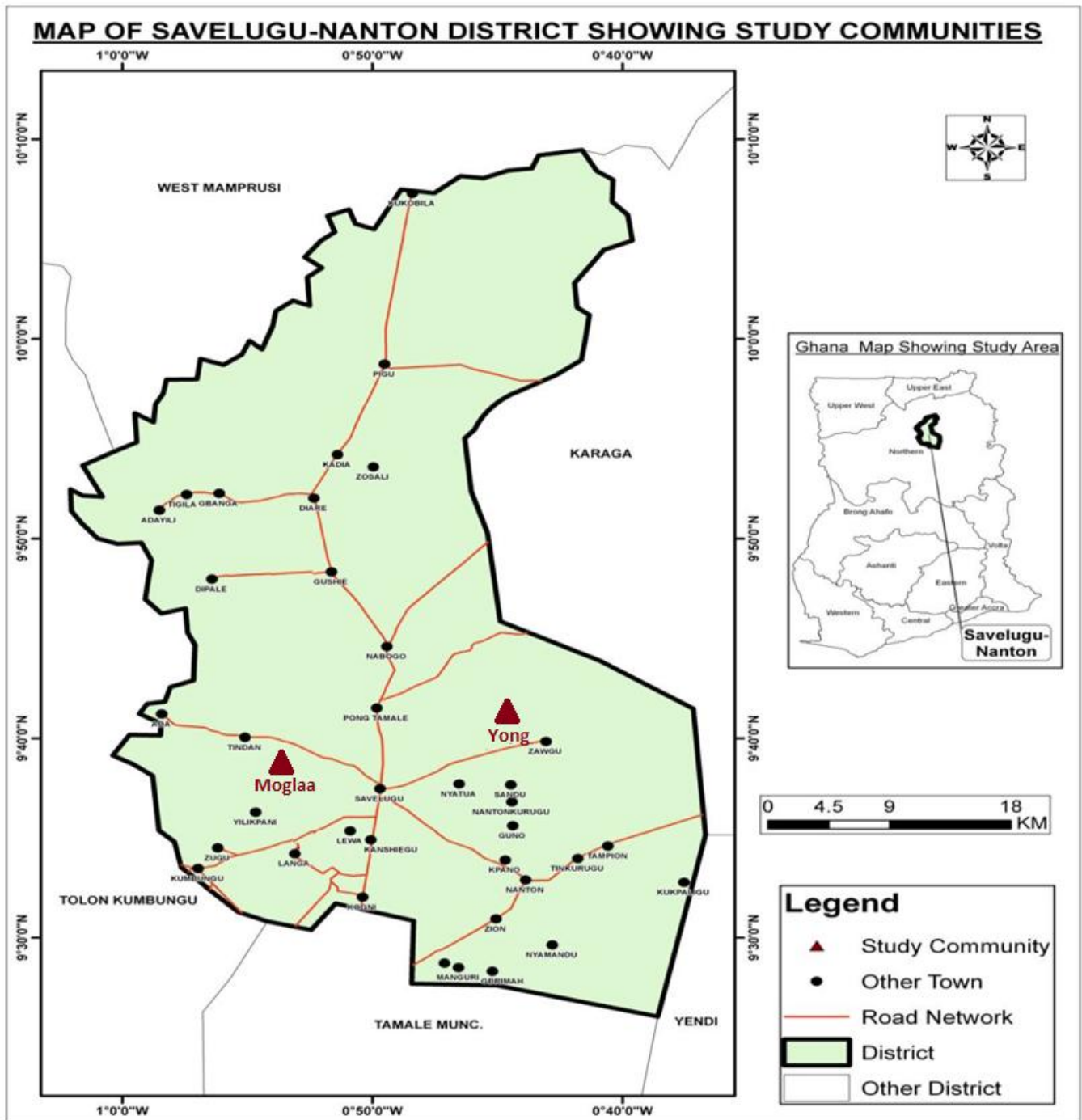
As mentioned before this research is based on data acquired in two villages, Moglaa and Yong, in the district Savelugu-Nanton in Northern Ghana. The district Savelugu-Nanton, with the district capital Savelugu, located in the Northern Region, the district shown in map 3 covers an area of 1790.70 square kilometers. The district borders the West Mamprusi district in the north, Karaga district to the east, the Tolon-Kumbungu district to the west and the Tamale Metropolitan to the south (Jarawura, 2013). The district is flat with a gentle undulating landscape. The southern part is slightly hilly and slopes towards the north. The altitude of the landscape ranges between 400 to 800 feet above sea level (SNDA, 2010).

There are multiple reasons for the choice for the Savelugu-Nanton district. First, according to the Savelugu/Nanton District Assembly (SNDA, 2010) over ninety percent of people's livelihoods is based on the agricultural sector, which in turn is largely dependent on rainfall. The agriculture in this

district is therefore highly climate-sensitive, particularly in relation to drought (Jarawura, 2015). *'The district is one of the few in the Savannah classified as highly vulnerable in terms of crop vulnerability to drought'* (Jarawura, 2015, p. 105). Secondly, the research of Mabe, Sarpong and Osei-Asare (2012) describes that this district is highly adaptive to climate change. The research concerning *'adaptive capacities of farmers to climate change adaptation strategies and their effects on rice production in the Northern Region of Ghana'* point out that the farmers are highly adaptive to the use of chemical and organic fertilizers, formal irrigation, farming near water bodies, the use of early maturing crops, drought tolerant varieties, mixed cropping, change of planting dates and the construction of fire belts (p.13). Many of their results are consistent with the adaption strategies that have previously been discussed in the theoretical framework, which makes this district suitable for this study. The third reason for the choice for the Savelugu-Nanton district is the fact that migration is a common strategy for vulnerable livelihoods in this district (Marchetta, 2011; Jarawura, 2008). Jarawura's research explains specifically that there is a high rate of out-migration in the Savelugu-Nanton district, with a new phenomenon of a lot of married women and children migrating independently (2008). This high rural out-migration could be a sign of a change in livelihood diversification in this district. This livelihoods change could indicate that there might be also influences of climate related processes in the Savelugu-Nanton district.

This research has selected two small villages in the Savelugu-Nanton district, Moglaa and Yong. The first selected village is Moglaa, displayed with a red triangle in map 3. This village is located west of the district capital Savelugu. The village Moglaa has an estimate number of 2263 residents and 225 households. Farmers in this village have small fragmented farms and mainly cultivate crops to satisfy their food needs, though some have also crops for the market. There is little usage of tractors or other machinery. This means that the sowing and harvesting are still labor intensive. The farmers in the Savelugu-Nanton district can therefore be referred to as being small holder farmers (Jarawura, 2015). Moglaa's topography is generally low-lying, surrounded by higher areas. This makes that Moglaa is a recipient of run-off water. In addition, irrigation is applied on small scale at the river close by (tributary of the White Volta). These irrigation activities make it an interesting village to investigate adaptation strategies, which is the main reason for the selection of Moglaa.

The second village is Yong, located east of the district capital Savelugu. The population of Yong has an estimated number of 1442 residents and 160 households. The context of this village is almost similar to Moglaa's. Almost every inhabitant is living from agricultural activities, and can be referred to as being a small holder farmer. Yong is located at higher ground than Moglaa and has no river nearby or irrigation system. However there is a borehole in the area, but it dries up during the dry season. The absence of an irrigation system in Yong is the main difference compared to Moglaa, which makes that this village is selected. The comparison between two villages, one with irrigation possibilities and one without irrigation possibilities is interesting in a research about adaptive responses to climate change.



Map 3. Research Area Savelugu (Jarawura, 2013, p. 37).

## Chapter 4: Descriptive analysis of the Savelugu-Nanton District

Prior to the analysis of the processes in Savelugu-Nanton it is important to discuss the various questions related to the what, how, where and when of the research area. Therefore this chapter will give a descriptive overview of physical, social and climatic characteristics of the research area Savelugu-Nanton. This chapter will describe the physical changes, the two case studies and their perceived climate change and their adaptive response. This part of the research is mainly based on quantitative data, derived from the questionnaires, which will be used later on in this research.

### 4.1. The geography of the Savelugu-Nanton district

The methodology chapter has already briefly discussed the two case studies of this research. This paragraph presents the characteristics of the area and it will also present a scenario outline. This scenario outline is on a macro level in order to give a comprehensive overview of the Savelugu-Nanton district and both case studies.

The Savelugu-Nanton district has a generally flat with gentle undulating landscape. *'The southern part is slightly hilly and slopes towards the north'* (Jarawura, 2013, p. 36). The altitude of the landscape ranges between 400 to 800 feet above sea level (SNDA, 2010). Agriculture, the main economic activity, is responsible for 97 percent of the population income. In this study agriculture can be related to both crop and animal farming. Other economic activities in the district include trading, sand winning, fishing, sheanut picking and processing, fire wood cutting and the production of charcoal (Jarawura, 2013). The main drainage system in the municipality consists of the White Volta and its tributaries (SNDA, 2006). The district is part of the Guinea Savannah vegetation type, with vegetation that consists of drought and fire resistant trees (for instance the shea -, the dawadawa - and the mango tree) as well as secondary forest, and short shrubs and grasses (Jarawura, 2013). These shrubs and grasses support livestock farming, which gives the Savelugu-Nanton district the potential to benefit from large scale livestock farming, as well as the cultivation of crops like maize, sorghum, millet, cassava, rice, cowpea, groundnuts and yams (SNDA, 2010). The climate of Savelugu-Nanton is strongly influenced by the West African Monsoon. The rainfall seasons are controlled by the movement of the tropical rain belt (Inter-Tropical Convergence Zone) (McSweeney et al., 2011; Yaro, 2004). The wet – and dry season are determined by the wind blowing from the Sahara and from the Atlantic Ocean. The wind from the Sahara is dry, dusty and cold air, causing dry conditions in the northern districts. On the other hand, the wind from the Atlantic Ocean brings moist air, creating the conditions for the rainy season (Jarawura, 2013). This results in two seasons, a single wet season (from April to August or September) and a single dry season (McSweeney et al., 2011). The temperatures in the area are considerably high, ranging from 18 up to 38 degrees Celsius (SNDA, 2010). The highest temperatures are usually measured in March and April, and the lowest temperatures in August (Jarawura, 2013). As mentioned before, the 'Harmattan' takes place in this area, with the result that in December the days are hot and the nights are very cold (McSweeney et al., 2011). It is also causing high rates of evaporation and transpiration, leading to the drying up of rivers and streams and the failure of crops (SNDA, 2010).

#### 4.1.1. Moglaa

As mentioned before, Moglaa located west of the district capital Savelugu has an estimate number of 2263 residents and an estimated number of 225 households. Moglaa has a gently undulating terrain,

surrounded by some higher areas. The village is characterized by compound houses, where several families and cattle live together. Compound houses are featured by close boundaries and a shared outdoor courtyard (see figure 7). Several inhabitants of Moglaa have electricity, for instance the presence of electrical outlets in the cottage of the chief and the electrical wires which are running through the village. Within close proximity (accessible by foot or scooter) a river is situated, a tributary of the White Volta that never dries up (see figure 8). This river allows several farmers in close proximity to the river to use irrigation, which makes cultivating of crops possible in the dry season. The presence of irrigation was the main reason to select Moglaa. However, some farmers further down the river cannot benefit from the available irrigation possibilities. This is because there is no system present which is able to bring the water further land inwards. This results in the majority of the cultivated land close to the village being rain fed agriculture. The river is also used to collect daily water for the inhabitants of the village. Figure 9 shows fresh footprints of people at the bank of the river which confirms that people use the river to collect water. A lot of people had already collected water from the river that day.

The inhabitants of Moglaa are engaged in crop and animal farming, which is the main source of their livelihood. The most frequently grown crops in this village are maize, rice, groundnuts, tomatoes, peppers, okro, soy beans and yam. The farmers mention that they always plant their seeds after the first good rain in July. The majority of the animals in Moglaa are goats, fowls, cows, chickens and pigs. Most of the animals are used to sell, not to eat, during difficult or hard times. The majority of the inhabitants are Muslim (88 percent). This aspect is reflected by the fact that in the village there is only a mosque and no church. The large amount of Muslims makes that polygamous marriages are the standard; a man usually marries multiple wives. This results in the situation that for instance the first, second and third wife with their families live, cook and eat in the same compound house together. Moglaa has a primary school and no junior high school, which results in the fact that children of a certain age are not present in the village during the day. Several people, including the chief, use cell phones to communicate with people in and outside the village. Finally, it was conspicuous that the women in Moglaa were dressed very colored, neat and veiled (see figure 9).

The population's mobility is mainly based on the use of scooters and bicycles (see figure 10). The village Moglaa can be reached by a dirt road of about two kilometers. This dirt road leads to a paved road leading to the larger village Savelugu. The village Savelugu can be reached within 30 minutes by the use of a scooter. The city Tamale (largest city of northern Ghana) is reachable by scooter within an hour. This makes that the scooter and the bicycle are of great importance for the mobility of people in Moglaa, there are hardly any cars present in Moglaa. Access to markets and good road networks could have a great influence on the vulnerability of the farmers. At the same time the large number of scooters and bicycles means that the mobility could decrease with age (like the ability to cycle on a higher age).





Figure 7. Compound house in Moglaa.



Figure 8. River with footprints nearby Moglaa.





Figure 9. Female inhabitants of Moglaa.



Figure 10. Livestock and mobility by motorcycles in Moglaa.

#### 4.1.2. Yong

Yong located east of the district capital Savelugu, has an estimate number of 1442 residents and an estimated number of 160 households. Yong has a relatively flat and gently sloping landscape with no higher surroundings. Just like Moglaa, is the village marked by compound houses (see figure 11). Nobody in Yong has electricity or running water, clearly shown by the fact that there are no electricity wires or electrical outlets in this village. Yong has no river nearby; as a result there is no irrigation possible for the farmers from Yong. Daily water, what is carried by women, comes from water sources in the neighborhood. In order to fetch water the women have to walk an hour back and forth. This water source often dries up during the dry season, which causes the women have to walk longer distances in their search for water. This daily water is stored in large barrels in the compound houses.

Crop cultivation and animal rearing is, just like Moglaa, the core of the livelihoods in this village. All of the agriculture in Yong is based on rain fed land cultivation. The most frequently grown crops in Yong are maize, rice, groundnuts, okro, soy beans, cassava and yam. Just like Moglaa the planting strategy of the farmers is to start planting after the first good rain in the beginning of July. Pigs, goats and chickens are the animals which are mainly kept in this village, for selling purposes. A difference with Moglaa is the shea butter production of Yong. In this village several women are busy with the drying, washing and heating of shea nuts. Figure 12 shows two ladies who are engaged in the process of shea butter production, in front is a woman washing the dried shea nuts while the women in the back is heating the nuts to process them into shea butter. The majority of this village is Christian (73 percent), the other inhabitants are Muslim. A church is being built in this village and there is no mosque present. A few men who are living in this village are married with multiple women. Instead of the sharing of compound houses by women who are married to the same man, in this village it is more common to share the house with relatives. It is common to share the house with parents, brothers, sisters or in-laws. In this village there is no primary - or secondary school present, what explains the amount of children in the village during the day. Poverty in Yong is a larger problem than in Moglaa. The inhabitants have more problems with paying school fees, buying clothes and providing food for their families. Another aspect is that the status of the chief of Yong is lower than the chief of Moglaa, which also reflects the difference in prosperity between the villages, and the respect for Yong as village in the neighborhood. Finally, the clothing that the women and men wear in Yong is slightly different, less neat and tidy, than that of the women of Moglaa.

Yong's mobility is to some extent comparable to the mobility in Moglaa and is based on motorcycles and bicycles. One thing that differs between the two is the proximity of a paved road. The village Yong is divided into two parts by a tarmac road. This makes that reaching Savelugu and Tamale takes less time. The farmers also use their bikes and bicycles for driving to their farming land. Just like Moglaa both vehicles are mainly used by young - and middle-aged people.





Figure 11. Compound house in Yong.



Figure 12. Sheanut production by women in Yong.



Figure 13. Female inhabitants of Yong.



Figure 14. Male inhabitants of Yong.



## 4.2. Objective versus perceived climate change

One of the most interesting parts of this study is the comparison between the objective climate change and the perceived climate change in both case studies. According to Jarawura (2013) the study of perceptions is considered to be important to understand human decisions and choices as a response to climate change. This is because recognition, understanding and interpretation of climate related phenomena influence the human response for surviving the impacts (Adger, 1999). Therefore this is important to get a better understanding of the farmer's perceptions of climatic changes and their responses to these changes. Initially, the objective climate change of Savelugu-Nanton will be discussed in order to make a good comparison with the perceived climate change later on in this study.

### 4.2.1. Objective climate change in Savelugu-Nanton

Ghana experiences, as well as other countries in West Africa, physical changes caused by the impact of climate change. The introduction has already mentioned the rising temperatures in Northern Ghana and the increase in 'hot' days and 'hot' nights. These are two of many climate related effects on the Savelugu-Nanton district. The annual rainfall in Ghana is highly unpredictable, which means that it is very difficult to analyze the trend of the rainfall in this area. The rainfall was particularly heavy in the 1960s and decreased to lower levels in the late 1970s and early 1980s, which showed an overall decreasing trend in rainfall in the period between 1960 till 2006 (McSweeney et al., 2011). A lot of climate scenarios are written about prospective changes; this chapter only looks at the climate changes so far (till 2014) in the Savelugu-Nanton district. The chapters about sustainable livelihoods (chapter 5 and 6) will consider climatic impacts after 2014.

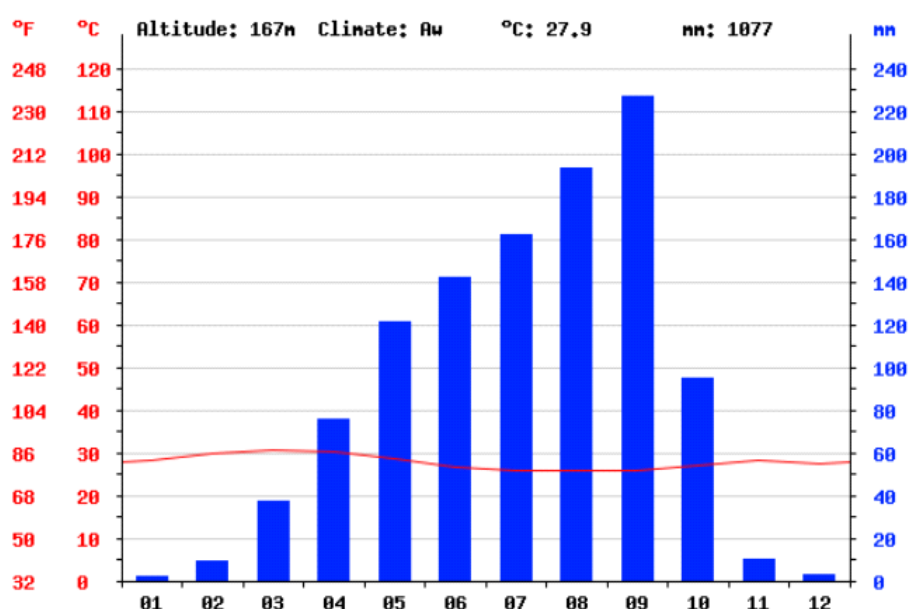


Figure 15. Climate diagram Savelugu-Nanton district (climate-data.org, 2014).

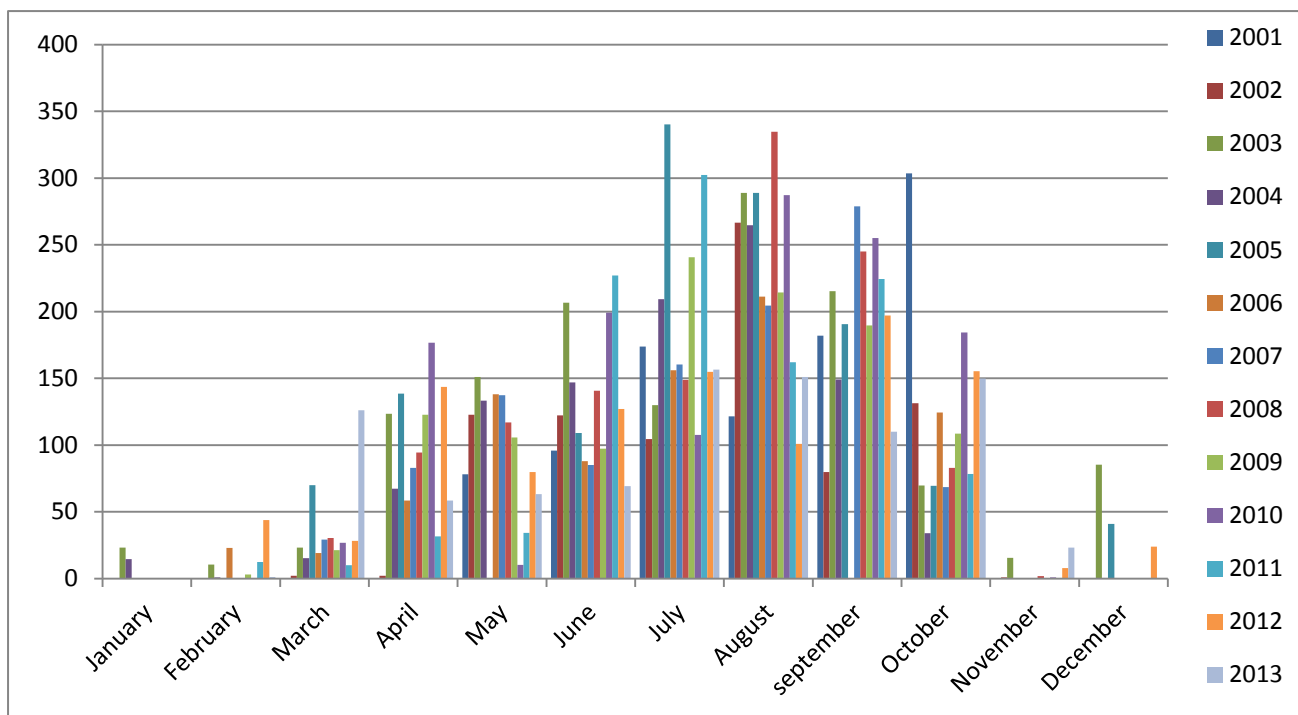
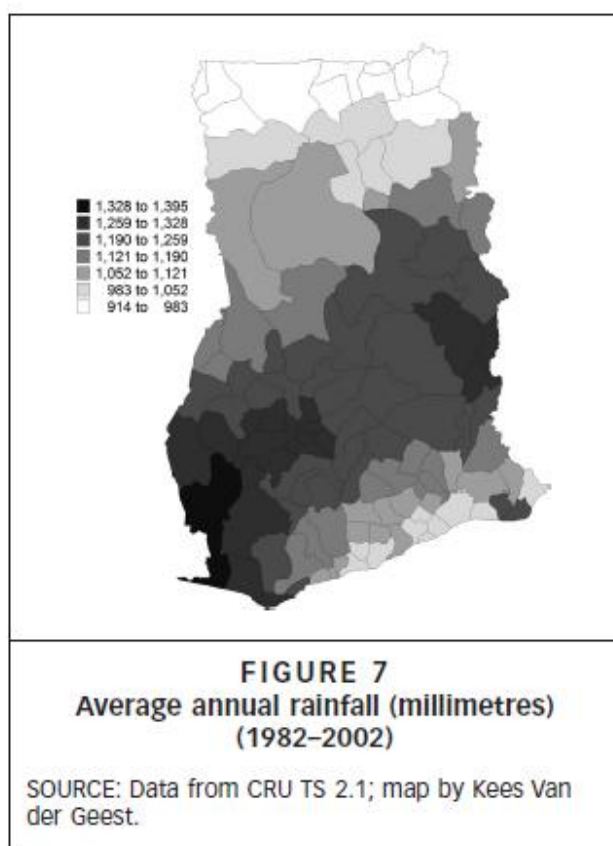


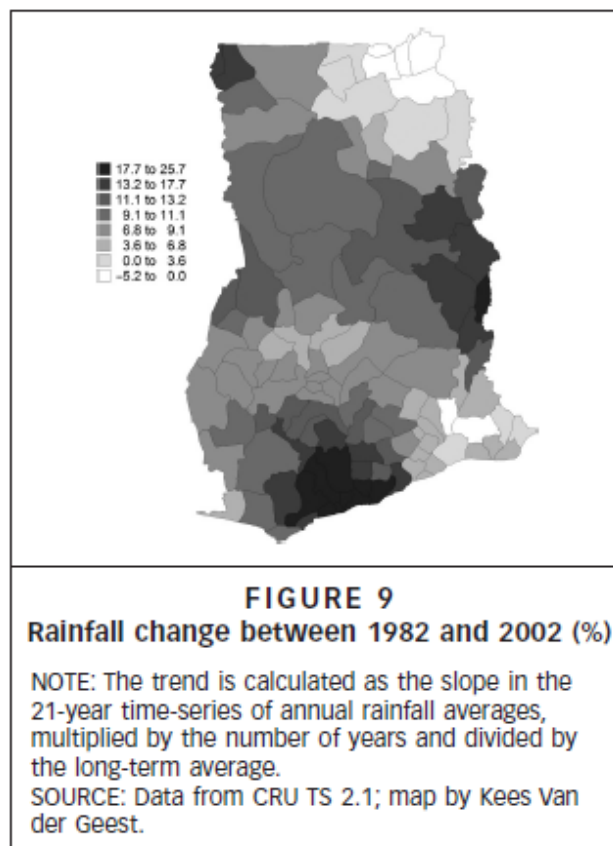
Figure 16. Precipitation Savelugu-Nanton between 2001 and 2013 (GMET,2014).

Figure 16 shows the rainfall and the temperature throughout the year in the Savelugu-Nanton district. The climate in Savelugu is tropical; in the winter the rainfall is less than in the summer. According to Köppen and Geiger is the climate classified as Aw, which is a tropical savannah climate. Figure 15 is based on summaries of averages, representing a general picture of the Aw climate in Savelugu-Nanton. Furthermore figure 16 shows the global climate as well as the changing rainfall from 2001 till 2013. The precipitation in the district is illustrated by bars of varying sizes in this graph. Remarkable about this graph and the precipitation numbers is the change which is visible from 2010 till 2013. The figure shows that in May (start of the wet season) there is hardly any rain, which is the opposite of the years before. In addition, the figure demonstrates that the rain is decreasing in the following months during the rainy season. The precipitation in the month October (normally the beginning of the dry season) in 2012 and 2013 is way above average. A lack of precipitation in the wet season often leads to droughts in this season. Droughts are therefore reported more frequently between 2010 and 2013 by meteorological institutes than in the years before.

The changing rainfall pattern could indicate a possible change in climatic conditions in the area of Savelugu-Nanton. Van der Geest, Vrieling and Dietz (2010) confirm this change in climate to a certain extent in their research. They show, in the following maps, that the Savelugu-Nanton district is rated as an area with the second lowest amount of precipitation in millimeters in the period from 1982 till 2002 (see map 4). Contradictory to the increasing droughts in 2010 till 2013 there was a positive change in rainfall in this district in 1982 till 2002. Map 5 shows that in most districts in Northern Ghana, as well as the rest of the country, rainfall generally increased between 1982 and 2002 (Van der Geest et al., 2010). According to this figure there is a positive change of rainfall of 3,6 to 6,8 percent over 20 years. In spite of the fact that map 5 captures the change in rainfall for a long period, it does not mean that this process is still happening today. However, it shows that the climate of northern Ghana is dynamic and not stationary.



Map 4, Average annual rainfall (Van der Geest et al., 2010, p. 115).



Map 5. Rainfall change between 1982 and 2002 (Van der Geest et al., 2010, p. 115).

Besides the changing rainfall patterns, there are also changes in other climatic concepts in the Savelugu-Nanton district, such as temperature changes. Figure 17 shows the temperatures from 2001 till 2013 in the Savelugu-Nanton district. Remarkable about this figure is that it is showing a recent difference in temperature pattern in this area of Ghana. The years 2011 till 2013 are totally different compared to the years before, almost the opposite of the average temperature wave of the Savelugu-Nanton district. Whether this is accidental or if it is a sign of climate change in this area is difficult to say at this moment, because climate related statements are often made over a longer period of time. Although it is hard to say what is causing these changes, one thing is certain, changing climatic circumstances are present in this district.

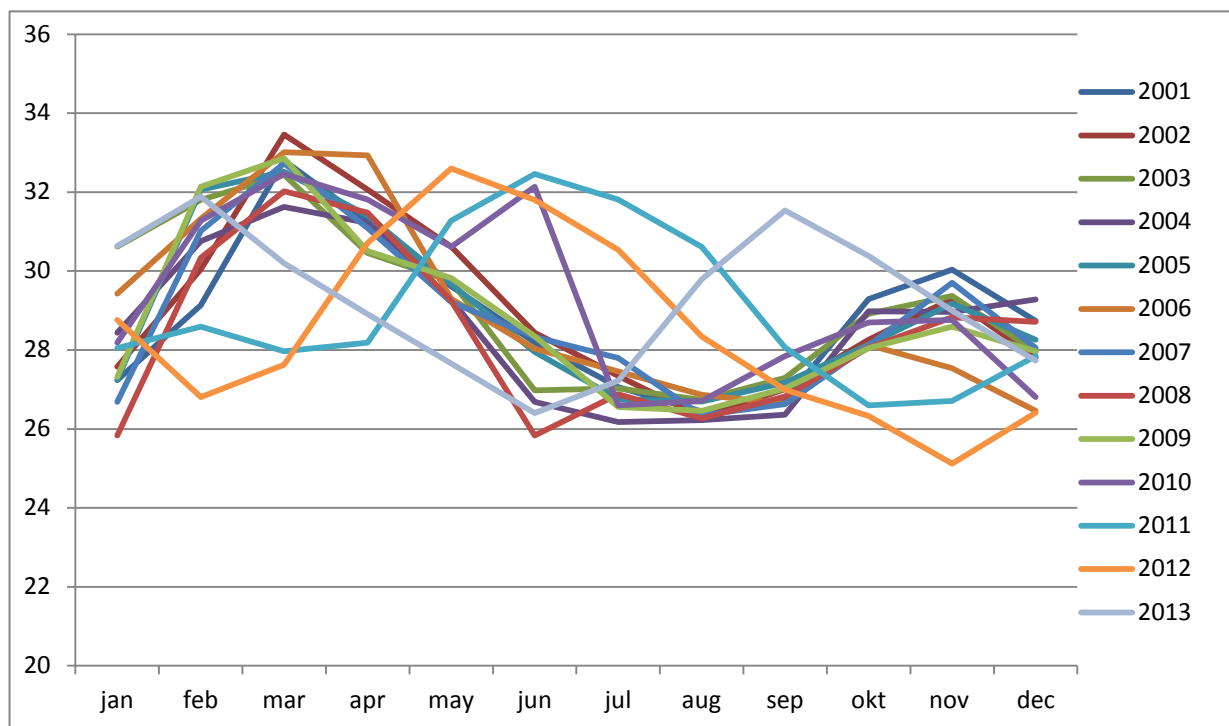


Figure 17. Temperatures Savelugu-Nanton district 2001 till 2013 (GMET, 2014).

Changing temperatures and rainfall patterns have been observed in the Savelugu-Nanton district, which are conditions that can cause droughts and floods (IPCC, 2007). However, it is in the Savelugu-Nanton district difficult to gather information or find databases with accurate information about floods and droughts because there is no institution or equipment for acquiring the specific information. Therefore searching other sources was needed to create some kind of an oversight regarding floods and droughts in the study area. For example the 1999 Northern floods swept through the Savelugu-Nanton district, as stated by NADMO staff (Personal communication 20 August 2014). Other data can be found about a major flood in September 2007 in the Northern Region, caused by heavy rainfall in the period between the 24<sup>th</sup> till the 29<sup>th</sup> of August. The rain continued in the month September (IRIN, 2007). In September and October 2010 in the Central Gonja District (close to Savelugu-Nanton) there was a flood that struck the area, once again caused by heavy rainfall and the opening up of the Bagre dam in Burkina Faso (Ghanaweb.org, 2011). Finally in the first week of March in 2013, severe rainstorms continued for two weeks, impacting the northern part of Ghana (as well Savelugu-Nanton district), which resulted in severe floods in the area (IFRC, 2013). The above figure, figure 17, shows this incident as well; a large amount of precipitation is measured in March 2013. Although this is not a complete overview, these examples of floods in the Savelugu-Nanton district give an overview and show that this area has been plagued by multiple floods in the past.

Droughts are also a well-known phenomenon in the Savelugu-Nanton district. From 1982 till 1983, Ghana experienced a large amount of droughts followed by a less intense drought in 2004. In 2007, after the major flood, there were months of drought with June and July being especially dry (Alfredo, 2008). These are the major droughts that not only affected the Savelugu-Nanton district, but the whole northern region of Ghana. At a local level droughts are a common phenomenon. Every year, during the dry season, some level of drought takes place in the Savelugu-Nanton district.



Farmers in this district generally perceive drought as a part of the climate (Jarawura, 2015). Because of the fact that this is a common feature of the climate, this study focuses only on droughts during the rainy season, which are more devastating for farming and a more uncommon phenomenon. Unfortunately there are no figures known about the drought during the wet seasons in the recent years, which make it impossible to state that there are changes noticeable in the frequency and intensity of droughts in the research area Savelugu-Nanton over the last decennia. However, the conditions of increasing lower rainfall and increasing temperatures create ideal circumstances for the onset of droughts.

#### 4.2.2. Perceived/experienced climate change in Savelugu-Nanton

People's perceptions influence their actions (Slegers, 2008). Exploring perceptions of rainfall, temperatures, drought and floods is therefore crucial in understanding the relationship between climate change and adaptation (Jarawura, 2013). *'Until recently, most studies ignored or places less importance on the role of perceptions as a driver of decision-making process'* (Jarawura & Smith, 2015, p. 21). Nowadays scholars argue that these perceptions are crucial to recognize and understand the influence how people experience and explain climate change and the decisions they make (Jarawura & Smith, 2015). Perception is defined in this study as to the way people see, hear or become aware of something through their senses (Oxford Dictionaries, 2015). The perception of a climatic phenomenon's is often related to the economic, social and cultural circumstances in which people are situated (Jarawura, 2013). This part of the study is about the experiences of local people with climatic changes, their perceptive causes of the changes and how they act based on their perceptions.

In this study the respondents were questioned about primary climatic changes like rainfall, sunshine, temperature and wind. Everybody, in both Moglaa and Yong, had experienced a change in rainfall pattern during the last three years which was established by the questionnaires and interviews in this research. The questions, based on primary climatic changes, were related to the 'actual' changes of climate in their opinion, what does not immediately mean that it is about the 'perceived' climate changes. The local people were able to give a sketch of changes of the last three to five years. However, their memory let them down when they were questioned about an earlier period of time. Despite the absence of measuring equipment and detailed knowledge it was possible to make a sketch of the experiences of inhabitants. However, a detailed analysis of the climatic changes in the area of a longer period of time is not possible. The majority (96%) describes the changing rainfall as decreasing, whereof 79 percent of the people describe that the rain is decreasing since their childhood. The chief of Moglaa tells that *'the rainy season used to last six months but these days we barely have it for three months. The pattern has changed both in frequency and in intensity'* (Personal communication, 11 July 2014). After asking about rainfall, the respondent was questioned about possible changes in temperature. Nearly all respondents described an increasing heat. According to the respondents this is caused by a higher temperature and an increased amount of sunshine during the day. Finally, they were questioned about a possible change in wind. The majority stated that the wind has changed. Adam Ibrahim (living in Yong) describes that the wind is blowing much more these days than it did in the last five years (Personal communication 13 July 2014). In contradiction to that, multiple inhabitants of Moglaa pointed out that the Harmattan winds blew less severe than they did about 30 years ago.

Besides these primary effects of climate change, the respondent were also questioned about the secondary effects/impacts; droughts and floods. Every household in this study experienced drought in their life, which is supported by the annual and seasonal droughts during the dry season every year. However, this study looks at droughts which occur during the rainy season; because these can form a risk and can make people vulnerable. Around 80 percent of the respondents described that the frequency of droughts during the rainy season is increasing. They consider (their perception) a drought as a risk if there is *'no rain for two weeks till a month during the rainy season'* (Mixed focus group Moglaa, 14 August 2014). Two weeks of a lack of rain could result in the failure to grow crops. Figure 18 shows whether the occurrence of the frequency of droughts has increased or decreased in both villages. The figure makes clear that more people in Moglaa experienced an increase in drought than in Yong. Although the data of both villages shows that people are more likely to experience an increase over a decrease in droughts during the wet season.

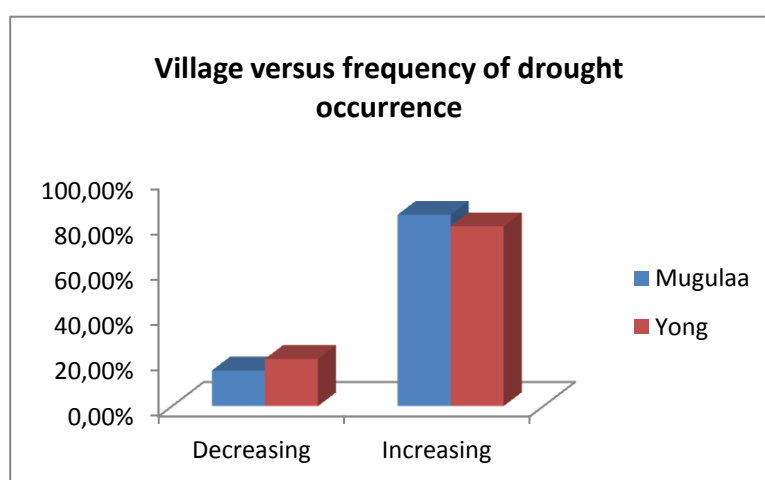


Figure 18. Frequency of drought in Moglaa and Yong.

The occurrence of floods in both villages is in comparison to drought not frequently mentioned by the respondents. Only 30 percent of the inhabitants of both villages experienced floods in their village in the past 10 years. Besides that 76,9% of the respondents indicated a decrease in floods in these areas. *'Floods will come sometimes when there is a lot of rain or for the people who are farming close to the river'* (Mixed focus group Moglaa, 14 August 2014). Only the people who farm in lower areas or closely to the riverbanks experienced floods during heavy rains on their farm. This happened especially when a lot of rain fell and when the rivers burst their banks. Although the fact that figure 19 is not showing a significant difference between the two villages. There is, however, a difference in the occurrence of floods in both villages. The interviews showed that in Yong floods are not common phenomena. Nobody declared during the interviews and questionnaires any form of existence of floods in contrast to Moglaa, where inhabitants spoke multiple times about the sporadic floods. Half of the respondents in Moglaa (52%) mentioned that floods are accompanied and (partly) caused by heavy rainfall. Multiple respondents in Moglaa talk specifically about a severe flood in 2007, which caused a lot of problems in the village. In 2007, the government of Burkina Faso opened the Bagre Dam during the heavy rainfall which caused problems throughout the whole northern part of Ghana, especially in low lying areas like Moglaa. This low lying position and the nearest tributary of the White Volta made the area more vulnerable to the flood. Besides the major flood of 2007 the local people in Moglaa spoke about more recent floods caused by heavy rain. Although the majority of the

local people in both villages agreed that the frequency of floods incidents has decreased in the last 10 years.

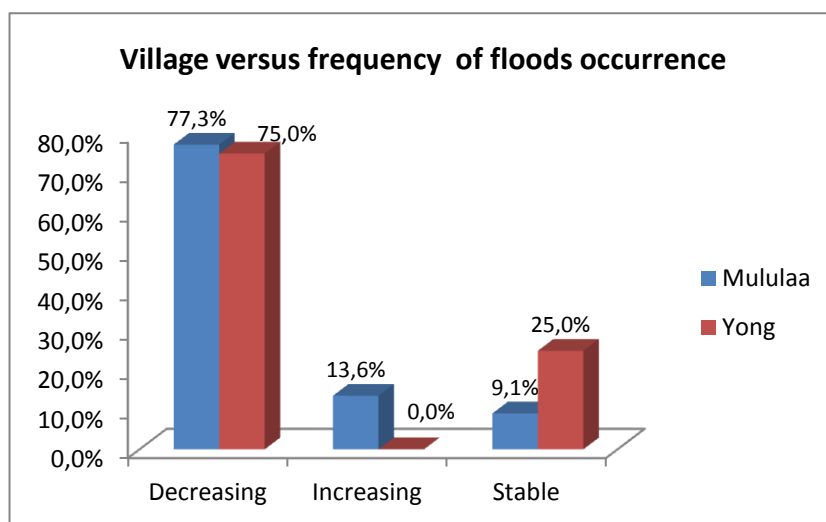


Figure 19. Frequency of floods in Moglaa and Yong.

Finally, it is necessary to know the tertiary effects of the climate change in this area, i.e. the effects on crop productivity, livestock and livelihood. So what are the effects of these droughts and floods on the perceived livelihood of the inhabitants of the two villages? Almost every household (99%) stated that they perceived a change in crop productivity during their lifetime, of which 85 percent stated that crop productivity decreased. The majority (94,9%) stated that their animal productivity had changed during their lifetime. Two-thirds (67%) of the inhabitants of both villages claimed that the animal productivity decreased, 23,7 percent stated that the perceived an increase and 9,3 percent stated that the productivity is stable. A lot of the inhabitants perceived a link between drought/floods and the decrease in crop - and livestock productivity. This relation will be discussed later on in this research.

#### 4.2.3. Reasons for perceived climate change

Preceding paragraphs had shown that the experienced climatic changes (higher temperatures, irregular rainfall, droughts and floods) are similar to the actual measured changes in climate by climate institutions. The various experiences of inhabitants about less rainfall, higher temperatures, more winds, more droughts and fewer floods are almost identical to the predicted and measured climatic changes in the region. This resemblance between both indicates that to a certain extent a kind of 'climatic' awareness among the local people can be found. Knowing this, makes it interesting to look at the explanations of the inhabitants for the climatic changes in the Savelugu-Nanton district. For instance, just one of the respondents made the connection between the concept of 'climate change' and the actual environmental changes in his village. This demonstrates that the things that inhabitants in both villages experience is very similar to the actual climatic changes, but their explanations of why it happens are very different than the actual causes certified by the IPCC. This indicates that the other respondents have another explanation for the changing circumstances, which will be discussed in detail in this paragraph. First the perception on primary effects like drought and floods are discussed, after which the perception on the secondary effects of low yield and crop production is handled. In total 55 percent of the respondents perceive 'God related' issues

a cause for the drought, besides that 25% speak specifically about the ‘abandoning of the gods’ (see figure 20). In both villages Moglaa and Yong an act of God was perceive to be the main reason for drought. In addition, there was no significant difference between multiple religions like Christianity, Islam or traditional religion in the attribution of climate change to God. For instance a female Muslim in Moglaa stated that *‘it is only God who has explanations to the rising temperatures and poor rainfall’* (Amina Tuahiru, personal communication, 10 July 2014). A 64 old Christen man in Yong discussed that *‘drought is basically the workings of god’* (personal communication, 14 July 2014). The explanation for the cause of drought is also discussed to be ‘deforestation’; almost 52 percent of the respondents see this as the main cause for the environmental changes like drought. The forest plays a vital role in their livelihood and as adaptation to climate change. Forests absorb and store carbon in trees and the soil. Although this is a misconception in both villages, because of the fact that the people are cutting trees in Ghana at a high rate. Cutting of the trees makes more economic sense for the local people, in the short term: clearance of forests for agriculture, roads, income or infrastructure (WWF, 2014). The felling of trees on a large scale can cause changes in the environment and climate on a longer term in both villages. The awareness of deforestation as cause for drought shows that local people see the relationship between a possible causal factor of climate change (deforestation) and the climatic changes (drought). Although, they do not link the processes of drought and deforestation to climate change as the underlying phenomenon. The same can be said about bushfires, because bushfires can result in climatic changes in this area. Fifteen percent of the respondents in Yong perceived bushfires as a cause for drought. *‘We cut the trees that could have protected us, and we burn the vegetation that draws disaster to us’* (Amina Tuahiru, personal communication 13 July 2014). Bushfires, as phenomenon as itself, can cause drought or the destruction of fertile soil. The contribution of CO2 emissions caused by bushfires could have a catalyzing effect on the changing climate in northern Ghana. Both deforestation and bushfires are ‘rational’ causes for the drought in the study area. This makes that it is worthy to say that the respondents have a good idea about the potential causes of drought. Finally a lot of inhabitants perceived the bad habits of humans as being a possible cause for drought. Moglaa: *‘Innocent bloods are shed all in the name of making money and these would invite God’s anger’* (Fati Seidu, personal communication 10 July 2014). This view on the causes of drought can be construed as ‘irrational’, because the statements are generally based on emotions rather than rationality.

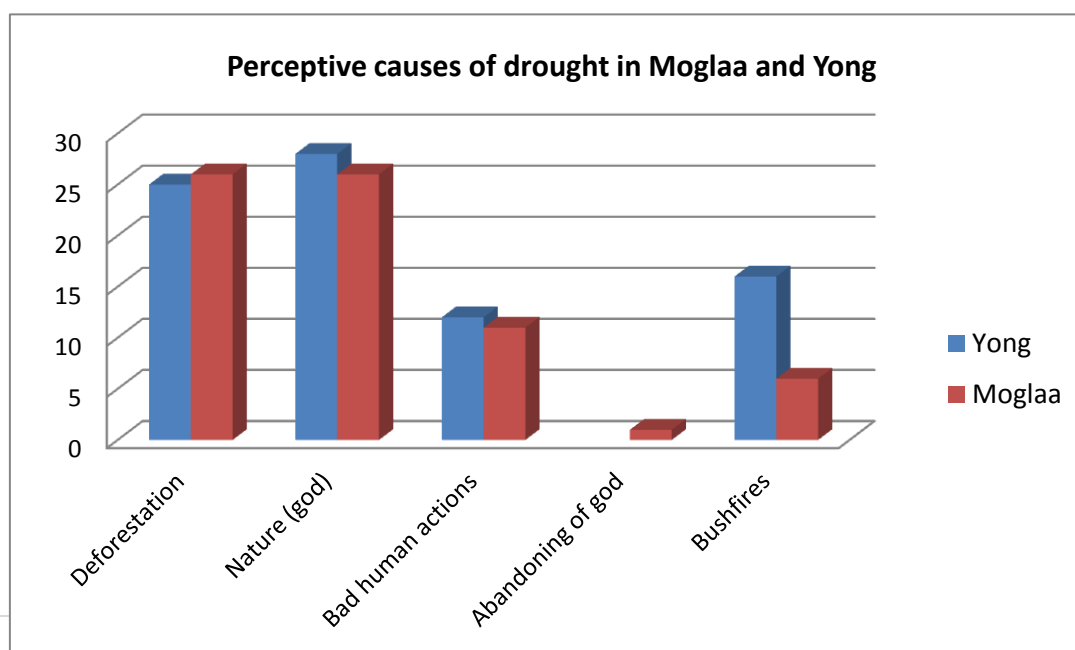


Figure 20, perceptive causes of drought in Moglaa and Yong

The second thing this study looks at is the experience with floods and the explanations of the respondents for this phenomenon. To start it should be noticed that only 30 percent of the respondents experienced floods in their life. Almost all of them were located in the village Moglaa, which is clearly displayed in figure 21. Only 5 respondents out of 50 described the event of floods in Yong. So floods seem to occur to a lower extent in the village Yong. In addition, only 20 people spoke about floods in Moglaa, which may also be regarded as a small group. During the mixed focus group in Moglaa it turned out that during the previous year it was the last time that a flood occurred. After asking about the extent of the floods, it became clear that the water rose up to their knees. These kinds of floods cause a lot of devastation in their houses and on their farms in Moglaa (personal communication, 14 August 2014). The main explanation of the respondents for the floods in Moglaa were 'heavy rains', which could be seen as a direct 'rational' cause for floods. Again, the inhabitants could describe the direct cause for floods (heavy rains). Only, the cause for the increase of heavy rains is an insight that is missing by almost all respondents. Multiple respondents mention the settlement on low land as a cause for floods. Farmland and residential areas are more vulnerable for floods in lower areas, and floods will occur more frequently if there are no safety measures. This aspect is related to the adaptation practice of several respondents who moved to higher grounds with their farmland (this will be discussed in paragraph 4.3 adaptation practices). The same applies to 'farming close to a water log' and settlement on low land, which is also a rational cause of floods. The chance of floods is larger in areas near the river, so several respondents perceive this as causal for flooding their farmland. Finally, just like the cause for droughts is part of 'nature' (the power of nature and the god of nature) this is also a cause for floods in the area. This is again an irrational cause of floods, which could not be reduced to a physical cause of floods.

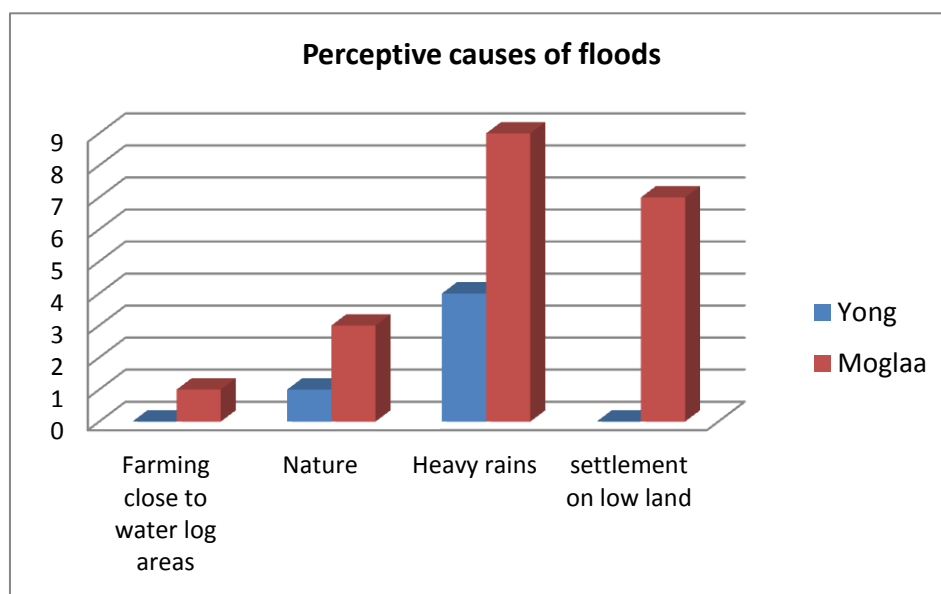


Figure 21. Perceptive causes of floods in Moglaa and Yong

The effects of droughts and floods are remarkable in both villages, which result directly in a perceived change in crop production. A perceived change in crop production means: A farmers experience with negative - or positive change in productivity of crops and his/her explanation for this change. Almost every inhabitant perceived a negative change in their crop production. They mentioned a lower yield than before and the increasing difficulty in growing the crops. Most interesting is the explanation given by the respondents to the negative change of their crop

production. Will they make the connection between climatic changes and their crop production? Figure 22, below, shows that the local people in Moglaa and Yong speak about three major causes for the negative change in crop production: floods, droughts and soil infertility. Also water scarcity and no adequate farming skills are perceived to be contributing to the causes of the negative change in yield and crop production. All five of these mentioned explanations for the change are 'rational' causes for the change in crop production. So the major part of the respondents describe the phenomenon that have a direct impact on their crop production and yield, which indicates the awareness of the local farmers with regard to the changing environmental conditions. However, the explanations for these direct effects of climate change have a less rational origin. Birds, gods and bad people (bad human actions) are causes which are part of the problems with the secondary effects (or environmental changes). These are not rational explanations for the decline in crop productivity and the negative change in yield. Lastly the causes were mentioned which would be the result of their own incompetence in farming skills: failure to harvest in time and failure to weed adequately. On the one hand these causes affect the crop productivity to a certain extent, but on the other hand it provides them with an opportunity to adapt these farming skills.

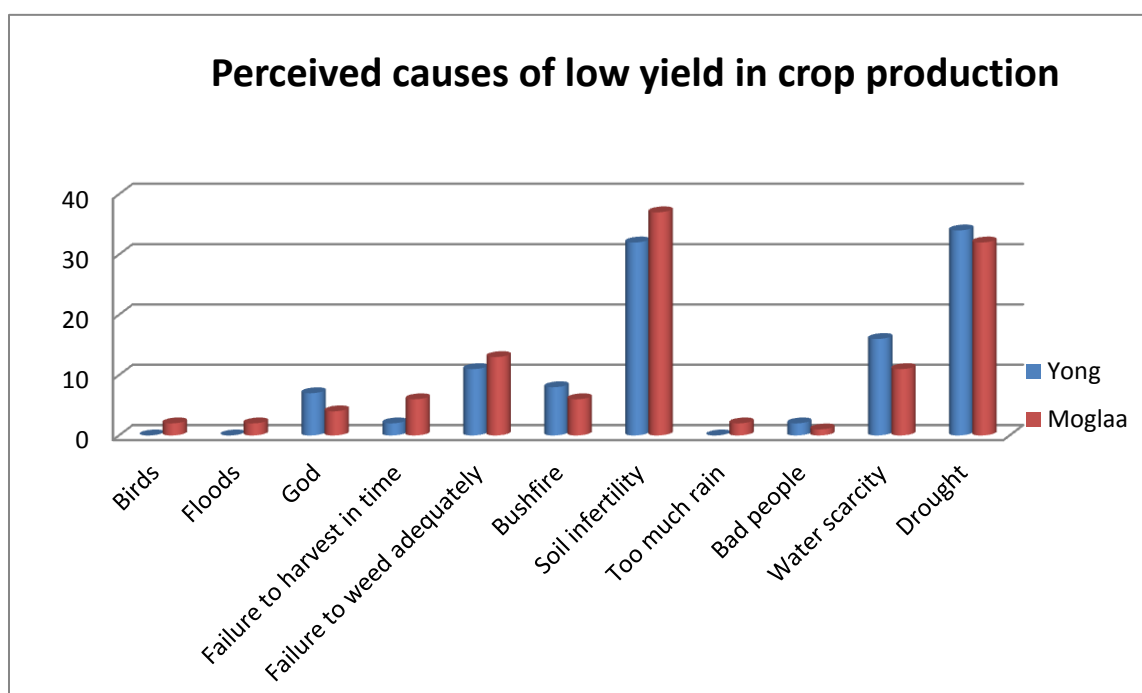


Figure 22. Perceptive causes of low yield in crop production in Moglaa and Yong.

Besides the crop farming, the animal productivity also plays an important role for the local farmers in the Northern Region. The animal productivity has declined in the last five years according to many respondents. The main reasons for the decrease in animal productivity are according to the inhabitants, caused by diseases and natural deaths. Diseases are caused by increasing drought, sunshine and higher temperatures according to the local population (Focus group women Yong, 13 July 2014); Focus group women Moglaa, 12 July 2014). Epidemiologists confirm that droughts can lead to an overabundance of mosquitoes, insects, parasites and other disease-causing organisms (Main, 2012). The decline in animal production is an effect of secondary climate effects, which makes it a tertiary impact of climate changes. Furthermore there is also a lack of food for the animals and the increasing heat is perceived to be the cause, both could also be related to climatic changes.

#### 4.2.4. Rationality versus irrationality

The previous subparagraphs about objective – and experienced/perceived climate change revealed that the differences between both the experienced climate change of the inhabitants and the actual climatic changes in the area do not differ much from each other. A lot of inhabitants experienced the ‘perceived’ changes of climate in the same manner as it was ‘objectively’ measured in both villages. This insight shows that the inhabitants are not considered to be naïve regarding to the impacts of climatic changes in their village. For instance, the objective climate change in the area shows remarkable changes the last three years. These changes have been described multiple times by several respondents in this research. One of the reasons for this is the fact that local people observe the climate closely, which makes them knowledgeable and able to sketch the situation regarding the recent changes in their environment. Although the similarities between objective changes and perceived (experienced) changes in climate are not the real causes and the perceived causes of the changing climate. The real climatic changes like higher temperature and irregular rainfall are not matching with the perceived causes of the inhabitants for their environmental changes. Their descriptions of causes differ a lot with the factual causes for climatic change of the IPCC. The perceived causes of drought and floods are at first instance mainly based on ‘climatic causes’ such as deforestation, bushfires and soil infertility, which are rational causes of drought, but not attributed to climate change. However, a major part is also attributed to other ‘non climatic causes’, such as religious reasons, gods and bad human actions, more irrational causes for climatic changes. Besides that it must be said that only one respondent mentioned climate change as a cause for the changing environment, which shows clearly that the inhabitants do not make a connection between climate change and their changing livelihoods.

This degree of correspondence between objective and perceived climate change stirs up the discussion about rationality versus irrationality in combination with livelihoods. This debate is based on the idea that individuals living in extreme poverty make daily consistently irrational decisions. They prioritize actions in the present and fail to invest in their future (Maclay & Marsden, 2011). This makes that livelihood approaches in general emanate from irrational decisions of individuals. The former part of the study shows that people the perception of climate change corresponds to some extent with the objective changes of climate change. Of course the people do not have a rain gauge in their backyard and they cannot specify exactly how the climate is changing. However, in general the similarity between them is high. This argues that rationality and irrationality is much more complex than generally is considered by livelihood strategies. Besides that, the irrationality and rationality mindset differs per person, some farmers do not think rational about the upcoming days while other farmers think about their future. For example some farmers in Moglaa and Yong think about their farming strategy, they change their timing, sort of crop or their farming skills. Other farmers were just sitting and waiting for better times.

Despite the absence of the detailed tracking of climate change, the question is whether there is an increasing ‘climatic awareness’ among the respondents? Are people getting better at keeping track of the irregularity of the rain? Several respondents indicated that previously people started to plant after the first good rains of July. In addition, the village elderly indicated whether it was a good time to plant. Nowadays the elderly do not even know when the farmers need to plant and planting after the first good rains of July is also destructive for crops, because of the irregularity of the rainfall. People start to get more aware of these changes, and start to count the days without rain in the rainy

season. Certain respondents could indicate the specific number of days without rain of this year, which shows an increasing awareness among the inhabitants.

In addition to the insight that the local inhabitants are not 'naive', the fact that people are actually aware of their changing environment, identifies another point of discussion. Namely, the difference in perceived causes for their changing livelihood, by the inhabitants, is a matter of debate. The fact that they have irrational causes as an explanation for climatic change does not mean that people in extreme poverty always act irrationally. When a resident migrates because of his belief in the malediction of his farming land, it could be said that this person is acting rationally based on an irrational reason. This person was adjusting his actions accordingly to the situation, which resulted in a rational act following an irrational cause. Rationality is not based on believing in curses, but rationality refers to the choices people make. This process in which an individual tries to determine the difference between what is right and what is wrong in a personal situation by using their logic could be defined as making the 'moral choice'. Several moral choices (choices based on irrational causes) were made by respondents in this study. These moral choices made by respondents resulted in several adaptation strategies. Adaptation strategies are mainly based on moral choices, the next paragraph will discuss the five adaptation practices of Mearns and Norton (2010).

#### **4.3. Adaptation strategies**

After discussing the geography of the two villages, the objective climate change and the experienced/perceptive climate change it is interesting to discuss the reactions of inhabitants to these environmental changes. This paragraph will discuss the extent of adaptation of the local people in a highly descriptive way, using the concepts of mobility, storage, diversification, communal pooling and market exchange (Mearns & Norton, 2010). In addition, other adaptation strategies will also be included, such as changing farming skills and the timing of crops.

##### **4.3.1. Mobility**

Van der Geest et al. (2010) describe a clear relationship between migration and climate change. Climate impacts like drought and floods can create conditions which could lead to changes in migration patterns (Jarawura, 2013). In 2000, a population census pointed out that one in four Ghanaians (26,4 percent) was a domestic migrant. One in ten (9,9 percent) had migrated within the region of birth and one in six (16,5 percent) is an inter-regional migrant (Van der Geest et al., 2010). Figure 23 shows the migration flows in Ghana. As you can see in the figure Greater Accra is the region with the largest share of in-migrant population. The two other in-migration regions are the Ashanti region and the Brong-Ahafo region. Most of the migrants are from northern Ghana, especially the Upper regions (Van der Geest et al., 2010). The exception is the Northern Region, which has a more stable population (low in-migration and low out-migration). In 2010 the Ghana Statistical Service held a new census and recently wrote a report about it (GSS, 2014). This research shows that 48,6 percent has migrated in their life. Of the migrated population 50,1 percent is female and 46,5 percent is male. The difference with the former census and figure 25 is that the Northern Region has experienced a higher out-migration in the last past years (GSS, 2014). This makes that the arrows in the figure 23 needs to be larger according to the statistics of 2010 (Van der Geest, personal communication 29 September 2014). So the migration patterns in the Northern Region are changing, what is causing this? In addition, this study focuses only on internal migration in Ghana, so



international migration is not represented in this study. The focus is especially on the in - and out migration of the Northern Region.

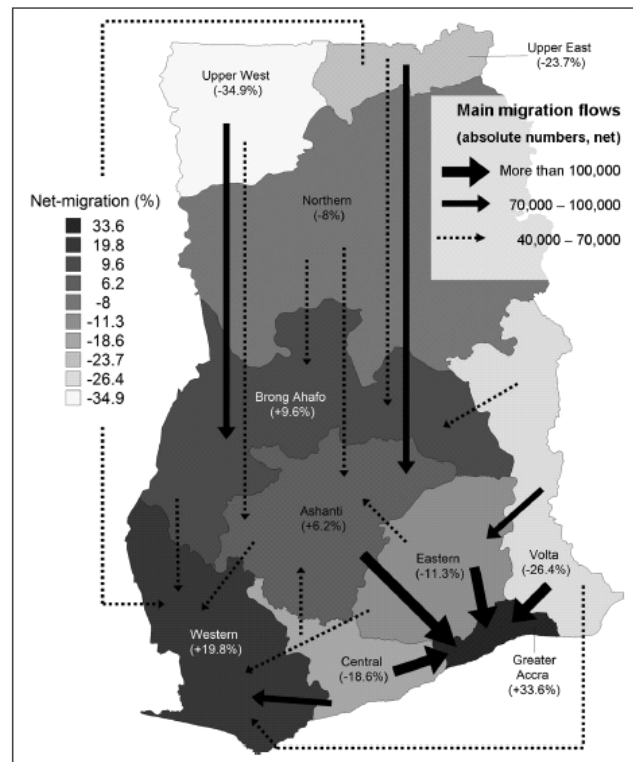


Figure 23. Migration flows (Van der Geest, 2010).

The first flow of people in this area is based on the movement of people from northern Ghana to Ghana's middle belt. This mobility is quite literally the migrations to greener pastures. People want to leave the interior savannah zone to move to greener forest and forest-savannah-transition zones. The main driver for this mobility is the scarcity of natural resources, underdevelopment and poverty in northern Ghana (Van der Geest et al., 2010). Besides that the changing climate in the Northern Region will create large numbers of people who are forced to some extent to move to better climatic circumstances. This makes that migration is a key adaptive response to environmental changes (Tacoli, 2009).

With this in mind, this study looks at the mobility in the two villages Moglaa and Yong. More than half (57%) of the respondents knew someone in their household who had migrated or migrated themselves (which corresponds to the statistics of GSS). In Moglaa: 37 respondents out of 50, and in Yong: 19 out of 50 knew a migrant in their household. Half of the respondents (50,9%) in both villages pointed out that there are more female migrants, 23,6 percent said that male migration was dominant and 25,5 percent perceived the distribution of female and male migrants being equal. A large amount of respondents (36,4%) described an increase in the number of people who migrated, while also 36,4 percent referred to a stable amount of migrants. The minority (25,5%) spoke about a decrease in migration.

The reasons for migration in both villages vary a lot. The main reasons for the migration of the population correspond to several economic motives: search for wealth (29%), lack of jobs in the dry season (23%) and poverty (22%). Besides economic reasons there are climate related issues forcing people to move. For instance the increasing drought (10%), the increasing floods (6%) and any bad/poor harvest as a result of a changing climate (17%). The specific frequencies of these reasons per village are displayed in the following figure (24). This figure shows that the people especially in Moglaa migrate for economic reasons. Most of the movements of the inhabitants is temporarily (94,6 percent in Moglaa and 89,5 in Yong), only around 7 percent of the migrations from the villages are permanent. Most of the respondents speak about mobility with duration of multiple months up to one year. Seventy percent (72,7% in Moglaa and 68,8 in Yong) of these migrants are moving during the dry season, the other percentage of migrants are moving during the rainy season or are not seasonal migrants. The opinions of the inhabitants about the length of the migration vary: the duration of their stay is shorter than before (Moglaa 34,4 percent and Yong 41,2%), the duration of their stay (Moglaa 43,8% and Yong 29,4%) and the duration of their stay is the same (Moglaa 21,8% and Yong 29,4%). These results mean that it is very difficult to notice any changes in the duration of the stay of migrants. As many studies already pointed out before (Van der Geest et al., 2010; Tacoli, 2009; Jarawura, 2013) is that the majority of the mobility is directed from rural to urban areas. Almost all (86,5% in Moglaa and 89,5% in Yong) of the migrant's destination are urban, so a rural-urban movement. The main places of destination were Accra, Kumasi and Tamale. A small part of the respondents spoke about rural-rural migration, which relates to farmers who went to other rural places to find other more usable land to farm. The next chapter will discuss migration as an adaptive response and the livelihood strategy in detail.

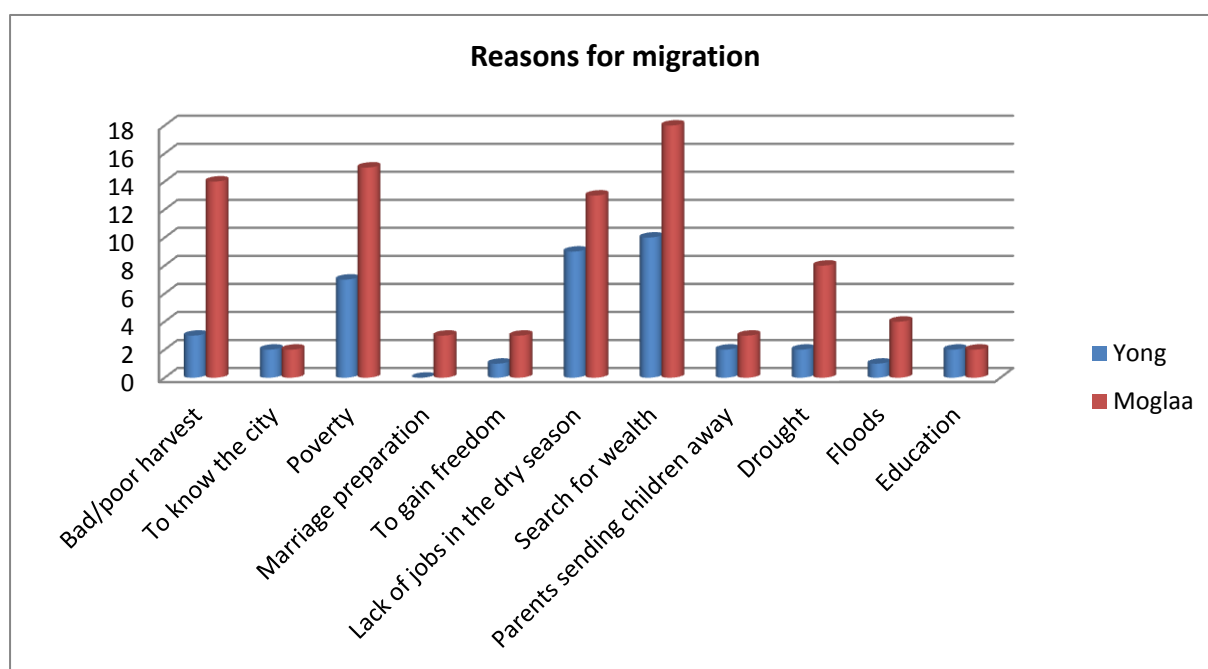


Figure 24. Reasons for migration in Yong and Moglaa.

#### 4.3.2. Storage

The second adaptations practice that Mearns and Norton (2010) mention is storage, the distribution of risks across time. Storage is the semi-permanent or long-term holding of goods or materials,

usually with the intention to use them at a later time. Storage is mentioned as an effective adaptive reaction to a changing environment.

Jarawura (2013) argues in his research that the storage of food and water is one of the most frequently used on-farm adaptation strategies in Northern Ghana (p.154). Respondents were asked whether they made use of food storage, water storage or animal storage. Almost every respondent made at least use of food storage, which they found obvious. People stored food in bags and buckets in their compound houses. The food was usually dried and it can be stored for a long time. The following figure 25 shows the main reasons for storage of food. The inhabitants started their storage just after harvesting at the end of the rainy season. The respondents usually used their storage when there was a shortage in the household, what came down to the fact that they mostly eat the storages throughout the whole year (Iddi Ibrahim, personal communication 11 July 2014). *'Some farmers are also storing for the selling of the food, till the moment that the price on the market is more beneficial'* (Adam Iddrisu, personal communication 11 July 2014). Most of the times, the inhabitants are eating their storages when the crops are still on the land. Finally, the food storages are normally not enough to feed everybody in the village during the whole year.

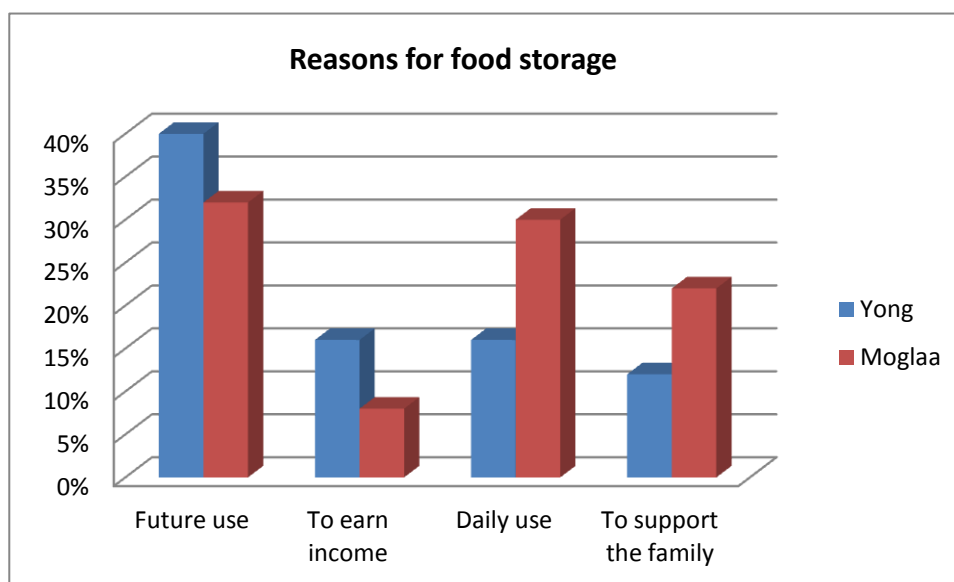


Figure 25. Reasons for food storage in Moglaa and Yong.

Besides the storage of food it also occurs that water is stored in both villages. Only 18 percent in Moglaa and 14 percent in Yong claims to make use of water storage, which is a relatively small part of the respondents. The women and children are normally walking long distances to get water for that specific day. The distance to the water differs every season and between the two villages. During the rainy season the distance is shorter than during the dry season for the women and children in Yong. As mentioned before, Moglaa has a tributary close by, where water is continuously available. So the variable distances and the non-stable supply of water makes that there is no possibility to store water in their villages. Another problem for water storage is the contamination of water. Still water can become a source of bacteria over time. So people do not want to store water for a long period of time, because it can cause sickness.

The last type of storage discussed in this study is animal/livestock storage. Almost one-third of the respondents in both villages store animals or livestock. This indicates that they are conscious

about the maintenance of their livestock. Animals or livestock can be used in the future as a source of protein or as source of income. In both villages Moglaa and Yong, selling of the animals/livestock was the main reason for the capture of animals (Focus group women Yong, 13 July 2014; Focus group women Moglaa, 12 July 2014). In addition, some farmers state that they lost their animals because of droughts and floods. So on the one hand, local farmer try to adapt to climate change by storing livestock, but on the other hand this makes it even harder to maintain their livelihoods during a similar climate change which involves droughts of floods.

#### 4.3.3. Diversification

The third adaptation practice is 'diversification': the distribution of risks across assets and resources of households. Diversification strategies can vary from asset portfolio diversification, skill and occupational training, occupational diversification, crop choices, production technologies and consumption choices. People try to reduce their vulnerability by making use of diversification strategies.

The first three mentioned diversification practices (portfolio diversification, skill and occupational training and occupational diversification) are applicable in both villages. Local farming households are shifting their income from being based solely on farming to another (non-farming) source of income. 74,5 percent of the respondents in Moglaa and 55,8 percent of the respondents in Yong have another source of income besides their main occupation of farming. All the respondents that indicate that they have another source of income in this study specifically state that this is necessary for survival. A large part of the respondents (72,5 percent in Moglaa and 48,9 in Yong) explain that they need the extra income to support the family needs, for feeding, clothing, construction and education. Another large part of the respondents state that their need for extra income is their need to support their farming activities, for instance to buy fertilizers, better seeds and better land. This is somehow contradictory. Farmers need another source of income because of the failure of farming, which results in the 'other source of income' being used for the support of farming activities. The last reason for the other source of income is to generate extra income, which is all about generating money for varying (not specific) reasons. An example of this is to be able to finance the migration, to save money for the future or to buy some material objects like a motorbike. These reasons for an extra income are specifically shown in figure 26 and figure 27.

The (non-farming) income is generated from different sources; trading, handwork, sheanut and rice processing, government employment and the selling of firewood. The merchandise is usually the remaining cultivated crops, firewood or chuckle, livestock and processed products (see figure 28). Handwork is defined in this study as the weaving of baskets, carpentry, hairdressing and other trained skills. A lot of (young) farmers learn another skill to be able to increase their income besides farming. The people who are also a government employee besides being a farmer are easily recognized. An example of this is a woman in Moglaa, who farms on the one hand and cleans at the regional office of the municipality on the other hand. Finally the processing of rice and sheabutter happens on a large scale. Remarkable about this aspect is that it is only done by women. So it can be said that the processing of sheabutter and rice is only an adaptation strategy for women to generate more income besides farming in both villages.

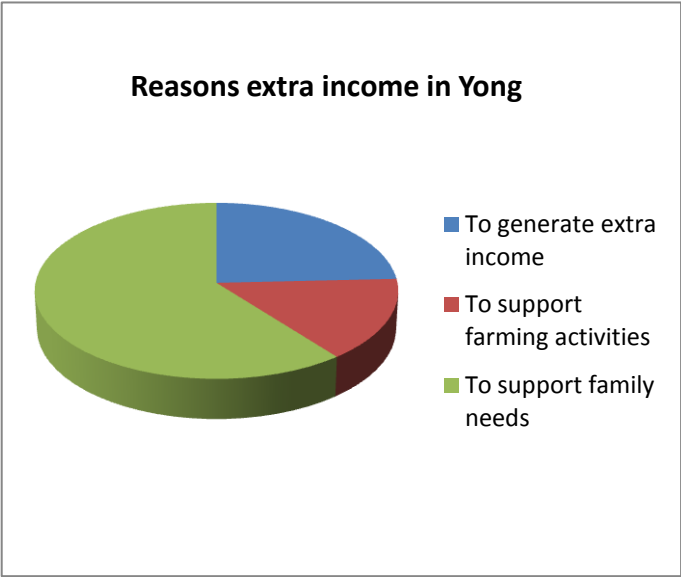


Figure 26. Reasons for extra income in Yong

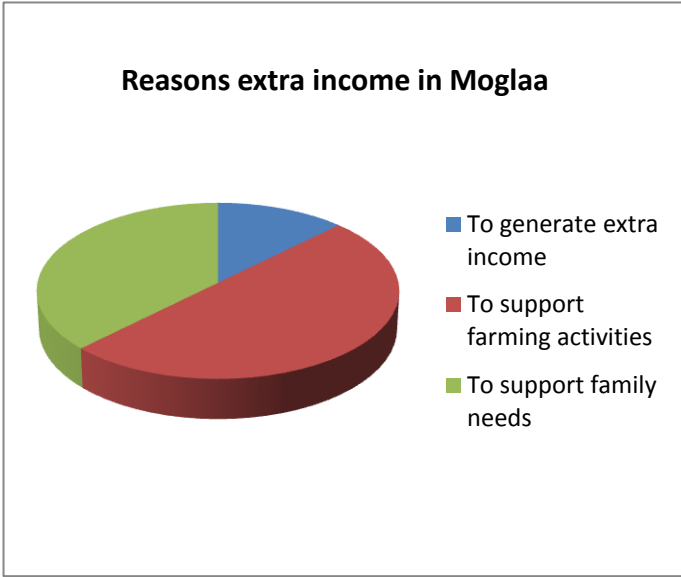


Figure 27. Reasons for extra income in Moglaa

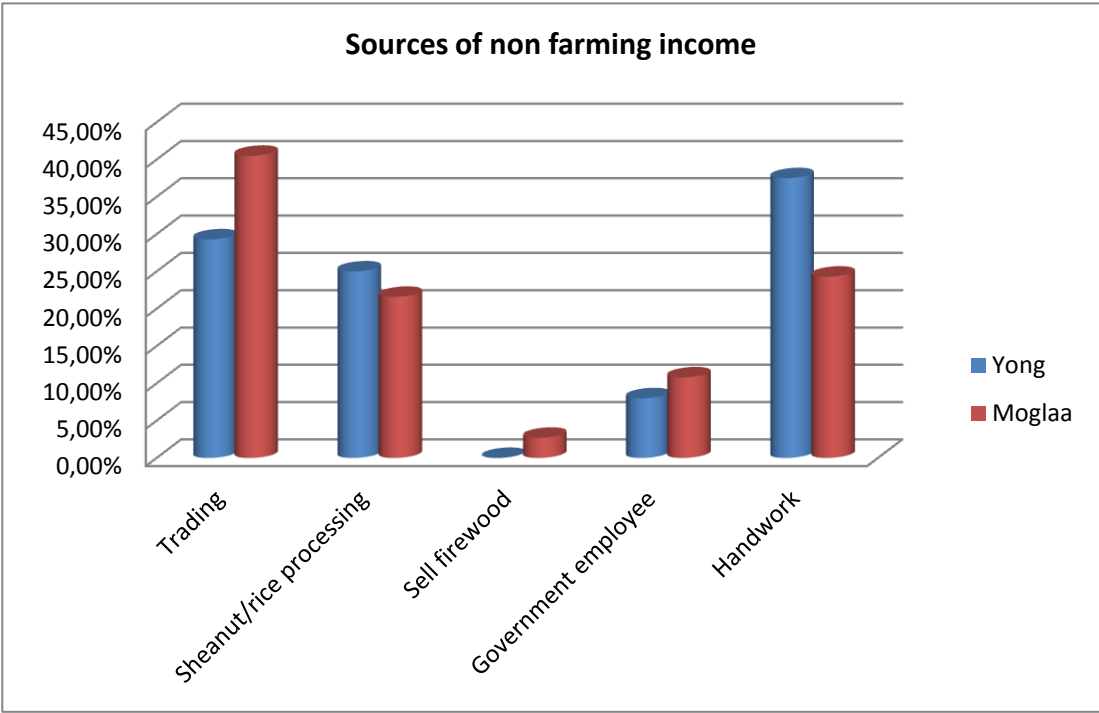


Figure 28. Sources of non-farming income in Moglaa and Yong.

The last three diversification practices of Mearns and Norton (2010) consist of crop choices, production technologies and consumption choices which have been observed to some extent in both villages. Besides the non-farming activities it is needed to look at the adaptation level of the farms, the farmers and the farming livelihoods. First, it is necessary to know the kind of crops farmers are cultivating in the area. The following table (table 5) shows the different crops that the farmers are cultivating in Moglaa and Yong. Maize, groundnuts, yam, soya beans, rice and okro are the crops which are most common in the area. Each crop needs a different amount of water and has a different maturing process. For example drought affects the amount of water a crop gets, so a better understanding of the water necessity of crops is useful to be able to see which crops are more

useable in a dry climate. Rice is a type of crop that needs a lot of water, any form of drought can be critical. Maize and okra need a lot of water in the beginning and during the formation of the crops. Water shortage during both pivotal times is disastrous for the crop, while during the periods in between, the crops are able to withstand some degree of drought. Groundnuts are water sensitive, when there is not enough water the yield of the crops will be less. Millet and sorghum don't need a lot of water, but is also able to be inundated for up to a week. These types of crops need water in the first two weeks, after this water is not necessary in a large amount. Soya plants are water resistant (can for instance grow in a floodplain) and are also drought resistant. When there is no water the soya plant will lie down and wait for water to come, which makes it a plant that can survive droughts. This makes that sorghum, millet and soya beans are the best crops to grow in dry areas (E. Van Zandwijk, personal communication, 9 August 2014). Remarkable is the fact that maize, groundnut and yam are the most cultivated crops in the area. This will be discussed further in chapter 6.

**Table 5. Cultivated crops of farmers in Moglaa and Yong**

	<b>Moglaa (frequency)</b>	<b>Yong (frequency)</b>
Mango	7	1
Maize	49	49
Millet	15	11
Sorghum	8	12
Rice	24	23
Groundnut	33	37
Cowpea	15	8
Tomatoes	31	7
Pepper	30	8
Onion	1	2
Okro	29	16
Soy beans	30	24
Cassava	8	15
Yam	23	35
Sheanuts	1	0

In addition to the kind of crops, a change in farming techniques could also be an important adaptation strategy. In times of a changing climate is it important to adapt with certain production technologies. The timing of the planting of the crops is a crucial aspect to be able to be successful during the harvest period. The changing rainfall pattern in the area of Savelugu, makes that people start to think about changing their time to plant. Normally, farmers start with farming after the first good rain of June. After asking the respondents in Moglaa and Yong it was revealed that 90,9 percent (97,9% in Yong and 84% in Moglaa) changed their timing of the planting the last five years. The reason for the change in timing, was primarily the unpredictable rainfall pattern, secondly the delay of the harvesting of the crops and thirdly the drought in the area. Many farmers are planting multiple times during the rainy season, which ensures them that they have at least some harvest at the end of the season. Another farmer's strategy is the cultivation of different crops on the same plot, whereby farmers hope that at least one of the crops is growing in the difficult circumstances. This could be seen as an adaptation strategy when the farmers use the appropriate crops to do it with. However, when they use the wrong crops together competition among different crops on the same plot may

occur, which results in the failure of both of the crops. The last adaptive response of the farmers in both villages was the use of fertilizer to improve the land. A large part, 87,9 percent (100 percent in Moglaa and 77% in Yong) of the respondent's mentions is the use of fertilizer on their farm. Women in Yong see the use of fertilizers as something negative, *'we are compelled to use fertilizers on our farms'* (Focus group women Yong, 13 July 2014). The high use of fertilizers indicates on the one hand the bad condition of the land and on other hand that people become more aware about the maintenance of their farmland.

#### 4.3.4. Communal pooling

The fourth adaptation practice is communal pooling, which means the distribution of risks across households. This means the joint ownership of assets and resources; sharing of wealth, labor, knowledge or incomes of households. So communal pooling entails that the risks are spread out over different households or within a large household, which makes the load of the risk less heavy per household or household member. This study showed that the household consists of a large number of people living in the household. Furthermore, many households found themselves in both villages. This large number of households and household members could be an indication of the presence of communal pooling processes.

Previously it was discussed that communal pooling is about forestry, infrastructure development, information gathering and disaster preparation as described in the theory of Mearns and Norton (2010). In the villages Moglaa and Yong there has been some kind of communal pooling, but communal pooling is occurring on a much smaller scale. In both villages there is only a limited amount of communal forestry or infrastructure development. However, to some extent there is a presence of social capital, information gathering and disaster preparation. For instance 14 percent of the total respondents indicate that during big emergency situations food and money is being borrowed from other people. This means that they depend on other people in times of high risk. Another form of communal pooling is the act of sharing work on the farms. A lot of respondents told that in times when crops fail, people work together and share their harvest. This ensures the decrease of vulnerability of individuals in both villages. Besides that it is normal for Ghanaians to borrow/give away, for instance, harvest. If someone is not able to take care of themselves, others are willing to assist to provide for this person. Besides that the disaster preparation is already described broadly in the part about diversification: the timing of the crops, the choice of crops and the use of fertilizer. Finally, within households the risks spread out through the sharing of wealth. For instance the money earned by a migrant member of the household is used by the entire household to survive the failure of crops.

As mentioned before is in this study the last adaptation strategy 'market exchange' is not taken into account in this study. So the adaptation strategy market exchange is not discussed further in this study.

#### 4.3.5. Conclusion

The following table shows an overview of the used adaptation strategies in both villages, which is based on the adaptation practices of Mearns and Norton (2010). The concepts mobility, storage, diversification and communal pooling are ranked to indicate to what extent they take place in one of the villages.

Table 6. Practices framework Mearns and Norton (2010) applied to the villages Moglaa and Yong

Class of Adaptation Practice	Corresponding Adaptation Strategies	Rate Moglaa	Rate Yong
Mobility	Agro pastoral migration	+	+
	Wage labor migration	++	+
	Involuntary migration	+/-	+/-
	immobility	+/-	+/-
Storage	Water storage	+	+/-
	Food storage (crops, seeds, forest products)	++	++
	Animal/ livestock storage	++	+
	Pest control	--	--
Diversification	Asset portfolio diversification	++	+
	Skill and occupational training	++	+
	Occupational diversification	+	+
	Crops choices	+	+/-
	Production technologies	+/-	+/-
	Consumption choices	+/-	+/-
	Animal breeding	+	+
Communal pooling	Forestry	--	--
	Infrastructure development	--	--
	Information gathering	-	-
	Disaster preparation	-	-
	Useful relationships	++	+

The first concept showed mobility, which is discussed in detail in the preceding text. Most of the migrations are based on 'wage labor migration', people are moving to other places with the main reason of finding a job somewhere else. In this study also some cases of 'agro pastoral migrations' and 'involuntary migrations' were found. The difference between both villages was the amount of migrants, Yong had fewer people who migrated. Although the reasons for migration were similar, the migration is the result of Yong being smaller. Almost all migrations in this study were temporary and seasonal, only a small amount of people migrate for a longer period of time. Nobody of the respondents mentioned any form of immobility, while this is also taking place in both villages. Unfortunately, this study cannot clarify the extent of immobility in both villages. Probably in both case studies poverty is the main reason for immobility. It is hard to adapt to a changing environment in times of poverty, which could have direct influences on the mobility of people. Despite the relatively high level of mobility in the area, the number of migrations was expected to be higher in Moglaa and Yong, considering the climatic influences. Questions related to this concept will be answered in the next chapter, chapter 5.

The second adaptation practice, storage, is something very common in Moglaa and Yong. Almost every farming household made use of food storage. The farmers preserved the food, after harvesting, in their houses. Next to food storage, water storage was not as common. The respondents in both villages went to the nearest water resource to get water every day, this makes that there is no form of the storage of water, the creation of a water well or some kind of water storage point. This made it impossible for farmers to make use of irrigation in Yong, so those farmers used rain fed agriculture. This situation differs slightly from Moglaa's, some farmers close to the tributary of the river made use of irrigation. However, the major part of the farmers did not use



water storage or irrigation, and relied on rain fed agriculture. Besides water and food storage a lot of farmers had some kind of livelihood storage. The animals are mainly used to sell in difficult times to survive. Finally, pest control was not used while the destruction of crops by pest was common. So if there were any pests, their crops would fail completely.

Diversification was used as adaptation practice by a lot of the farming households in both villages. Many people had another non-farming income or another profession besides farming (more people in Moglaa than in Yong). For instance the fact that people were learning carpentry, hair dressing or some other profession. It was also remarkable that the diversification was not only based on non-farming activities, a lot of people seem to diversify their farming skills. Think about the large amount of fertilizers used by the farmers, but also the different farming skills or the change in the timing of the crops. Also the awareness of the kind of crops was present, a lot of farmers choose fast-growing, yielding crop as maize, groundnut and yam. However, it is still the question whether this is the best suitable crop for the climatic circumstances. The farming households participated less in the adaptation practice 'production technologies', besides the use of fertilizer were no cases of production technologies (no irrigation, no machinery or other technologies). The table shows the low rate of consumption choices, which is because of the fact that farmers are most the time self-sufficient. They are not farming for production, but are only cultivating crops that are useable for their own household. The awareness of the specific characteristics of crops is missing most of the time. At last, animal breeding, this adaptation practice is applied by a lot of farming households. Animals are kept as a kind of 'saving' for the future. Most of the animals are not included in the diet of the local people, but they are held to sell in the future.

The last adaptation practice, communal pooling, is present in both villages, mainly based on the use of relationships to reduce vulnerability to climate change. The residents in both villages help each other in difficult times with food etcetera. Through the presence of this communal pooling is the concept of 'useful relationships' added to table 6. In both villages forestry and infrastructure development were uncommon. The felling of trees was a daily activity, which wasn't restrained by people in the villages. Besides that was there is no measured information or mention in any form of information gathered among the people in both villages. Although, to some extent disaster preparation did occur, think about migration, storage and the change in farming skills. However, irrigation as a disaster preparation for drought or the building of dams, canals or something else to prepare for floods were not common in the case study of Moglaa.

Finally, it can be said that adaptation is visible to great an extent in Moglaa and Yong. However, it is important to look at this phenomenon critically. This descriptive analysis showed that the adaptation strategies 'mobility' and ' diversification' are the most commonly used strategies in both case studies. The following chapters will therefore elaborate these adaptive responses further. This chapter creates a number of questions about these phenomena. Are people really less vulnerable after adapting to climatic impacts? Are the changing livelihoods something positive or negative for the local people? Finally, most interesting are the underlying processes of these adaptation strategies and practices. This will be discussed in the following chapters.

## **Chapter 5: Migration as an adaptation strategy to climate change in Savelugu-Nanton**

Mobility as an adaptation strategy has been mentioned in the previous chapter. This study showed that about half of the respondents migrated or knew someone who has migrated in their household. Literature shows that adverse climatic conditions in a geographical area can cause an increase in the mobility of local people. The Savelugu-Nanton district has a long history in negative climatic changes, which creates the conditions for a rise in mobility. This chapter will discuss the motives and the underlying process of these migrations. First, the history of internal migration in Northern Ghana will be discussed. After that, the different forms of migration will be described. Followed by, the reasons and motivations of the migrants. Thereafter, the influencing factors on migration will be discussed. Finally, this chapter will review migration as an adaptive livelihood strategy. The goal of this chapter is to determine and connect the importance of the environment (climate change) as driver for 'adaptive' mobility.

### **5.1. History of internal migration in northern Ghana**

It could be the case that there is a long history of internal migration on national scale. Van der Geest (2011) discusses the mobility and movements of people over shorter distances in search for fertile lands and to escape conflicts and slave raiders in the pre-colonial times. In the eighteenth and the nineteenth century's conflicts between the Ashanti, the Gonja and The Dagomba; and colonialism and the slave trade influenced these processes. This had a major impact on migration patterns resulting in less mobility. In that time migration was accompanied by conflicts and major insecurity, which caused a decrease in the north-south migration. From 1906 to 1927, migration was forced, by the British colonialists. They forced migration from the northern part of Ghana because of labor recruitment (Lentz, 2006). Ghanaians from the north were recruited as laborers for the mines and for railway constructions in southern Ghana (Van der Geest, 2011). After this a period of voluntary migration started, individuals of different ethnic groups moved from north to south in search for welfare, good opportunities and fertile lands for farming (Jarawura, 2013). The introduction of cocoa in the late nineteenth century resulted in unprecedented mobility of farmers around Ghana (but especially derived from the northern part of Ghana). Many farmers moved internally from their natal regions to other regions (Awubila et al., 2008). Jarawura (2013), Awubila et al (2008) and Van der Geest (2011) describe this as the rural-urban, rural-rural and urban-rural migrations during the post independence period. During the nation widespread economic crisis, political instability and high food prices around the 1970s and 1980s the migration declined from northern Ghana (Van der Geest, 2011). The bad conditions in the south made Ghanaians in the northern areas stay in their own village. After this period, the migration from northern Ghana to other parts of the county has risen and is still rising.

### **5.2. Forms of migration in Savelugu-Nanton**

Jarawura (2013) discussed different forms of migration in his research in the Savelugu-Nanton district. This study partly uses the same forms of migration as Jarawura (2013) because both research area and topic has strong similarities. The migration forms that emerge in this study are: the '*come and farm*' migration (form of temporal re-settlement for farming purposes), the '*kayaye*' migrant (form of temporal re-settlement for economic purposes in the city), the '*Djoa*' migrant (form of

temporal re-settlement to perform agricultural labor tasks for cash pavement) and the 'Ayugba' migrant (forms of re-settlement of a female inhabitant for labor during harvesting). Finally this study will describe the 'Kohimma' migrant (form of short re-settlement of a female inhabitant for trading) (p. 82-83).

The 'come and farm' or *Kanako* involves individuals who seek agricultural land elsewhere, but remain partly located on their permanent residence. This type of migration implies that the entire household or a part of it changes residence seasonally. The farmers leave their permanent residence for the farming residence at the beginning of the rainy season and disperse it after harvest. The part of the household that migrates as 'Kanako' usually consists of a husband, a first wife while other adults and children that harvest their piece of land (Jarawura, 2013, p. 82). In this research local inhabitants migrated to look for better farming places in urban or rural places. *'A nephew and a niece left for Accra two years ago to look for greener pastures'* (Chief Moglaa, age 68, personal communication 11 July 2014). *'I have six household members who migrated because of the low fertility of the land. They migrated to Techniman to look for more fertile land'* (Mohammed Yakusu, age 65, Moglaa, personal communication 11 July 2014). Both correspond with the 'Kanoko' migrant in terms of the search for agricultural land elsewhere. However, the last respondent talks about a permanent migration instead of a seasonally residence. Despite the presence of these 'come and farm' migrants relates this to relatively few migrants in this study. Only sixteen percent of the migrants leave at the beginning of the rainy season and only seventeen percent leaves with the reason being a bad or poor harvest and to look for fertile land.

The second form of migration that Jarawura (2013) mentioned is the 'Kayaye' migrant. Kayaye initially referred to female migrants that go to urban areas to work as head porters. Though, this concept changed, now it includes all females and males who migrate to the city and engage in non-farm jobs (p. 83). Kayaye, what means carrying of heavy loads, is a common feature in the urban and commercial centres. It involves girls, boys and adults, carrying heavy loads for client for charged fees (Salome, 2010). A lot of interviewed people spoke about people they knew, who became a kayaye. *'A lot of women go to Accra, Tamale or Kumasi to carry load on their heads'* (Focus group women Yong, 13 July 2014). A 30 year old woman in Yong describes her experiences, as follows: *'I have been to Accra more than 4 times, because of work. I sold stuff at a store and carry load on my head. The last time I spent more than 2 years in Accra'* (Amina Tuahiru, personal communication 13 July 2014). A woman of 45 years in Moglaa described that she usually left during the dry season, but she stayed till the other dry season (Awabu Abdulai, personal communication 10 July 2014). The last two examples indicate that the phenomenon is not time-limited in Moglaa and Yong. People who leave as Kayaye are not necessarily migrating seasonally, temporarily or permanent, but it is subjected to the mindset of the individual. One thing that this study shows is that all the people who knew someone as Kayaye mentioned in fact that these people went to urban areas. The main reasons for these migrations were the lack of jobs in the dry season in the district (23 percent) and the search for wealth (29 percent).

The third form of migration is the 'Djoa' migrant which refers to the migration of males to rural communities to perform agricultural labor tasks for cash payments (Jarawura, 2013, p. 83). Jarawura mentioned also that these migrations are most of the time undertaken by the youth. An example of this is the clearing of vegetation for new farms, which is an off-season activity (2013, p. 83). Most of the time, this is a form of migration outside the farming season. These 'djoa' migrants also occurred

in both villages in the Savelugu-Nanton district. *'Young people go and travel out before the beginning of the farm season to look for jobs. They have no plots themselves, so they will go to provide labor on other farms'* (Focus group women, Yong, 13 July 2014). The male focus group in Yong highlighted also the 'djoa' migrant. They mentioned that people, most of the time young people, with fertile land or no land went to other rural areas to continue farming on someone else's land in exchange for money (13 July 2014).

The 'Ayugba' migrant refers to females who migrate to other villages to do labor during harvest in exchange for payment (Jarawura, 2013). This ayugba migrant is involved in activities as the harvesting of groundnuts, maize, soya or rice. During this research the inhabitants just retrieved the harvest of groundnuts and maize. The local farmers had grown these crops themselves, causing a large portion of women who were able to work on their farms without the need to migrate. However, a lot of women migrated for a while to pick sheanuts or to help with the harvesting of rice in exchange for payments. *'I pick sheanuts somewhere else and process them into shea butter to sell'* (Awabu Abdulai, age 45, Moglao, 10 July 2014). This lady is harvesting sheanuts somewhere else and is processing them into sheabutter in her own village, to make money. So she partially fits the description of the Ayugba migrant.

Another aspect that Jarawura (2013) mentioned in his thesis is the 'Kohimma' migrant, which refers to migration for the purpose of trading. He describes the phenomenon that female traders usually go to cities to make some money by trading. But the women do not stay long enough to qualify them as a migrant (p. 83). In this study this is also taking place. *'A lot of women sell ingredients, trade in food stuff (for instance boiled rice) and sell chuckle on the markets'* (Female Focus group, Moglao, 10 July 2014). Women are travelling on a daily basis to the nearby cities to trade stuff. This also happens in Yong, where the women are selling the same stuff on for example the Savelugu market.

### **5.3. Influencing factors on internal migration**

Someone's choice to migrate is always influenced by multiple factors or circumstances. Choices of households or individuals are influenced by socio-demographic characteristics like age, gender, level of education, sources of income, property of land, occupation and marital status (Jarawura, 2013). This study will focus on the characteristics: sex, age, religion, number of people living in household and the relation to the head of the household. The differences in these kinds of characteristics will affect the choices of people in the villages. Besides these socio-demographic characteristics are also more geographical factors influencing the decision to migrate of an individual or a household. For instance push and pull factors, the distance to a city, land tenure and changes in the migration patterns. This will be discussed in the second part of this research.

#### **5.3.1. Socio-demographic influencing factors on migration**

Households vary in many different ways, which makes them respond differently. The different characteristics create different responses, particularly regarding migration. A bivariate analysis was done to test the association between the variable 'know someone in your household who migrated' and different demographic variables. The selection of the independent variables was partly based on the literature about migration and information retrieved from interviews and focus group discussions. The socio-demographic variables gender and age have influence on their adaptive responds (Obeng, 2005). The third variable 'religion' is chosen because of the fact that religion

remains a factor in people's decisions to leave their place and their choices where to go (Henegan, 2012). This made that religion could play a role in the adaptive response of inhabitants in both villages. Focus group discussions revealed the number of people living in the household had an influence on the decision of individuals or households to migrate. They said that a large number of people in a household could make the decision for migration easier. This could indicate a direct relationship between the number of migrants and the amount of people in a household. Finally, the relation to the head of the household is a factor which should also take into account. The intra-household dynamics are crucial for understanding the movement of people within households. For instance, in a male-headed-household it could be hard for women because they have little influence on their own migration or other migrations (Chant, 1998). The following table shows the frequency of these variables, the percentages of total of respondents and the frequency in both villages.

Table 7, socio-demographic characteristics

### Socio-demographic characteristics

Sex	Frequency of total	Percentage of total population	Frequency Moglaa	Frequency Yong
Female	24	54,4%	15	9
Male	32	59,3%	22	10
<b>Age</b>				
20 – 29	24	63,2%	19	5
30 – 39	12	52,2%	6	6
40 - 49	11	50%	9	2
50 - 59	9	64,3%	4	5
60 >	1	33.3%	0	1
<b>Religion</b>				
Christian	14	34,2%	4	10
Muslim	42	75%	33	9
<b>Number of people living in household</b>				
1 to 5	1	14,3%	1	0
6 to 10	18	51,4%	9	9
11 to 15	18	58,1%	10	8
16 to 20	8	80%	6	2
21 to 25	4	80%	4	0
26 to 30	3	60%	3	0
31 to 35	3	60%	3	0
46 to 50	1	100%	1	0
<b>Relation to household head</b>				
Son	20	68,9%	16	4
Daughter	2	66.6%	2	0
Wife	18	52,9%	11	7
Brother	1	33,3%	1	0
Sister	0	0%	0	0
Husband father	2	100%	2	0
Household head	9	40,9%	4	5
Mother	0	0%	0	0
Nephew	1	100%	1	0

Table 7 shows the characteristics of 56 respondents (who indicated to know someone in their household who migrated or migrated themselves). Thus only those people are included in this table. First it demonstrates that there is a small difference between the answers of the male and female respondents related to the awareness of migration within the household. The main difference in response of males and females can be found in the both villages. The table shows that the respondents in Yong knew far less people who migrated. This absence of people who knew a migrant in their household is clearly visible in the table. Besides that it shows that each age group knows approximately the same number of people who migrated in their household in Moglaa, except for the age group above 60 years (of which only one respondent knew a migrant in both case studies). The latter may be caused by the fact that this age group is little underrepresented in the questionnaire, which makes the representativeness limited. In addition, it is striking that the persons 'who knew someone who migrated' in Moglaa is less equally distributed than in Yong. Striking is the large amount of respondents between the age group 20 and 29 in Moglaa who knew someone who migrated or migrated themselves. This could be an indication that young people migrate - or think about migration more than the other age groups. Or it shows a higher level of migration awareness among this age group.

Another aspect that is remarkable is the major difference between the two religions and the awareness of migration in their households. A significant larger amount of Muslim respondents knew someone who migrated, which could indeed indicate that religion could play a major role in the decisions of migrants. However, almost all the Muslims are located in Moglaa, making it difficult to say whether the choice is influenced by religion, prosperity or habitat. The respondents are, based on religion, better divided in Yong where little can be said about the influence of and the role that religion plays in the choice for migration.

The table also shows that the respondents with a larger number of people (6 till 15 persons) in their household knew more people who migrated in their household. This is exactly what the inhabitants mentioned during the interviews and focus groups. Naturally, it is more likely that someone migrates if a bigger number of people are living in the household. But also other aspects play a role, for instance: *'I know six people who migrated in my household, they have to migrate, and those who are not going to school are migrating to other places'* (Mohammed Yakusu, Moglaa, age 65, 11 July 2014). Parti Pedro, a middle aged woman from Moglaa with a large number of people in their households discusses the necessity to earn money somewhere else. Some of her children are sent out, in the hope that they will bring back some money (11 July 2014). Both of these respondents show the need to migrate if a large number of mouths have to be fed in a household.

Finally the variable 'relation to the head of the household head' reveals some surprising answers, where limited number of conclusions can be extracted from. However, the quantity of son's and wives in Moglaa that know someone who migrated or migrated themselves is very large in comparison with Yong. This could for instance be an indication of a trend of migration among young men and wife's in the villages.

### 5.3.2. Geographical influencing factors on migration

In addition to the socio-demographic influencing factors are also other factors important in the decision making of people in the migration process. The 'descriptive analysis' chapter showed that 57 percent of the respondents knew someone who migrated or migrated themselves. According to other research from for example Jarawura (2013), Van der Geest (2011), Awumbila et al. (2008) is this particular low score for this part of northern Ghana, especially because relatively few people

indicated to have migrated themselves. In addition, the negative changing climatic conditions ensure that a 'migration flow' should arise in this area. What are the reasons for the lagging of migration in this area and at the same time what are the reasons for the high number of people who migrated? K. van der Geest mentioned several reasons that would in this specific case be valid; the push - and pull factors, distances to a city, land tenure, culture of farming and the changing seasonal - and rural-rural migration could influence the choice of people to migrate (Personal communication, 29 August 2014). The factors that have impact on migration flows are discussed in the text below.

### Push and pull factors

*'Environmental push and pull can be contributing factors in many migration flows, but except under very specific circumstances, they never act alone'* (Van der Geest, 2011, p. e70). This research looked at the degree of environmental push and pull factors which are experienced in both villages. In a survey among 100 inhabitants of Moglaa and Yong was asked whether they had ever migrated or whether they knew someone who had migrated within their household. Half of the respondents indicated that they migrated before or knew someone who migrated, including a part that left home for environmental push and pull factors. The descriptive analysis (chapter 4) already discussed the reasons for migration into detail. Some of them indicated that they decided to migrate because of the scarcity of fertile land, low crop yields and high vulnerability in the field of food production. An example is the 65-year-old Mohammed Yakusu from Moglaa who said that about six members of his household migrated: *'their reasons were because of the fact that there is no fertile land, scarcity of the land and the unreliable rainfall pattern'* (Personal communication, 11 July 2014). In addition, the increase of droughts, higher temperatures and floods were also partly determining for the decisions of these migrants. Like the research of Kees van der Geest (2011) about the North-South migration in Ghana, shows that the main reason for people to migrate is poverty and financial problems (push factors) and the opportunities for a better life somewhere else (pull factor). Pursuing a better life somewhere else states mostly in relation to more favourable 'economic' conditions. In these villages, whereby everyone is living from farm activities, is poverty mostly related to failed agriculture. Poverty could be linked to changing climatic conditions (push factors) by the poverty that occurs in times of crop failure. A third factor that a minority mentioned in this study is based on non-environmental reasons to migrate. Examples are 'to know the city', marriage preparation, to gain freedom and to maintain relationships with family and friends. This study, like recent research of Van der Geest (2011), shows the importance of the (environmental) pull for migration. The (environmental) pull is at least as important as the environmental push in order to decide to migrate. Examples of this are the migrants who leave their village of origin to farm other climatic circumstances, i.e. the 'come and farm' migrant. This emphasizes the environmental push (the scarcity of fertile land partially caused by unreliable rainfall, droughts and floods) for migrants in the area of Savelugu-Nanton district. The example of the 'come and farm' migrant shows as well the pull factors (fertile land and better climatic circumstances) of other areas of Ghana.

A clear difference between the climatic push factors, bad harvest and fertile land like the research of Van der Geest (2011) is not observed in this research. Both categories of environmental push factors and pull factors were mentioned almost equally. Despite the absence of the difference between the categories agrees this study with the aspect of the importance of environmental stress in the decision-making-process of a migrant. *'If the environment is indeed an important driver of migration, one would expect migration rates to be higher in places with times of more severe scarcity'* (Van der Geest, 2011, p. e69). The migration rates of both Moglaa and Yong are not excessively high

for this part of Ghana, while the conditions that causes 'environmental stress' are present in the district. This could mean that environmental push and pull factors aren't the only determining factors in the decision-making process of migrants, other (non-climatic) push or pull factors could also play a role.

Another reason for the relatively small amount of migrants could be based on the fact that the situation in the district totally different is compared to the situation in the 80s. During the climate crisis in the 80s was speak of a major climatic push for people in northern Ghana, but the economic – and southern pull was missing. There were political, economical and social problems in southern Ghana, which made it unattractive to migrate to the southern part. The situation nowadays is totally different. Economic developments throughout the country have created new opportunities for people in northern Ghana. New options to make money in southern Ghana are offered to people in the north. Many people leave the northern part of the country because there is still speak of a climatic push, while the pull factor has become larger for migrants than before in the south Ghana (Kees van der Geest, personal communication, 29 August 2014). People are now migrating because of drought but the situation is totally different from that in the 80s. The southern cities that the respondents mentioned most as 'migrants destination' are Kumasi and Accra, the largest cities of southern Ghana. A major part of the reasons for migration to the large cities could be attributed to the increasing pull factors of southern Ghana.

#### Keep and repel factors

Migrants are often seen, for example in the popular push-and-pull model, as the ideal homo-economical. The decision to migrate is however most of the time not based on a full economic rational decision. People simply do not have all the information they need to take a fully rational decision (Van der Velde & Van Nearsen, 2010). This push-and-pull framework is an approach that only focuses on the mobility and movement of people. While only a small part of the people in the world is taking the decision to migrate, this makes the remaining people according to the push – and pull model immobile. The majority of the people in both case studies were not a migrant, so this critic applies also to both villages. This makes that a greater focus on the factors that make people stay should be in this area. The aspects that influence decisions of migrants are called 'keep and repel' factors, which are discussed before in the theoretical chapter.

This study showed that many negative pushing climate-related factors in the Savelugu-Nanton district. This did not show the many aspects or reasons that ensure people to stay in this research area. As mentioned before in the descriptive analysis is the migration awareness, know someone in their household who migrated, around 57 percent (73 percent in Moglala and 40 percent in Yong). By changing the focus means this number that a lot of people do not know someone who migrated or migrated themselves. This allows the 'keep and repel' factors to get into the picture. An example of a repel factor is mentioned by Francis Jarawura (2013) is the immobility caused by the lack of willingness for migration to 'forest and bush areas' in the southern part of Ghana. People in northern Ghana see farming in the southern areas as last resort. *'The fear of snakes and the comparatively extra energy required for farm activities keep emigrants preferring urban areas since they already had been involved in the high energy demanding farm work at home'* (Jarawura, 2013, p. 141-142). So previous experiences of unfavorable working conditions during dry periods are explained as repel factor of migrating to the south and keep factor of staying in the north. These experiences created



immobility among households during the last years. It is explained that there is often undue physical stress from jobs at the destinations, which makes them hesitate and cautiously about certain destinations (Jarawura, 2013). These clear examples of repel factors promote immobility in northern Ghana because they imply that places on 'the other side' are perceived less appealing than places at home (Van der Velde, 2009).

Respondents in this research mentioned more clearly 'keep factors' for the immobility of inhabitants. Awabu Abdulai, age 45, indicated a common reason to stay in the village. Namely, she did not travel anymore after she got married and gave birth to children (Moglaa, 10 July 2014). In the same village, women reported the irrigation facility as a major keep factor. *'There is an irrigation facility, what makes them to stay'* (Mixed focus group, Moglaa, 14 August 2014). The low amount of migration awareness in Yong is partly attributable to the attitude towards migration of the inhabitants. Many of them indicated that migration was not a frequently occurring phenomenon. *'These days it is not common for people to travel'* (Mariama Yalwa, age 65, Yong, 13 July 2014). So several reasons stimulate immobility when places in the 'home' country are considered more attractive than 'foreign' places (Van der Velde, 2009). Although, the question may be asked whether this immobility of the respondents a conscious decision is influenced by these 'keep and repel' factors. Or are the inhabitants more forced immobile? And are the respondents anyway able to be aware of migration in this way?

#### Land tenure and the landless

Land security in sub-Saharan Africa is a more elusive concept than the simple holding of a title of land. A common feature of many of Africa's tenure systems is that all eligible members of local ancestry or kinship groups have assured access to at least some land. But at the same time, full ownership rights over land traditionally reside with the community, and individuals have a more restricted set of use and transfer rights over the land they farm (Place & Hazel, 1993, p.12). Land tenure is a complex system, specifically in rural areas for established families. But what happens when a family is moving or going away from their immobile and robust piece land? Ghana is known for its Tenada, a kind of traditional function, which allows for the distribution of land among families (K. Van der Geest, personal communication, 29 August 2014). This 'Tenada' would undoubtedly have evolved into the type of native ruler, who is not only high priest and custodian of the land of his tribe and of the ancestral spirits, but also one who was a chief or king on a territorial basis and whose sanctions were secular and physical rather than spiritual (Bourret, 1960).

*'In Ghana is land tenure a communal, particular sub-chiefs 'own' the land. Upon their death, the throne and the track of land pass on to the next sub-chief. This could be taken by any one illegible but not necessarily the family of the previous chiefs'* (Francis Jarawura, personal communication 3 February 2015).

Now this chief and Tenada, is a care taker and both an actual owner (although the chiefs assume roles of owners in an era of liberalization and the sale of land). An aspect that has made such position as Tenada more lucrative and therefore a competitive position, particularly in the last two decades. Sub chiefs are supposed to be caretakers, whereby each family has used tenure to fragments and rarely tracks of lands. In general, a sub chief cannot shift this right to other people in the village. This means that people can take the land back, from them who were allowed to use it temporarily, if they migrated. Besides that has no one the right to farm on it unless granted

permission by the owner. First owners keep the land 'forever' until it is sold for housing (Francis Jarawura, personal communication 3 February 2015). For instance, the chief of a village can ask a sub-chief to sell some land to the visitor, whereby the sub-chief may or may not accept to do so. They are in most cases in discussion with the former mentioned 'Tenada', who is a powerful and spiritual guide. An interesting aspect that Francis Jarawura mentioned is that some migrants explained in their interview that they couldn't take all land back at once, due to closer ties with those who were allowed to use in their absence. Some migrants told that they fallowed their lands for several years, even the chiefs cannot reallocate such lands (personal communication, 3 February 2015). However, if a family migrate and have no intention or ties with the original village, then after several decades their piece of land could be lost (Francis Jarawura, personal communication 3 February 2015). So when families migrate completely to another place, without any intention to keep it, they lose their rights to own a piece of land. In general, if you have a family; father, mother, daughters and sons, one of the sons need to stay in order not to lose their rights and to maintain their piece of land (Kees van der Geest, personal communication, 29 August 2014). Otherwise is the land returned to the Tenada or (sub)chief of their village. This makes that the owning of a piece of land could cause immobility of inhabitants. Someone has to stay; otherwise the land will be given away to someone else. This could be another explanation for the relatively low amount of migrants in both villages.

In counter of immobility because of land tenure, states the ownership of land and the scarcity of land. The lack of ownership could precisely be a major cause to make the decision to migrate in northern Ghana. In the Savelugu-Nanton district is fertile land scarce, which makes a lot of people landless. *'I have six of my household member who migrated. Their reasons were because of the fact that there is no fertile land 'scarcity' of the land and the rainfall pattern. They migrated to Techniman because the land there is still fertile'* (Mohammed Yakusu, age 65, 11 July 2014). This limited accessibility to fertile land in this district ensures people to migrate to places with more fertile land and where the access to land is easier. *'Some migrated because of fertile land, they go to other rural areas to continue their farming activities'* (Male Focus group, Yong, 13 July 2014). Those people who are landless are more likely to migrate than the inhabitants with land. Because they were compelled and less out of choice, and as such their movement can best be described as displacement (Kartiki, 2011).

### Culture of farming

Francis Jarawura (2013) highlights in his research about northern Ghana that households normally search for farming investment capital elsewhere. *'One way of securing this capital in such situation ... is to migrate in the months just before the rains to sell ones labor'* (Jarawura, 2013, p. 135). Inhabitants are willing to invest their own money, earned with activities outside farming, in agriculture (mentioned before in chapter 4 of this research). This is a very strong indication of the deeply attachment of people to the self-production of food (Kees van der Geest, personal communication, 29 August 2015). Besides the deeply attachment of people with their own food production is it another explanation for the lower amount of migrations than expected in this area. Non-migration which is attributable to the cultural aspect of farming. The 'identity' that is connected to farming makes people rather farm than migrate to earn money. The male focus group in Yong showed that people invest their non-farming earned money into their farming activities (17 July 2014). They earn money with carpentry, missionary jobs, rearing of animals and basket weaving

which they spend often on fertilizers for their ‘problematic’ piece of land. This is strong identification of the ‘cultural aspect’ of farming in both villages. Van der Geest mentioned this as well, his research showed that identity is connected with the growing of daily food crops as millet and sorghum (Personal communication, 29 August 2014). Despite the increasing problems caused by climate change, changing rainfall patterns, increasing drought and increasing floods, continued a major part of the inhabitants with the increasing difficult farming activities.

The large amount of seasonal migration is also another indication for the cultural aspect of farming and migration. Seasonal migration makes it possible for many people to support themselves enough by leaving temporarily to earn money somewhere else. The ‘belonging to the land’ is more important than building a new (possibly better) live somewhere else (Lentz, 2013). So the failure of crops in the rainy season can be compensated by their seasonal migration during the dry season. Allowing people in both villages to still do farming activities. Another explanation for this culture of farming is that farming is seen as a maturing process in northern Ghana (Kees van der Geest, personal communication, 29 August 2014). Mainly young men see farming as ‘something that must be done in order to be mature’. In addition, this study shows a lot of men who studied or had a job as teacher, who farmed in their leisure time. The following box 1 is an example of someone migrating from south to the north. It represents very well the ‘culture of farming’ among young Ghanaians. This example shows that even people with a profitable business are willing to leave to farm. He plans to use irrigation which shows that his migration will be permanent to the Brong-Ahafo region. The abandoning of his profitable business and family shows that this ‘culture of farming’ is actually present in the mind of lots of young Ghanaians.

Box 1: Selassi, a taxi driver in Accra

A young man, originally from northern Ghana, drives a lot of ‘white people’ around in the capital city Accra. His customer network is large and he earns quite a lot of money with his driving activities. Selassi is not married, not educated and his family lives with him in Accra. Despite the fact that his business as taxi driver is productive is he planning to migrate to the Brong-Ahafo region to cultivate peppers. He decided to buy land with six other (young and male) friends to make some money out of the growing of peppers. To the question ‘why do you want to do this?’ answers he that this is lucrative and necessary. ‘*Necessary because it will make me a men*’ he says.

Changing seasonal and rural-rural migration

Following several theories about vulnerability, coping and adaptation, is seasonal labor migration a permanent source of livelihood instead of a coping strategy to deal with unusual stress (Van der Geest, 2004). Migration and the depopulation of African villages are often seen as a negative and unwanted process, by for instance NGO’s, like migration is something people do not pursue. However there are many positive aspects about migration, especially seasonal migration. Seasonal migration makes it possible to leave for a short time, which makes it easier for people to make the choice to migrate temporarily (K. Van der Geest, personal communication, 29 August 2014). Seasonal migration is often difficult to display, because these movements tend to elude national statistics and census data (Tacoli, 2009). This makes it hard to give a precise oversight of the temporarily and seasonally movements of people in the Savelugu-Nanton district.

Seasonal migration from northern Ghana serves important functions: it compensates for the lack of employment opportunities during the dry season; reduces the pressure on household food stocks; reduces seasonal income variability; and is a means to raise food security via remittances in cash and in kind (Rademacher-Schulz et al., 2014, p. 46). In this research area is seasonal migration not everywhere visible or possible, but the outcomes of the survey in the descriptive analysis (chapter 4) already showed that a high amount of seasonal migration in the Savelugu-Nanton district is present. A characteristic of seasonal migration in this area is the departing of migrants during the dry season (when inhabitants are not able to farm). Both villages showed that a high amount people who left during the dry season (73% in Moglaa and 69% in Yong). The main part of the migrants left for multiple months till a half a year, which corresponds to the length of the dry season. Often is seasonal migration a solution to earn money to compensate the money loss caused by the failure of crops in the rainy season (Kees van der Geest, personal communication, 29 August 2014).

Chapter 4, the descriptive analysis, showed a map (figure 23) of Kees van der Geest et al (2010) with migration flows in Ghana. This map originates from 2010, what makes it not very recent. This map is based on data from the Ghana Statistical Service (2005) what is based on the population and housing census of 2000. The map shows that the largest migration flows derive from the Upper West and Upper East region in Ghana. It also indicates that the flow from the Northern Region is somewhat small in comparison with the Upper regions. Recently, in 2011, a new population and housing census had been published. Based on this new data, examined Kees van der Geest the major changes in migration flows in Ghana. One of the changes he mentioned is that more people migrated out of the Northern Region district to south Ghana, the arrow of out-migration will be thicker in the next version of this map (Personal communication, 29 August 2015). Laube et al. (2009) give an important reason for the seasonal migration; ‘farming households view the fact that there are ‘fewer mouths to feed’ as a major benefit of seasonal migration’ (p. 762). In a world where the consequences of climate change becoming worse is this seasonal migration an adaptive response to become less vulnerable.

#### Distance to a city

*‘The distance which must be spanned in migrating is generally regarded as one of the principal factors influencing the number and characteristics of migrants which arrive or leave a given point’* (Bogue et al., 1949). Distance to a city can act as a barrier for internal migration or can lower the threshold for the decision to migrate. Both villages Moglaa and Yong in the Savelugu-Nanton district are located close to the district capital Savelugu. The capital city of the district is near by the capital city of the region Tamale. Tamale is the largest cities in the northern Ghana, with a lot a people living there and economic activities going on. Between both the districts – and region capital is a lot of traffic, which makes it relatively easier for the people in both villages to travel to a ‘large’ city than in other parts of northern Ghana. Troto’s, shared taxis and the motorbikes makes it easy for the local people to commute between their village of origin and the cities. Besides the opportunities for people to commute is the presence of a large market in Savelugu conveniently. *‘These two economic processes can reduce the need to migrate for people in both villages’* (Kees van der Geest, personal communication, 29 August 2014). This situation make that inhabitants are able to choose for diversification strategies (the diversification of their income through non-farming activities, trading etc.) instead of migration as adaptation strategy.

#### 5.4. Migration as 'sustainable' livelihood strategy for farming households

*'The concept of 'sustainable rural livelihoods' is increasingly central to the debate about rural development, poverty reduction and environmental management'* (Scoones, 1998, p. 3). Because of the fact that sustainable rural livelihoods are central in the debate will this aspect be included in this study. A livelihood is sustainable when it is able to adapt and recover from stresses and shocks, maintain or enhance its capabilities and assets, while it is not undermining the natural resource base (Chambers & Conway, 1992). Within 'sustainable livelihood strategies' are three broad clusters of livelihood strategies identified. These are agricultural intensification/extensification, livelihood diversification and migration (Scoones, 1998). These three strategies are seen to cover the opportunities that are open to rural people in order to adapt to changing climatic circumstances. This paragraph discusses the sustainable livelihood strategy of migration in the Savelugu-Nanton district.

##### 5.4.1. 'Sustainable' seasonal migration?

Migration forms a central component in livelihood diversification. Migration is a widespread phenomenon and it is often linked to income generation strategies (McDowell and de Haan, 1997). For instance, migrant remittances may relieve a rural credit constraint, which shows the importance of migration to those living in poor agro climatic conditions (Reardon, 1997). *'Some scientists have shown how migration may represent a rational allocation of total household labor to maximize household utility'* (Hussein & Nelson, 1998, p.6). In the past some writers have pointed out the importance of migration in providing the resources that were much needed (Griffin, 1976; in Hussein & Nelson, 1998). So this makes that it is widely agreed that migration forms a central part of rural people's risk adaptation strategies. Several studies showed that temporary migration is on the rise (Yaro, 2006). Box 2 shows that many people (including non-lactating women, young men and middle-aged men and women) temporarily migrate to urban areas to search for paid work, and various income generating activities (Hussein & Nelson, 1998). The generated income out of these urban activities was mainly used for planting at the beginning of the rainy season in both villages. This makes it on the one hand a 'sustainable' system for the maintenance of the agriculture in this area. People became less dependent on rainfall and good weather conditions through seasonal migration. Through migration are fewer mouths to feed by their own agricultural activities. This makes that the people in these livelihoods can survive negative climatic changes and become less vulnerable. Another important aspect of seasonal migration is not so much sustainable because people would earn more money, but it becomes sustainable because their income is more assured than by an income derived from only agriculture.

**Box 2: Seasonal migration as sustainable livelihood strategy in Savelugu**

Awabu Abdulai, age 45, originating from Moglaa, migrated to Accra and Kumasi multiple times in her live. She went to these cities during the dry season to earn money with carrying load on her head. In addition, she learned different skills such as basket weaving and the cleaning of wool. When she earned enough money in these urban areas, she brought it home. So she migrated to supply cash earning for household expenses in order to create a sustainable livelihood for her household. This livelihood strategy 'of seasonal migration' created possibilities for her households in difficult times. Finally, she wants to emphasize that if there is good rain, and people can work at home, nobody will travel. This shows that their livelihood strategy can be influenced and changed by environmental circumstances (Personal communication, 11 July 2014).



Figure 29. Awabu Adulai (11 July 2014).

However, the local 'culture of migration' (see paragraph 5.3.2.) that appreciated long-term migration because of the opportunity to gain experience and accumulate some wealth, seems to be disappearing – along with the number of seasonal migrants (Laube et al., 2009, p. 762). The research of Laube et al (2009) showed that people in their research areas (northern Region) are increasingly aware of the risks and disadvantages of migration, for instance the lack of support back home and at their new destination, exploitation, behavioral changes and crime. Besides that the people became aware of the higher probability of getting infected by dangerous diseases (for instance HIV) in the city. At the same time, the profitability of seasonal migration is decreasing. Difficulty in finding jobs, provisions for employment agents, an abundance of labor, low wages and the rising costs of food, accommodation and transport, have made migration from *North to South* Ghana less attractive (p. 762-763). However, seasonal North-South migration still continues to be an essential source of additional income for households, and remains an important strategy in crisis (Lay et al., 2009). Those in need continue to travel south after the dry season harvest, and return after a short period of time to prepare the land for the next rainy season (Laube et al., 2009). Both phenomenon's make it hard to predict the migration flows from North to South in the future in Ghana.

Besides the North-South migration is another kind of migration also mentioned in this research, namely *rural to rural* migrations. More and more studies reveal an increasing and more dominant seasonal rural to rural migration pattern in northern Ghana (Laube et al., 2009). Jarawura (2013) also pointed out that the importance of rural-rural migration as a strategy become more significant to deal with drought. He is suggesting that a rural-rural migration deserves some more attention in prospective research on migration (p. IV). Jarawura described that in his study area (in the Northern Region) the rural-rural migration has been found significant and understood to be rising (Jarawura, 2013). As rural-rural, farm related migration is becoming more important in adapting to climate change, should scientist not only focus on urban migrants as it largely the case (Jarawura, 2013, p. 190). This research also showed several cases of rural-rural migrations, which makes this a possibility

for a new form of sustainability of livelihoods in the Savelugu-Nanton district. A livelihood could become more sustainable through the temporarily migration to a rural place.

#### 5.4.2. 'Sustainable' remittances?

Migration is also used as sustainable livelihood strategy through the maintenance of the flow of remittances in villages (Jarawura, 2013). Van der Geest (2011) also argues that the influence of remittances has a large affect on the 'livelihood strategies' of people in northern Ghana. These remittances are primarily used for several survival purposes, not specifically one purpose. He also mentions that remittances could be a sustainable way to maintain their 'farming livelihood', through investing that money in sustainable farm practices. Van der Geest (2011) even mentioned that a lack of remittances from migrated relatives could lead to a negative opinion towards long-term migration. The following box 3 gives an example of a small aspect of sustainable remittances. Namely, the sending out of young people in order to retrieve money in form of remittances.

##### Box 3: Sending out young people as 'sustainable' livelihood strategy in Savelugu-Nanton

In both Moglaa and Yong flows of remittances are present obtained by the sending away of young people. Lots of inhabitants leave their place of origin to earn money somewhere else, most of the time in urban areas. This earned money is mainly sent back home. *'Some of the migrants are going to the big cities and the family is receiving money'* (Mixed focus group Moglaa, 14 August 2014). Most of the times are the remittances from very young migrants in urban places. *'Some of the children are sent out for remittances, when they go they will bring back some money home'* (Parti pedro, age 30, Moglaa, 11 July 2014). The strategy of sending some young family members away to earn money somewhere else has passed often during this research. A 30 years old woman from Yong travelled two times to Accra in her youth, this migration was encouraged by her parents (Amina Tuahiru, 13 July 2014). These young people come back home with some small money, which will be used to survive, to pay school fees or to invest in their household's farmland (Mixed focus group Moglaa, 14 August 2014).

A positive effect of this out-migration of young people is that it reduces the pressure on their farmland (Van der Geest, 2011). Remittances may also lead to increased economic activities and wealth (De Haas, 2005). Negative effects of the migration of young people and remittances for the livelihoods are the loss of labor needed for environmentally sustainable farm practices (Jarawura, 2013). In addition, the loss of the departure of young and supposedly successful and entrepreneurial men and women makes the dependency on the remittances rising for the remaining people in the villages (De Haas, 2007). Besides that *'people living in migrant-sending areas are said to be inclined to withdraw from local economic activities'* (De Haas, 2007, p. 1274). So this raises the question if remittances in Moglaa and Yong contribute to a 'sustainable' livelihood strategy.

The second question arising from this phenomenon of the remittances is: why are especially young people migrating in both case studies with the aim of sending remittances? Several studies mention that the migration and the remittances of young people will not result in a 'sustainable' livelihood. Young people with few family responsibilities will generally place priority on using the remittances for investments to prepare for marriage, pay for fun activities (have a good time) or help other



friends out (Conway & Cohen, 1998). However, this is not entirely applicable to the two case studies in this research. Especially for young migrants is the role of networks and relationships in Ghana important, which makes that this young generation is prepared to invest quite a lot of their remittances and other services to the elders (Azama & Gubert, 2006; Smith, 2007). Respondents in both villages mentioned multiple times the importance of relationships with their households and close friends. The social protection given by the traditional behavior was especially important for the migrants in this study. Besides the role of the migrants are some scholars concerned that remittances are often too often spent (by the receiver) on consumptive activities such as luxury goods, large house etcetera, rather than on productive activities such as business and farming (Smith, 2007). This raises the question, will the migration of young people (and their behavior with remittances) ensure adaptation to climate change and will that create sustainable livelihoods?

Many people in rural Africa relied on the remittances sent by migrants (Smith, 2007). *‘Migration and remittances are often therefore thought lead to a passive and dangerous dependency on remittances’* (De Haas, 2005, p. 1272). Remittances have proved to be a less volatile, less pro-cyclical, and therefore more reliable source of income than other capital flows to developing countries (Kapur, 2003; De Haas, 2005). Remittances are however not always a reliable and stable source of income. There is a concern that livelihoods that dependent on remittances of migrants will endure foreign exchanges shortages and falling living standards as remittances levels fall because of lower migration rates and the belief that migrants’ willingness to remit declines over time (Brown, 1998). Will the later generations (for instance second - and third generation) still send the same amount of remittances, or will this decline over time? Are these generations still connected with their places of origin? This will be a crucial aspect whether remittances could provide a sustainable livelihood in times of a changing climate.

## **5.5. Conclusion**

This chapter about migration as an adaptation strategy showed that in both case studies in this research migration is used as an adaptive response to climate change. A lot of people survived the negative impacts of climate change through the extra income derived from migrating themselves or remittances from migrants. The question that still remains is this form of adaptation a sustainable way for maintaining livelihoods in rural areas in Africa? Are people less vulnerable to climate change through migration as adaptation strategy? This chapter discussed specifically migration as an adaptation strategy on its own. However, migration can also be seen as just a part of other adaptation strategies. Recent research suggests that household members who migrate can facilitate investments in new activities. Migration enables rural households to overcome problems on several scales, which is introducing the adaptation strategy ‘diversification’: the diversification of incomes through farming and non-farming activities. So migration can be an adaptation strategy on its own, but can also be part of a larger diversification strategy of households. The next chapter will discuss diversification further as adaptation strategy.

## Chapter 6: Diversification as an adaptation strategy to climate change in Savelugu-Nanton

The appearance of a typical agricultural African village and their responses to climatic change has changed in literature over time. What Corbett (1988) described agricultural African villages as places with relatively straightforward 'coping strategies' and 'insurance mechanisms' in the African dry lands. Based on the investment in and exploitation of buffers. Rowland (1993) described later other reactions to climatic changes. Namely the reactions of 'dry land farming' and crop adaptation to drought are in relation to climate change. Van der Geest & Dietz (2004), however, observed that these typical African patterns have changed over time. Coping strategies and insurances to deal with predictive, seasonal shortages have been replaced by adaptation strategies, which have become permanent features of livelihoods. This includes the activities undertaken to reduce the likelihood of future entitlement failure altogether, rather than a failure of primary production alone. For instance livelihood diversification, this is a strategy to enhance Household's portfolio options to deal with crisis. The process by which rural families construct a diverse portfolio of activities and social support capabilities in order to survive and to improve their standards of living (Ellis, 1998). This makes that African economies become a more unifying factor between rural and urban places, and it have become the best playground for the emergence of these diversification livelihoods.

This chapter will discuss diversification as a livelihood strategy of rural households in the Savelugu-Nanton district. Chapter 4, the descriptive analysis, showed that the diversification of livelihoods a commonly used adaptation strategy is in both villages. Other recent research describes the increasing trend of livelihood diversification in Ghanaian villages as well. Jarawura (2013) gives an example of a rural farmer obtaining a salaried job as watchman in a nearby town in order to increase his income and ability to ensure food security for his household (p.30). This example of livelihood diversification showed that the farmers' income is coming from different sources, which makes him less dependent on his own agricultural production. This chapter discusses how the livelihoods of both villages had been changed through the use of diversification strategies in their livelihoods. Included in this chapter are also the processes of deagrarianisation, diversification of non farming activities and the diversification of farming activities. Thereafter a discussion is drawn about the sustainability of livelihood diversification.

### 6.1. Deagrarianisation and diversification of non-farming activities

*'Deagrarianisation should be seen as a process embedded in social change, bearing in mind the reversibility between farm and non-farm livelihood strategies used by households'* (Yaro, 2006, p. 125). Bryceson (1996) defines deagrarianisation as a long-term process of the adaptation of occupation, the reorientation of income, social identification and spatial relocation of rural household members. Deagrarianisation is the choice of people (in Africa) to move away from a strictly agrarian existence. This deagrarianisation process makes African populations becoming less agrarian in nature year by year (Yaro, 2006). Deagrarianisation is derived partly from general studies on livelihood diversification. This makes the process of deagrarianisation beneficial to use in the chapter of diversification. *'The livelihood perspective argues that households and individuals diversify assets, incomes and activities in response to push and pull factors'* (Yaro, 2006, p. 127). According to Yaro (2006) include 'push' factors: risk reduction, response to diminishing factor returns in any given use, reaction to crisis or liquidity restrains and high transaction costs that force people to earn

income in another way and to be self-provisional. The pull factors of agrarian livelihoods include the realization of strategic supplementary between activities (for instance crop-livestock integration) and the specialization according to comparative advantage because of technology, skills or endowments (Yaro, 2006). The following text discusses the push - and pulls factors and the process of deagrarianisation in both case studies.

The non-farming activities of the inhabitants (see table 8) and the different reasons for these incomes are discussed into detail in chapter 4. All hundred respondents were selected on the aspect of relying on any farming activity in their live. The non-farming income is explicitly derived from non-farming activities. Table 8 shows that the number of people having non-farming activities is the largest in Moglaa. The non-farm activity 'trading' is most frequently mentioned in both villages. This implies the trading of residual crops and the trading of animals or cattle. As mentioned before, livestock is not seen as proteins by the respondents but rather as a product to sell. Also the processing of sheanuts and the boiling of rice was often done by women in addition to their farming activities to earn some extra money. Another large category is the manufacturing of products or the provisions of services are places under the heading of 'handwork'. A lot of respondents manufactured products as weaved baskets and zanamats, robe making and sheabutter (Iddi Ibrahim, age 72, Moglaa, personal communication 11 July 2014). But also the provision of services was mentioned a lot, especially by young respondents. A few of them spoke about using carpentry, animal rearing, fishing, hunting for bush meat and masonry to earn more money besides farming (Male focus group, Yong, 13 July 2014). These numbers of non-farming activities demonstrate a certain level of diversification in both case studies. This certain degree of diversification could suggest that there is speak of the process of deagrarianisation. The amount of non-farming incomes could indicate the long-term reorientation of income or movement of farmers to a more non-agrarian existence.

Table 8. Non-farming activities.

Village	Non-farm activity	Frequency
<b>Moglaa</b>	Trading (resources and livestock)	15
	Sheanut and rice processing	8
	Sell fire wood/chuckle	2
	Government employee	4
	handwork	9
	<b>Total</b>	<b>38</b>
<b>Yong</b>	Trading (resources and livestock )	24
	Sheanut and rice processing	7
	Sell fire wood/chuckle	6
	Government employee	0
	handwork	9
	<b>Total</b>	<b>24</b>

Previous chapter discussed already the 'push' and 'pull' factors which influence migration into detail. However the fact that these factors of migration differ a lot from the push and pull of livelihood

diversification, are the climatic push factors also applicable for the process of diversification and deagrarianisation. Irregular rainfall, increasing temperatures, increasing droughts and floods create circumstances that enforce people to reduce the risks of farming, to react to crisis and to earn income in a more non-agrarian way. The increasing uncertainty of climate changes in the Savelugu-Nanton area increases the risk of farming. This resulted in less agrarian activities in both villages nowadays than decades ago. In addition, the transaction costs of farming started to rise because of the use of more fertilizers, technology and knowledge. All three measures necessary to allow the crops to grow well. Most farmers in both villages couldn't afford these kinds of measures, which made them start looking for other non-agrarian incomes. So in multiple ways, climatic changes and necessary measures are the livelihoods of farmers influenced by 'push' factors. The 'pull' factors of agrarian livelihoods are also visible in Moglaa and Yong. Many inhabitants diversify their income with non-farming activities to continue farming. As mentioned before in the chapter about migration and adaptation, is farming in both villages a 'cultural aspect' for the inhabitants. This makes that, just like the research of Yaro (2006), the cultural aspect of farming a strong 'pull' factor is to an agricultural livelihood. Even respondents, who earned less money through farming activities and earned more money with non-farming activities, still continued farming. The non-farming incomes are therefore often seen as a strategic supplementary for the survival of the farming businesses. Comparative advantages as technology, skills and endowments were main influences to the 'pull' factor of farming in Savelugu-Nanton. Little comparative advantages based on the push and pull factors of farming were present in both villages in northern Ghana. So on the one hand is a strong pull factor of diversification visible in form of the expansion of non-agrarian activities besides farming. Also on the other hand is a push factor of diversification clearly present because of the lack of technology, skills and endowment. Both the push – and pull factors of diversification in the case studies provide a context for the occurrence of livelihood diversification.

#### Box 4: Diversification of jobs.

This lady, in Yong, is a rural farmer obtaining a salaried job as cleaner at a governmental institute nearby Tamale. This woman explained that she start her day early in the morning with working at the farm, after which she is going to clean at the institute. Her income is divided into different resources to be able to have income and to have food security. This woman is a typical example of job diversification in both villages. This salary as government employee will not stop the agricultural crisis in the area, but it may reduce her vulnerability to these climatic impacts (Respondent questionnaire, Yong).



Figure 30. Lady with several different incomes in Yong.

In addition, there are many people (12 in Moglaa and 26 in Yong) who did not have any non-farming activities. Some people fail to engage in multiple activities because they are busy throughout the

year with farming-related-activities as rain-fed agriculture, gardening or irrigable plots during the dry season (Yaro, 2006). These people refute the principles of the process of deagrarianisation, making their lives still based on an agrarian existence. Another explanation for the lack of non-farming activities is poverty. Several respondents represent the ultra-poor in the villages, people who do not have the opportunity or are not in the position to have non-farming activities (Male focus group Yong, 13 July 2014). The ultra-poor are forced to do single activities because of the lack of resources to diversify into new activities (Yaro, 2006). The questionnaires and interviews showed a relatively low amount of people who did not have any form of non-farming activities in Moglao. This may be due partially to the fact that the level of poverty seems to be higher in Yong than in Moglao. The relatively smaller amount of prosperity is observed in Yong by looking at the bad conditions of their houses, the lack of electricity supply, the lack of running water, the poor state of the clothes of respondents and the multiple times mentioning of poverty as a key problem. On the other hand Yaro (2006) describes in his research about northern Ghana that the poor in his villages were forced to participate in non-farm sector activities, because they did not own 'farming' assets, which made for them the possibilities in agriculture limited. This could be associated with the part earlier in this research about the 'landless'. Those people who are landless are more likely to migrate than the inhabitant with land. This applies the same for the process of diversification, landless will be more likely to develop non-farming activities. People without a piece of land are more forced to earn money with non-farming activities than people with their own agricultural land.

#### 6.1.1. Diversification and migration

Migration does actually not exactly fit into one of the categories of diversification, and most of the time is this process of mobility placed under non-farming diversification (Jarawura, 2013). After discussing migration as adaptive livelihood response is migration examined as specific diversification strategy in this subparagraph. First, will be referred back to the forms of migration in table 9 (earlier mentioned in paragraph 5.2.).

Table 9. Forms of migration.

Forms of migrants	Specification
'Come and farm' migrant	Form of temporal re-settlement for farming purposes
'Kayaye' migrant	Form of temporal re-settlement for economic purposes in the city
'Djoa' migrant	Form of temporal re-settlement to perform agricultural labor tasks for cash pavement
'Ayugba' migrant	Forms of re-settlement of females for labor during harvesting
'Kohimma' migrant	Form of short re-settlement of females for trading

Other investigations in northern Ghana showed that migration is used as a diversification strategy as response to the increasing drought (Jarawura, 2013). *'So some of the young men migrate every year to bring back something to support us ... because only God knows when there will be drought'*

(Jarawura, 2013, p. 158). The statement above made by Jarawura (2013) shed light on livelihood diversification through migration as a response to the impacts of the current droughts. He describes this drought-related migration as a long term response to drought-related troubles suffered from the past. *'Some of us, the strong ones, have to migrate in the dry-season to get money ... the young ones do all kinds of jobs'* (Jarawura, 2013, p. 159). Migration is a way to diversify livelihoods to increase the security of the households (Jarawura, 2013). The research of Yaro (2004) argues that the increasing rural-urban migration trend in Northern Ghana signifies the growing importance of non-farm livelihood strategies or diversification of households. Another trend is that lots of Ghanaians migrate over shorter distances in search for fertile land (Van der Geest, 2010). Finally, temporal rather than permanent migrations are, however, understood to be dominant (Jarawura, 2013).

The descriptive analysis (chapter 4) already mentioned some abstract numbers about migration in Moglaa and Yong. This section will refer to the numbers that are related to the processes of diversification and migration. Like Jarawura (2013) previously identified is the majority of the migrations temporarily (94,6% in Moglaa and 89,5% in Yong). Only 7 percent of all the migrations in total in both villages are permanent. The following table shows the duration of the temporarily migrations. The temporarily migrations are primarily taken place during the dry season (72,2% in Moglaa and 69,8% in Yong). About 87,7 percent of the people who migrate are leaving to an urban area. All these numbers subscribe the findings of the earlier mentioned trends by several other scientists.

**Table 10. Duration of migration.**

<b>Duration of migration</b>	<b>Moglaa (frequency)</b>	<b>Percentage of total</b>	<b>Yong (frequency)</b>	<b>Percentage of total</b>
One month	4	11,4	2	11,8
Multiple months	9	25,7	2	11,8
Half a year	8	22,9	5	29,4
One year	10	28,6	4	23,5
Longer than one year	4	11,4	4	23,5
<b>Total</b>	<b>35</b>	<b>100</b>	<b>17</b>	<b>100</b>

All rural households in Africa confront seasonality as an inherent feature of their livelihood. Seasonality on its own explains many of the patterns of diversification in the household incomes, especially those involving on-farm diversification and off-farm agricultural wage earnings (Ellis, 1998). This means that the on-farm and the off-farm labor can vary during a year, because of seasonal changes, creating the diversification of livelihoods. The large amount of temporal migration in both villages can partly be attributed to the seasonality and the seasonal diversification. This raises the question; what kinds of diversification choose or use the inhabitants in both case studies? What sort relation between migration and diversification do the inhabitant prefer in their household?

The diversification-and-migration strategies of households in Moglaa are mainly based on the expulsion of young people who have just finished Junior High School or Senior High school. *'They usually migrate down south to work so that by the time their results are out, they have some money to help pay their school fees'* (Female focus group, Moglaa, 10 July 2014). Back in the days young people used to travel to rural farming communities to work, but today, most young people head for Accra, Kumasi, Sunyani to work as a 'Kayaye' (Fati Seidu, age 26, Moglaa, 10 July 2014). These young people tried to earn money with selling or carrying stuff as service in urban areas. *'When you're here*

*you don't get anything, so when you travel you will earn something and bring home'* (Awabu Abdulai, age 45, Moglaa, 10 July 2014). The diversification of their income with non-farming activities is needed to make sure that there is money for school fees, whereby the money is retrieved from young people in urban areas. A second form of a diversification-migration strategy that emerges from this study in the temporal movement of people to work on other farms for payment in Moglaa, the 'Djoa' migrant. *'It was just a two month migration when I went to Zabzugu-Tatale to work on people's farm to raise money'* (Osman Haruna, age 30, 10 July 2014). His migration (during the rainy season) was necessary to compensate his crop failure caused by the lack of rain in de Savelugu-Nanton district. In addition, a single case of the 'come and farm' migrant occurred in the interviews. Mohammed Yakusu, age 65, told that members of his family migrated because of the scarcity of fertile land in the area. His family members moved temporarily to another place to farm and earn extra income besides their household income (Moglaa, 11 July 2014).

The frequency of people who 'migrated or knew someone in their household who has migrated' in Yong was significantly lower than in Moglaa. *'In this community is migration not so common'* (Adam Timoty, age 64, 13 July 2014). A lot of respondents indicated that they did not know someone in their household who migrated in their life. The percentage of temporarily migrations, however, is high which could be an indicator for some level of diversification of income through migration. Just like the case study in Moglaa migrated young people after finishing Junior High school or Senior High school to earn money in urban areas as 'Kayaye' (Female focus group Yong, 13 July 2014). These young people will earn income to give partly to their relations back home. Alongside young people, adults are migrating as well to urban areas. *'The main reason for migration was to mobilize money and to come back and farm'* (Adam Ibrahim, age 40, 13 July 2014). Some inhabitants need clearly an extra income besides farming, which shows again the diversification of income. Amina Tuahiru (30 years old) migrated four times, after harvesting, to Accra for a couple of months. She is a typical 'Kohimma' migrant, because she travelled only for trading to the capital city (13 July 2014). The fact that Amina solely travels outside the farming season makes her story a typical example of the diversification of income by migration and non-farming activities. Her main occupation continues to be farmer, which is supplemented with an income derived from non-farming activities. The last form of temporarily migration-diversification strategy is the 'come and farm' migrant. The major part of migrants in Yong goes to other rural areas to continue their farming activities. They migrate in search for fertile land, which they will be use to farm, in the dry season (Male focus group, Yong, 13 July 2014).

Respondents of both villages showed a level of migration-diversification strategies, risk spreading, in their livelihoods. The main used form of migration in both villages is the 'Kayaye' migrant, which is specifically aimed at the migration of young adults to urban areas. Sending out several members to earn money with non-farming activities is a clear example of the diversification of the household income. This form of migration can be regarded as a *non-farm-related migration* (Jarawura, 2013). The 'Djoa' migrant in Moglaa can be categorized as *off-farm-related migration*. Finally, the 'come and farm' migrants in both villages are also known as on-farm-related migrants, because of their rural-rural movement in order to farm (Jarawura, 2013). Despite the fact that the most migrations are non-farm related it appears that people's livelihoods seem to be so arranged that the migration of household members is needed to fill the gaps in income (mostly) outside the farming season (diversification) with the aim to invest in farming again.

## 6.2. Diversification of farming activities

The adaptation process of diversification involves not just a move from the farm to the non-farm sector, but also an intensification and change of the farming sector (Yaro, 2006). For many rural families is farming the only way of living and existence, which makes them more vulnerable for the perspectives that farming is and will not be supplying their whole existence (Ellis, 1999). This makes that an on-farm adaptive response, such as change in farming, use of technology or change in crops, could spread the climatic risks and reduces the vulnerability of people. Households have to diversify their incomes geographically as well as sector specific to compensate for cropping outcome variation and risk (Reardon et al., 1992). This research showed already in the descriptive analysis (chapter 4) that multiple farming strategies changed during the lifetimes of the respondents. The diversification of their farming income will be discussed with reference to the change in different sort of crops, change in different farming strategies and new production technologies.

One form of diversification is the spreading of climatic risks through the change of farming strategies. Most farmers in Northern Ghana made decisions about the planting of the crops based on the weather what had occurred the previous seasons. Besides this aspect they revised decisions based on short-term assessments of the upcoming season (Ingram et al., 2002). The planting period, which lasts 30-90 days, is the most critical part of the farming season. *'Farmers used to consider the timing and nature of onset and the performance of crop establishment, especially whether or how many times they must replant, to be the most reliable indicators for the rest of the rainy season'* (Ingram et al., 2002, p.339). Recently climate change created a context in which these predictions or indicators of climate aren't reliable any more. A good example of this is the research of Francis Jarawura (2013) in northern Ghana, whereby he described the situation nowadays in northern Ghana. The elderly in a village used to have the knowledge about the behavior of the weather and about the best time to start farming. However, Jarawura indicates that even the elderly cannot longer predict the patterns of weather (especially rainfall) in their villages. This is causing turmoil among the peasants. A 45 years old lady in Moglaa confirmed this by saying *'we are not able to determine the right time for planting'* (Awabu Abdulai, personal communication, 10 July 2014). *'Farmers can no longer follow the seasons as it used to be. As soon it rains people start planting and doing all kinds of things because there is no pattern any more in rainfall'* (Adam Timoty, age 64, Yong, personal communication 13 July 2014).

### 6.2.1. Diversification of crops

One on-farm strategy of the farmers to the unreliable rainfall, increasing drought and their primary impacts is the selection of drought-resistant crops (Jarawura & Smith, 2014). Drought limits the agricultural production by preventing the crop plants from expressing their full genetic potential (Mitra, 2001). Drought acts as a serious limiting factor for crops to reach their maximum yield. Drought resistant crops are plants that need a low amount of water, making them suitable to grow in a dry environment. Pearl millet and sorghum are the most inherently drought-tolerant of all crops, which makes them key cereal grain crops in dry lands (Mitra, 2001). An expert from WIENCO (agricultural company in Ghana) confirms that millet and sorghum are drought resistant crops. He adds that both need water in the first two weeks (after this water is not needed in a large amount) and millet and sorghum are able to be inundated for a week, which is convenient in flood-risk areas. In addition, crops as soya and sheanut trees have in general a lower water demand, but still need



more water than the earlier mentioned sorghum and millet. The crops groundnuts, maize, okro, cotton, rice and mango have a high water demand (Eric van Zandwijk, personal communication, 9 August 2014). It should be noted that even pearl millet and sorghum can be affected by drought at the reproductive stage (Mitra, 2001).

The descriptive analysis (chapter 4) showed already an overview of the different crops they used. That chapter showed that maize, groundnuts, yam, soya beans, rice and okro were the most common crops in Moglaa and Yong. Remarkable is the fact that in general 'highly water needed' crops are cultivated in the villages. The respondents mentioned different reasons for the cultivation of these types of crops: the money for the yield of these crops is relatively higher (47 percent), these crops are the main ingredients in the eating habits of Ghanaians (26 percent) and the choice for crops is often passed from father to son (Male focus group, Moglaa, 10 July 2014). Most interesting is to see whether there is a recent change in the crops choices the farmers made. Are the climatic changes in the Savelugu-Nanton district influencing their choices? *'We are changing some of our crops to early maturing ones, millet and maize'* (Female focus group, Moglaa, 10 July 2014). *'Farmers are changing seeds or seeding that mature within a short period of time'* (Male Focus group, Yong, 13 July 2014). *'On the human part, we try to plant early maturing crops, maize and millet'* (Fati Seidu, Moglaa, personal communication 10 July 2014). So some farmers start to use the drought resistant crop pearl millet, while others prefer crops which are early maturing like maize. Both are diversifying the risk of crop failure through the adapting their crops to the changing climatic conditions.

#### 6.2.2. Diversification of farming techniques

In addition to the diversification of crops could a change in farming technique also be an important strategy. One of the most challenging tasks in crop diversification is choosing the appropriate time to plant the seeds (Hooks & Johnson, 2002). Good timing is needed in order to ensure that the plants have insufficient water. Necessary allowing the plants to stay alive and not be destroyed by pest populations. Another aspect is the competition among crops, which could influence the behavior of the crops. So the timing of the planting of the crops and other techniques are crucial aspects to be successful during the harvest period. Preliminary research shows that lack of rain, higher temperatures and other negative impacts of climate change has directly influence on the yield of crops (Chipanshi et al., 2003), which makes that especially rain fed agriculture needs to change their timing and other techniques. The changing rainfall patterns in the area of Savelugu-Nanton made that people start to think about changing their farming techniques. Normally, farmers started with farming after the first good rain of June. *'Now they start as soon as it rain. People start planting immediately and doing all kind of things because there is no pattern any more in rainfall'* (Adam Timoty, Yong, age 64, personal communication 13 July 2014). After asking the respondents in Moglaa and Yong revealed that 90,9 percent changed their timing of the planting the last five years. The locals describe the timing as *'it is a matter of luck'* (Mixed focus group, Moglaa, 14 August 2014). This change in timing was first caused by the unpredictable rainfall pattern, second caused by the delay of the harvesting of the crops and third caused by the drought in the area. Many farmers seeded and yielded multiple times during the rainy season, which ensured them at least some yield at the end of the season (Mixed focus group, Moglaa, 14 August 2014). Adam Timoty, a 64 year old household head clarifies this:

*'Now we do not plant all crops at the same time. We plant early crops, half way we plant some, and later crops are planted. This is to ensure that when there is drought, you don't loss all your*

*crops. If the early ones failed, the late crops may do well'* (Yong, personal communication 13 July 2014).

Another farmer's strategy is the cultivation of different sort crops on the same plot, whereby the farmers hope that at least one sort is growing during difficult circumstances. Fati Seidu grows a variety of crops to survive the increasing drought of the last five years (Moglaa, personal communication 10 July 2014). This could be seen as a useful adaptation strategy when the farmers use the appropriate crops to do it with. However, when they use the wrong crops together, competition will occur among the different crops on the same plot, which will result in the failure of both crops (see box 5).



Figure 31. Moglaa, competition among crops (14 Augustus 2014).

#### Box 5: Competition among crops in Moglaa

The picture above (figure 31) provides a clarification of the phenomenon of competition among crops. It shows a plot of cultivated land in Moglaa on which several different crops are planted at the same time. The higher stems of the corn protrude above several other sorts of crops. Normally, all those crops should be more fully grown at this time, whereas now the crops are behind. Of course, this could be caused by that's year's drought, but if you compare the crops with the maize of a farmer approximately 100 feet away (figure 32), you can see a clear difference. This shows that competition among crops can have negative influence on the growing of the crops, the productivity of the crops and the yield retrieved from the crops.



Figure 32. Moglaa cultivated land with irrigation possibilities (14 August 2014).

### 6.2.3. Diversification of production technologies

The last on-farm adaptive strategy in this research is the diversification of production technologies, such as; fertilizers, irrigation and machinery. A large part, 87,9 percent, of the respondent's mentioned the use of fertilizer on their farm to overcome the drought (Moglaa 98% and Yong 76,5%). *'The heat and the sun force us to use fertilizers. Without the fertilizers the crops are not able to grow well'* (Awabu Abdulai, Moglaa, age 45, 10 July 2014). Osman Haruna is even selling his animals to buy fertilizer for his land. Otherwise is he not able to harvest and yield from his farm this year (Moglaa, age 30, Personal communication 10 July 2014). The high use of fertilizers indicates on the one hand the bad condition (soil infertility) of the land, the hard climatic circumstances in the research area and on other hand that people become more aware about the maintenance of farmland in Moglaa. The situation is slightly different in the village Yong. Women in Yong see the use of fertilizers as something negative, *'we are compelled to use fertilizers on our farms'* (Focus group women Yong, 13 July 2014). Those women cannot afford to buy fertilizers, making their crops much smaller compared to the ones using fertilizer (Focus group women Yong, 13 July 2014).

Irrigation is another technology that could reduce risks on farms in times of climate change. The amount of yield may increase excessively in use if made of the capital improvement irrigation in West-Africa (Harwood et al., 1999). Irrigation technology permits growers to produce more food per unit of water (Gleick, 2003). Irrigation could be an adaptive response to the lack of rain in the Savelugu-Nanton district. Farmers are still able to harvest at the end of the season despite the increasing droughts. This study mentioned multiple times that only respondents in Moglaa had the possibility of irrigation, because of the nearby river. Not many respondents talked, used or thought about irrigation as adaptive response. Why is irrigation not seen by these respondents as an on-farm solution in this village? Faiti Seidu gives an explanation for the lack of irrigation: *'only those near water bodies can use it to irrigate their crops, but such people are not many'* (Moglaa, personal communication, 10 July 2014). Besides that is the problem that there is a possibility that the water bodies dry up during the dry season, which makes farming during the dry season impossible (Iddi Ibrahim, Moglaa, age 72, personal communication, 10 July 2014). Poverty has its influence on the amount of irrigation in the area as well. The available amount of land and water are determining key factors in the use of irrigation in the livelihood of poor rural people (Hussain & Hanjra, 2004). Therefore, poverty could play a role in the absence of irrigation in the village Moglaa. In contrast states the mentioning of inhabitants who are not migrating because of the irrigation facilities by the mixed focus group (Moglaa, 14 August 2014). Irrigation makes them stay in the village.

The last production technology diversification strategy is the use of machinery on farms. Not many respondents mentioned the use of machinery. Mariana Jarawa, age 65, explained that they used to do everything on the farm by hand and that there were no tractors. Today, some farmers use tractors or other machinery on their farm in their village (Yong, personal communication 13 July 2014). In addition, some of the farmers rely on the machinery during the rainy season: *'we rely on tractors to plough quickly when it rains'* (Female Focus group, Moglaa, 10 July 2014). So the inhabitants try to adapt to the irregular rainfall by plowing fast and directly by the first rains in order to maximize their harvest later on in the season.

### **6.3. Savings through livestock, useful relationships and storages**

Mearns and Norton (2010) did not mention savings through livestock, social capital and relationships in their theory on adaptation strategies. The descriptive analysis (chapter 4) already added useful relationships to 'communal pooling' because this proved to be an important aspect in both villages during this study. Despite the fact that the theory on adaptation strategies of Mearns and Norton (2010) is well accepted raises this theory several questions. The main reason for the choice of this adaptation theory was to emphasize the mobility element. However, this theory makes a clear distinction between diversification and communal pooling, whereby the relation between both concepts is not explained into detail in their book. This study revealed that the strict classification of diversification and communal pooling is not working for this type of research, which does not need to be seen as a problem. But for the state of the argument will this research argue that each of the elements of saving through livestock, saving through social capital and saving through storages, what all came out as important adaptation strategies, will proceed as a diversification strategy. One reason for this is that all these aspects of savings diversify the incomes of inhabitants partially. The small contribution to the household income makes them less of a main adaptation strategy, which is the main reason for this new classification. The inclusion of these kinds of saving is particularly important because they are part of the assets of the livelihood theory, which is used in the theoretical framework before. This paragraph discusses the social capital asset and partially the financial capital asset (especially savings) of the livelihood strategy.

#### **6.3.1. Saving through livestock**

A lot of people in rural Africa have to live and cope with severe poverty and extreme variability in income (Udry, 1995). Keeping and rearing livestock, as nonfarm activity, is in rural Africa typically and positively correlated with income and wealth and thus seems to offer a pathway out of poverty (Barret et al., 2001). It has long been hypothesized that households in rural Africa keep livestock as a buffer stock to insulate their consumption from income fluctuations (Fafchamps et al., 1996). The continuing importance of livestock in the value systems of many different societies in Africa is evident, often seen as an economic aspect in African societies. The importance of cattle, particularly when it concerns livestock and dealing with risks, has been emphasized in a number of studies (McCown et al, 1979; Dahl and Hjort, 1976; Eischer and Baker, 1982). In Nigeria and Burkina Faso played livestock a crucial role during the droughts in the 80s (Fafchamps et al., 1996). Because of the fact that the saving through livestock is widely used in Africa as response to drought examines this research the saving and risk reducing aspect of livestock.

As mentioned in the descriptive analysis (chapter 4) changed the animal productivity negatively in both villages. According to the inhabitants is this mainly caused by drought, floods, lack

of food and diseases. To survive drought is the 'selling of animals' the most frequent reaction, 57 percent of the respondents describes this during the surveys. The number of people who stored animals was very high (30% Moglaa and 32% in Yong). This indicates that livestock plays a certain important role in both villages. All most every respondent mentioned the rearing and selling of livestock as a response to the increasing drought:

*'Farmers have to fall on their livestock (sheep's, goat, poulling and cattle) to sell to feed their family. I keep a few fowls and ruminants to fall on when the crops farming fails'* (Chief Iddirisu Andani, Moglaa, age 68, personal communication, 11 July 2014).

*'We also rear animals which we sell to buy food when there is drought, also well as pay our children school fees'* (Awabu Abdulai, Moglaa, age 45, personal communication, 10 July 2014).

*'We also rear animals which we sell in times of need'* (Female Focus group, Yong, 13 July 2014).

*'We survive drought by finding jobs such as carpentry, mason activities and rearing farm animals, such as goats, pigs and poultry'* (Male focus group, Yong, 13 July 2014)

Obvious is that inhabitants in both villages use livestock as a kind of saving or last resort in their livelihood in order to survive negative climatic influences on their farm. None of the respondents was a rancher, who only focused on keeping livestock. Rearing animals was not a farmer's main profession, rather a separate - or saving activity.

#### 6.3.2. Saving through useful relationships/social capital

*'Most households are a combination of multiple households, so sharing is not a strange thing for them to do. Sharing to them is a key because sometimes they feel that it is a duty'* (Yaw Agyenman Boafo, personal communication 19 August 2014). As mentioned before in the theoretical chapter is the joint ownership of assets and resources; sharing of wealth, labor, knowledge or income important during times of scarcity (Mearns & Norton, 2010). Adaptation is a dynamic social process: the ability of societies to adapt is determined, in part, by the ability to act collectively (Adger, 2003). This sub-paragraph reviews perspectives on collective action, useful relationships and social capital.

*'In agriculture, forestry and other resource-dependent livelihoods, resources frequently exist under multiple property-rights regimes. There are many different users, and there is limited information about the impacts of environmental change on sustainability'* (Adger, 2003, p. 389). This is also measured in villages, where people aren't aware of the climate impacts in the future and how they should deal with the sustainability of resources. Sharing of harvest, income and knowledge is therefore an important local solution to adapt to climate change impact. Several respondents (14 percent) mentioned that 'borrowing food and money' from family and friends the way was to survive drought. Yaw Boafo emphasized this by saying that sharing an important aspect is in helping people in times of reducing harvest. People in northern Ghana create through sharing a network which will help in times of need (personal communication, 19 August 2014). Several respondents mentioned to survive through the gifts from friends and family in difficult times (Adam Iddrisu, Iddi Ibrahim, Inusak Musah & Mohammed Yakusu Moglaa, 11 July 2014). Besides the support of individuals by other households (family or friends) provide some farmers a system to help other farmers with failed crops. *'It happens, when your farm is bad that everybody will help them. The women will come and help with cooking ... some persons have a large farm, who will ask people to work and share in*

*harvest*' (Female focus group, Yong, 13 July 2014). The people who were able to hunt went to the bushes to hunt. Inhabitants who have a lot of firewood gave this away and people who had large plots of lands shared their harvest (Yaw A. Boafo, personal communication 19 August 2014). Another aspect of useful relationships is related to the former paragraphs about migration. The relationship with a migrant in Ghana can be very lucrative. In general, people who migrate provide their household with money and necessities (Martha Issahaku & Alhassan Absul Rahaman, personal communication 13 July 2014). Everybody helps each other, which makes the maintenance of peoples network an important aspect in order to survive climate change. But is this a sustainable strategy for a household's livelihood?

### 6.3.3. Saving through storages

As mentioned in paragraph 6.3. is the saving of storages in this analysis part of the diversification strategies. Storages can contribute to divided incomes of farmers, which ensure that it fits in this chapter as well. Chapter 4 (descriptive analysis) discussed already storage as an adaptation strategy. Storage of food, water and animals was a widely used adaptation strategy in both villages. The main intention of storages was based on future use; after which daily use, source of income and consumption were mentioned. The strategy of the storage of water and food was mainly used to provide in their own daily basic needs. The storage of water and food was basically not based on earning money or on creating savings. A surplus in storages, however, created an extra income by selling the redundant crops. Livestock is the kind of storages which created the savings for the respondents. Many farmers derived their extra income through the rearing and selling of animals. Despite the fact that storage is a frequently used adaptation strategy contributes it slightly to the reduction of vulnerability of inhabitants. The interviews and questionnaires showed that respondents in Moglaa and Yong barely think about storages and how to use them in a sustainable manner.

## 6.4. Diversification as a sustainable livelihood strategy

Diversification could be an outcome of failure of previous livelihood strategies or a bid to enhance the accumulation of wealth or fortified security against threats (Swift & Kate, 2001). This paragraph discusses the possible failure of previous livelihood strategies and the possibilities of security against climatic threats. In addition, describes this paragraph the adaptive diversifying responses in order to create sustainable livelihood strategies. Diversification has clearly benefited the inhabitants of both livelihoods economically and nutritionally (McCabe, 2003). Is diversification on farm and non-farm activities a move towards sustainability? Many questions emerge during discussions about the sustainability of livelihoods in Moglaa and Yong. What are the possibilities in order to create a sustainable livelihood? This paragraph discusses the sustainability of deagrarianisation or non-farming activities, sustainability of farming activities and the sustainability of social capital.

### 6.4.1. Sustainability of deagrarianisation of non-farming activities

The diversification of income by means of farming and non-farming activities is a process that is taking place in northern Ghana. The nature and dynamism of the livelihood adaptation process in Ghana shows that peasants are adopting multiplex livelihoods, in recognition of opportunities, constraints and changing social relations dictated by external and internal forces (Yaro, 2006). This process raises questions like: is this deagrarianisation a sustainable livelihood approach? Is the adoption of a multiplex livelihood a sustainable solution for changing climate? This research showed

multiple times that the local conditions in both Moglaa and Yong defined the dynamic of livelihood adaptation. Farmers are reaching out for non-farming activities to earn extra income besides their farming. These non-farming incomes made their general household income less dependent on climatic circumstances creating a more sustainable situation in times of climate change. The non-farm income was found to be an important indirect determinant of farm productivity, and ability to intensify and improve production (Savadogo et al., 1998). This research showed also respondents who earned extra money to maintain their agricultural existence. It is hard to say which income (farming or non-farming) is the main source of cash in the area, but a large amount of people (62 percent) had another non-farming income. The new peasantries may be differentiated from traditional peasant agriculture (Lockie et al., 2011), this could be a more sustainable form of agriculture. People will not only depend on agriculture, which makes it more inevitable in a context of changing climate.

Another form of non-farming income is the remittances received by migrants. Previous chapter discussed that the reliance on migration and remittances is not a sustainable process. Second - and third generation of migrants will feel less for assisting their friends and family with money, leaving the stragglers with nothing. So it is not a sustainable household strategy in the long term. Local coping strategies (for instance local diversification) makes that the households not rely entirely on migration and remittances, which makes the livelihood strategy more sustainable (Jarawura, 2013). An example of this is that none of the households indicated to depend entirely on the remittances of migrants. The diversification of the roles of the members in the household (every member plays its own role) made the relying on migrants somehow sustainable.

Livestock has sustained the importance of the farm sector. Without livestock would the proportion of farming households income be lower (Yaro, 2006). Livestock forms the major medium of savings and investment activity of farmers in the Savelugu-Nanton district. *'Diversity in livestock rearing is an important ingredient for sustainable livelihoods, as each livestock type has specific uses, with multiple livelihood implications'* (Yaro, 2006, p. 155). The sale of livestock is common, and therefore an adaptive sustainable response to the failure of crops. This development makes people considering the danger of too many cattle and overgrazing in extreme circumstances.

#### 6.4.2. Sustainability of farming activities

Ghana *'masks enormous changes going on in the totality of peasant livelihoods, especially in the farm sector from which so many still earn their basic living'* (Yaro, 2006, p. 155). Often is only direct attention paid to non-agricultural activities, without thorough consideration of contextual factors accounting for livelihood adaptation (Yaro, 2006). The level of farming is so primitive in both case studies that there are many improvements in a sustainable manner possible. Often is mentioned the concept of sustainable agriculture, but what is exactly considered as a sustainable farming system? Veihe (2000) use the following definition of a sustainable cropping system: *'a cropping system is sustainable if it has an acceptable level of production of harvestable yield which shows a non-declining trend from cropping cycle to cropping cycle over long term'* (p. 393). This definition fits individual farm field scale of this research.

Jarawura (2013) mentioned that livelihood adaptation or diversification through irrigation is one of the best options to consider given the agrarian nature of rural communities in Northern Ghana. Irrigation makes farming more sustainable, especially in the dry season. This makes farmers not



dependent on rain fed agriculture. Irrigation doubles the harvest and the land productivity. In developing countries irrigation improves economic returns and can boost productivity by up to 400 % (Khan et al., 2004). On the other hand; irrigation could have unwanted environmental consequences. About one-third of the world's irrigated lands have reduced productivity as a consequence of poorly managed irrigation that has caused water logging and salinity (FAO, 1998). So the question remains whether adaptation through irrigation is one of the best sustainable options?

A second sustainable farming solution that Jarawura (2013) mentioned is agricultural extensification or diversification (for instance bush farming), which can be an effective response to recurrent drought in Northern Ghana. Bush fallow farming is a response and adaptation of farmers to this environment. It can be defined as an agricultural land use system and set of practices that is based on the rotation of land between different uses rather than a single permanent use (Awanyo, 2010). This all to achieve several agronomic goals and favorable agro ecological conditions. Bush farming is often associated with deforestation and bush fires, both contradicting the concept of sustainability. Just like migration can some agricultural extensification or diversification be a sustainable manner to derive income.

#### 6.4.3. Sustainability of social capital

*'Social capital is very crucial to the sustenance of livelihoods based subsistence agriculture as people tend to depend on each not only to conduct their activities but to absorb frequent shocks'* (Jarawura, 2013, p. 126). For this reason it is important to consider the sustainability of these social relations. Paragraph 6.3.2. already mentioned that social capital as an important aspect, which helps people with adapting in times of drought through food and monetary gifts. In what way would the sustainability of social capital be enough? The severity and scope of drought are high and wide respectively, it resulted in the failure or reduction of strength of one's social capital. Particularly in absorbing the concomitant food shortages and stresses within the zone (Jarawura, 2013, p. 126). This means that borrowing or getting food from friends, family or other relations in other villages become difficult or impossible when more time passes. Reflecting on the fact that the situation probably will be worse it is difficult to say whether this 'social capital' can ever be a sustainable system in times of climate change.

### 6.5. Conclusion

This chapter about the adaptation strategy 'diversification' showed that the diversification of livelihoods a common phenomenon is in reaction to climate change in the research area Savelugu-Nanton, specifically in Moglao and Yong. Many inhabitants survived the negative impacts of climate change through diversification of farming and non-farming activities, useful relationships and the diversification of migration. The process of deagrarianisation is happening to a large extent. Local farmers move in large quantities from a traditional agrarian livelihood to an existence that is based on multiple sources of income. The non-farming incomes are a strategic supplementary for the survival of their farming businesses. Although this deagrarianisation, remains farming still the main occupation of the inhabitants of Moglao and Yong.

The former chapter already mentioned migration as an adaptation strategy. This chapter emphasized the relation between diversification and migration within a household. It focused on the temporal migrations, which were often necessary to fill the gaps in the incomes of households. An example of this is the temporal, seasonal and rural-urban migration of young people to contribute to



the household's income (diversification). They are transmitted as 'Kayaye' to urban places and return after a while (mostly before the rainy season) back. This is seen as a commonly used strategy of households in the Savelugu-Nanton district.

The third diversification strategy is the diversification of farming activities. This study shows that the selection of the crops is not done carefully by farmers. Drought resistant crops were not converted to a great extent. Other reasons for crop choices were more prominent present than the negative climatic impacts on crops. Although, the mindset of some farmers started to change into the cultivation of more drought resistant crops. In recent years showed that the timing of the planting of the crops totally changed. None consistent pattern of the timing was founded the last five years, due to the irregular rainfall in the area. Farmers started to plant directly after the first good rains, which made this a process based on luck. Besides that started farmers to plant multiple times during the rainy season and multiple crops on the same plot, to spread their risks of crop failure. In addition, the use of machinery or technology was very low in both villages. A large part of the farmers only used fertilizer, but no other equipment in order to create a better harvest.

Finally, the savings through storages and useful relationships are commonly used strategies in both villages. 'Sharing is a common phenomenon in both villages', these aspects help to get a little more income. To create sustainable livelihoods through diversification a lot of adaptations and strategies are necessary. None of the respondents told about having a concrete plan to protect themselves against the impacts of climate change. For instance, the use of irrigation would embrace the farming activities in the research area. Irrigation is also a good example of a sustainable resource that could resist the climatic impacts in the future. The subject of sustainability and diversification creates a lot of questions about non-farming activities in the areas, migration and useful relationships. To what extent can these activities be seen as sustainable?

## Chapter 7: Conclusions and recommendations

This study was aimed to better understand the adaptation strategies of farmers in so-called climatic impacted areas in Northern Ghana. The manifestation of adaptation to droughts and floods in the Savelugu-Nanton district stood central in this research. In order to be able to reduce the vulnerability of people to climate change, the most suitable adaptive livelihood strategies need to be examined. Therefore the visibility of well-suited adaptation strategies in that specific area is needed to create more understanding of this phenomenon. This led to the following central goal:

*The goal of this study is to contribute to a more complete understanding of the role of adaptation to climate change and the impact of these adaptation strategies on the livelihoods of people in rural areas in the Savelugu-Nanton District, Northern Ghana*

The following central question has been set up in order to achieve the central goal of the study:

*What different adaptation strategies to climate change do households in rural areas in the Savelugu-Nanton District, Northern Ghana, employ?*

This research has mainly been performed according to the successive components of ‘adaptation practices’ of Mearns and Norton (2010). These practises were used to contain the practical side of adaptation strategies and to establish a more in-depth research. Besides these adaptation practises several other concepts were added. First, this research provided an overview of the real - and the perceived/experienced climatic impacts. This provided an overview of the similarities and differences between the rationality and irrationality of climatic changes in the study area. With respect to the institutionally measured impacts of climate change on the one hand and the experienced climate change by local respondents on the other, consistency can be concluded. For instance an increase in drought was not only measured by institutes, but also by local respondents. This raised the question whether climate and climate change can be titled as observable entities or just as constructions. The chapter about rationality and irrationality revealed differences when it comes to the reasons for climatic changes. Many respondents spoke about irrational causes of climate change, like causes as god and bad human actions. Due to these irrational causes of climate change acted multiple respondents in a rational way by migration and adaptation strategies. Furthermore, current climatic changes led to the development of adaptive livelihood strategies. This research showed that the most commonly used ‘practices’ in the Savelugu-Nanton district were migration and diversification. Mobility played a major part within the adaptation strategy diversification; the relation between both concepts will be discussed later on in this conclusion. Subsequently to what? Two adaptive responses were described in the second part of this research. Both the migration and adaptation part revealed that many people survived negative climatic impacts through an extra income, remittances, derived from migrants. Despite the high number of out-migrants was predicted that more people would migrate to another place, expecting the climatic impacts to rise in the future. Temporal, seasonal and urban migration appeared to an increase in the last years in a response to crop failure and the constant struggle of being a farmer. Thirdly, diversification as an adaptation strategy has in this study been investigated in Moglao and Yong. Many inhabitants there survived the climatic impacts through the diversification of income by means of the farming and non-farming activities. Following the ‘adaptive practices’, the other added concepts and the stated sub-questions of this study, a comprehensive answer can be given to the stated central question. First the conclusion, and

recommendations are provided to further shape gathered insights stated in the conclusion. Thereafter limitations and recommendations are given for future research.

### **7.1. Adaptation strategies of households in Savelugu-Nanton**

This paragraph provides the major conclusions of this research. In detail is discussed how the farming households in Northern Ghana, the Savelugu-Nanton district, cope with or adapt to climate change. Two different villages in Moglaa and Yong were studied therefore.

The descriptive analysis made a clear comparison between both villages whereupon a more comprehensive analysis of the case studies was provided in the following chapters. At first instance is the initial argument based on the part that discussed the differences between both case studies. The reason for the selection of the two villages was based on similarities like an approximately equality in circumstances, people and geographical location, and difference like the potentials for irrigation (in Moglaa) and no possibilities for irrigation (in Yong). This latter difference was chosen for certain reason. Some literature asserts that the reliability of climate change could be more under control through an irrigation system. Climate change will make agricultural systems depend more on solutions like irrigation (Varela-Ortega et al., 2014). This point of departure was tested during the fieldwork in this research. The field research showed that only on a limited scale irrigation took place in Moglaa, which made the difference between the two villages on the point of irrigation less distinct. Not any specific form of groundwater -, borehole -, lake – or machinery for irrigation took place in Moglaa. The fact that little visible irrigation systems were present in Moglaa does not mean that there is not any form of irrigation systems at all. The cultivated land around the river was relatively low, so during rainfall the land flooded. This water remained on the land for a while and performed somehow as a detention basement, which however evidently cannot be seen as a fully fledged irrigation system. Nevertheless it holds the water for a longer period of time in comparison with rain fed agriculture, whereby farmers could become less vulnerable to climatic changes in their area. Despite the presence of irrigation systems almost none of the farmer's made use of this. Because of the lack of use of irrigation will this conclusion not go into the differences between the villages. Therefore, the further conclusion relates to the more global processes which take place in both villages, which are more interesting in this instance. These more general processes in the case studies are discussed in the next paragraphs of this conclusion.

#### **7.1.1. Diversification, migration and the continuity of the household**

After the forgoing nuance of the research results the main interest of this study is based on the changed circumstances and reactions to climate change of livelihoods in both villages. Several adaptive processes that took place in Moglaa and Yong will be described hereafter.

*The first process* that obviously took place is that people have become less dependent on agriculture as the main basis of their income, which could be seen as the adaptation strategy diversification. The circumstances for rain fed agriculture have become more difficult, in particular caused by changes in the climatic circumstances. Severe droughts, irregular rainfall and floods caused crop failure to large extent in the research area. These circumstances made it for local people much harder to maintain their life as a farmer. The process of the change in the main dependency from mainly agriculture into other sources of income as well had also been described by other scientists before. Therefore it can be concluded that both case studies accord to already existing theory. The addition of this research to this specific part of literature is that a village could look cosmetically, beautifully and perfectly like

an African agricultural village but if one looks more closely it may differ from the literature. Looking at the portfolio of income of the inhabitants, the main incomes are not derived from agricultural activities. Agriculture is part of the lives of almost every citizen, but is not sufficient solely anymore in terms of income. However, if you meet an inhabitant and ask what his or her profession is; they all respond with 'farmer'. Farming is the profession where people are concerned about and occupied with throughout the day. The inhabitants are proud on their farming activities and therefore they like to show it and speak about it. In both villages some kind of 'cultural farming' developed, which does not provide in their everyday money anymore. The fact that respondents spent their money (earned with non-farming activities) to farming is an example of the farming culture in both villages. In other words, someone likes to ride a bicycle while this person can afford a car. That the person uses his bicycle does not mean that this person is poor, but that he/she likes to ride a bicycle. One of the main things that emerge strongly in this study is that these societies are called agricultural, but in fact only partially are based on agriculture; there is also another entirely different basis.

*The second process* that is observed during this research is about the mobility of people in the Savelugu-Nanton district. This research and the research of Jarawura (2013) show that the climate has changed drastically the last years in this area. The fast changing climatic circumstances made it much harder for the farmers to adapt. To some extent are people triggered to move or migrate to another place because of the difficulty in farming. It cannot be said that because of climate change or climatic changes people are migrating, it perhaps reinforced the decision for migration. The specific relation between climate change and migration is an age-old subject in migration-literature. Formerly, people migrated to another place for a long time (long-term migration) to earn money and to send it back home in form of remittances. In more recent studies it has been stated that 'long-term migration' occurs less while more people obtain for 'short-term migration'. People leave their home more easily and return within a year. This connects with literature that describes the increase of short-term migration in Africa. Almost all respondents indicated to migrate temporarily, more specifically a large part of them described it as something seasonal. This works in two directions one part left during the dry season because of the lack of jobs in agriculture. This migration is most of the time rural-urban, people left to work as 'Kayaye' migrant in the large cities. Another group of migrants left during the rainy season to earn money with agricultural activities in other mostly rural areas. These generally rural-rural migrations, the 'come and farm' -, 'Djoa' - and 'Ayugba' migrants, were more common than previously conceived. Therefore, this study shows that seasonal migration has taken a more prominent role in the internal migration of Ghana.

The migrations of the villagers have an impact on the livelihoods of the remaining people in the village of origin. A lot of research has been written about all the processes that have been acquired by migrations. One of the processes is the 'dependency on remittances', which includes that the incomes of people in the place of origin depend on the money flows derived from migrants. This research affirmed that this also takes place in the study area. Several respondents spoke about the necessity of the remittances they retrieved from migrated family members. The fact that respondents mentioned remittances as an essential source of income establishes the importance of these money flows. Was, furthermore, the contribution of remittances to the livelihoods of the respondents also shown by the strategy they developed as household? Youth were sent out at a young age to earn extra money in larger cities in Ghana. They had to make money to pay their own school fees, but also to contribute to the household income. Sending young people to earn extra money in cities mainly took place in Moglala. A more detailed study in Moglala is needed to determine

if these migrations of young people are really a household strategy to combat the effects of climate change, or a more 'cultural' conception of local people as an act to maturity for instance.

*The third process* that plays a major role in this study is the continuity of the household, communal pooling and social capital. As mentioned before is sharing, helping and cooperating an important aspect in times of climatic changes for the farmers in the research area. People help each other out, which makes the maintenance of people's network one of the most important aspects in order to survive climate change. This study stated the strong degree of social capital in both villages (see chapter 6), but to what extent is this actually the case? People can make a very nice sketch of what is happening in their village, their relationships with inhabitants and migrants and the social cohesion, but is there a single truth? It certainly will be valid for a certain part of the population (as showed in this research), but there always will be people who do not think this way. Selassi, the taxi driver, mentioned in paragraph 5.3.2. who came originally from the Northern Region and migrated to Accra to work as taxi driver is a great example of such a non-believer with regard to the value of social capital. He was planning to leave the capital city to farm in another district, without the intention of sending his family any of his earned money. This showed that he has a hidden agenda. Despite the fact that the social capital is very high in his original village, he is not willing to send any form of remittances to his family. Questions could be raised by the continuity of the household of Selassi, what will be his new role in his household? Can in general the continuity of the household be questioned in the future in Northern Ghana? These processes or phenomenon of social capital and the continuity within the household will ask for more detailed research. Especially research that looks at the phenomenon from different positions of actors in the process. This will be discussed in the second paragraph of this chapter, the recommendations.

How long take these processes already place in Northern Ghana? What will these livelihoods look like in ten years? How will the climate develop in the future? Are the adaptive responses of these livelihoods sustainable? The first process, the diversification of livelihoods, raises a lot of questions. A small reversal seems to take place in the research area. Deagrarianisation is taking place on an ever increasing scale. The agricultural system is visible crumbling, and people are changing their way of life and their sources of income. Migration and non-farming activities start to play a more important role in the lives of people in Northern Ghana. Besides that is it also the question how the migration pattern looks like in the future. Based on current prospects, there will be a continued increase in temporary migration during the different seasons in Northern Ghana. People will leave the area in hard times to look for better circumstances somewhere else. Another question about the mobility patterns is based on the amount of people migrating to urban areas. Will the amount of migrants increase or decrease in the future? And what will be their role within their place of origin? Their possibly changing contribution to their village will become an important issue for future research. Attached is the question about the persistence of the remaining of the large amount of remittances by the second -, third -, fourth – generation of migrants. One thing is for sure migration is not a new phenomenon and it is not expected that climate change will cause major changes. Besides that when every time the older generation will send the young generation away to make money in urban areas, whereby those young people may return at an older age to farm in the villages, a change in mindset may take place among the younger villagers. This could for instance lead to the permanent out-migration of the younger people in the villages because they look for a different life, which also could lead to the deagrarianisation. Resulting in depopulation in small agrarian villages in Northern Ghana. The third process, the social capital, was clearly present in the research area. Social capital is not

indefinitely, the help from other people will be endless for everybody. The amount of help between households will probably reduce to some extent when someone asks for help too often. The bad climatic circumstances made that people have to rely on each other a lot, which could cause a decrease in social capital between household. So it is very difficult to say whether this 'social capital' can ever be a sustainable system in Northern Ghana.

These three global processes of diversification, deagrarianisation, seasonal migration and social capital are discussed more holistic in the preceding conclusion whereby households predominantly were seen as unity. In addition, little attention has been paid to the interlock of the different processes of diversification, deagrarianisation, migration and social capital within the household. Next paragraph will elaborate on this aspect more.

#### 7.1.2. Adaptation strategies within the household

Previous claims reflect on diversification, migration and communal pooling as separate adaptation strategies. But to what extent seize these strategies into one another? Is it possible that a respondent is a farmer and a migrant at the same time? Or is it possible that members of a household pursue different adaptation strategies? The relationship between in particular the concepts of diversification and migration will take the center stage in this sub paragraph. In addition, this part of the research is important because it described the behavior of the household, and how a household sets its strategy in combating climate change.

The interview and questionnaires indicated that there could be difference in livelihood strategy within a household. It showed a certain level of professional affiliations in households. Some respondents had more preference for farming activities than non-farming activities. Several family members chose specifically for migration as a response to crop failure and the hard circumstances, others chose to use diversification of farming strategies as their response to climate change impact. Besides the personal preferences for occupations and adaptation strategies played the strategy of an entire household also a role. The consciously dismissing – and maintaining of certain members in the household was a process that took place in the research area. For instance the conscious sending away of young people to urban areas after they finished school to earn extra money for the household was such a strategy. This deliberate decision of the member of the household is the diversification of their income by the use of migration. These kinds of strategies will make their income less dependent on farming, thanks to the generated income by other non-farming activities. As said before this does not necessarily mean that their income will increase, but it could give more warranty to their income especially in times of climatic changes.

Several household strategies made that the concepts of diversification (generating different incomes) with migration intervene. As described in chapter 2, the livelihood approach, endorses this by the efforts to achieve a more sustainable livelihood. The example of this household strategy shows the intervention of the concepts of diversification and migration. The converge between the concepts is also reflected in the fact that not a single respondent speaks about only diversification - or migration strategies in their household. This research did not find any household consisting of only migrants or only farmers, which indicates that migration and diversification are and could be related to each other. It also shows that both adaptation strategies could be combined in a household. Several members could be a conscious migrant and several members could be a deliberate farmer. This combination of both migration and diversification within a household shows again that these

concepts could not be seen as separate theoretical constructs, but that both concepts could intervene and come together. Following the aspects just mentioned it can also be said that diversification could be hidden in relationships. The different roles of the members in the household which define the common income of the household could also be seen as diversification. The members of the household do not diversify their sources of income for themselves, but because of a household strategy (where everyone plays a different role) we can speak of diversification of the household.

A clear example of the relation between diversification and migration within a household is measured in chapter 5 of this study. This chapter shows that the respondents with a larger number of people (6 till 15) persons in their household knew more people who migrated in their household. This suggests that how higher the number of people in a household, the more migration takes places. This research cannot prove this by significances, so this will remain an assumption. Although, this assumption could indicate that in larger households the members better be aware and think about the diversification of their household, which results in sending away several people in their household to earn money somewhere else. This raises the question what do households with a smaller amount of members chose for adaptation strategy?

**Box 6: The future of Mariama Yalma**

The former image of Mariama Yalma was not optimistic and particularly sketched to show the seriousness of the situation in Northern Ghana, especially in the village Yong. Of course this wasn't a nuanced picture about the potential future of Mariama Yalma and her household. Fact is still that the climate will change negatively and farming will become more difficult every year, especially if they do not adapt their farming strategies to the influences of the climate. Although, Mariama and her household do not need to continue their farming activities what is equivalent to high vulnerability risks. She and her (relatively) small household could develop a household strategy in order to improve their livelihood. Her son started with learning the expertise of an electrician besides his farming activities. Because of this started his income to become more stable in times of climatic change and during the dry season. Another strategy that this household could use is the diversification of income through obtaining remittances from migrants. Sending away the young people could be a possibility in the family of Mariama, which exists of a large number of young people. Figure 33 shows Mariama with her grandson in their compound house. Looking at the future image of this household may this little boy on the picture is the solution to the problems with climate change in the region.



Figure 33. Mariama Yalma with her grandson in Yong



## 7.2. Recommendations

Following the provided conclusions and the nuances mentioned in the introduction of this chapter, recommendations to contribute to the scientific debates about adaptation strategies will be described here. Some critical remarks with respect to conducting the data for this research have to be stated in advance. As mentioned before, research is needed to interpret phenomena regarding adaptation & migration, adaptation & diversification and adaptation & social capital from different perceptions. In this research an inside out approach has been used to collect data. People living in both research areas were used as data sources. An external approach could lead to different or additional insights and places the gathered data and experiences in another perspective. For instance, it is likely to occur that locals indicate the social cohesion to be higher than it will be experienced by outsiders. For example people who have left the village might be daring to specify the problems. Extensive research into these processes will therefore enrich the literature about this subject. Another point what demands some level of consciousness is the time period wherein this research took place. The questionnaires and interviews took place during the rainy season at the moment that drought already took place for a few weeks. It could be that this recent dryness had little effect on the perceptions of the local farmers at that time. Research during the dry season will probably be different than during the rainy season. So dry season research will be enrichment for literature.

### 7.2.1. Scientific recommendations

The central goal of this research was to contribute to a more comprehensive understanding of the role of adaptation strategies towards climate change and the impact of these adaptation strategies on the livelihoods of people in rural areas in Northern Ghana. This research showed that several scientific concepts or theories can benefit from the outcomes of this study. However, it has to be clear that follow-up studies are necessary to investigate new – or changing phenomena in this particular scientific domain. This will be discussed in this subparagraph.

First of all, the use of perception in climate-related research is worth exploring to identify the impacts of climate change in for instance small villages in Africa. Examples as the research of Mertz et al. (2009), Van der Geest (2010), Jarawura (2013) and Jarawura & Smith (2015) showed already that this aspect of ‘perceptions’ has become more important in research about climatic adaptation. This research appeared to be in accordance with those studies, because of the large conformity between the perceived climate change and the actual climate change. However, this goes only for climatic perceptions on a short term period. Long term climatic overviews are difficult to make for these areas, because of the lack of equipment. In addition, the perceptions of locals clarify to a large extent the adaptive responses to the changed climate. Therefore more perceptive oriented research based in this field of research could be very useful. A Changing perception of people, for instance a temporal analysis, could play a role in new studies about this concept. Interesting for further research are, therefore, gender related aspects and a possibly changing role of women in originally farming households. Men used to be engaged in cash crops to earn money while women took care of the family. Is this still the story or do the perceptions of people change with respect to the role of gender in times of climatic changes.

Secondly, there is a need for further studies into the role of migration and adaptation to climate change. A lot of research has been done on this subject, but certain aspects need a deeper

investigation. For instance, mentioned by Jarawura (2013), the increasing role of rural-rural migration as a means of adaption to drought. The literature mainly focuses on rural-urban migration, which suggests that rural-rural migration seems to be rather irrelevant. This research established however the importance of seasonal rural-rural migration in both Moglaa and Yong, what signified the greater importance of rural-rural migration than previous studies have shown so far. This favorite role of rural-urban migration is even more enforced by the fact that rural-urban migration is on the ascendancy worldwide thereby the assumption that rural people will eventually abandon farm-livelihood strategies for non-farm based strategies (Jarawura, 2013, p. 191). This research indicates that this assumption is partly true because of the increase of non-farming activities and deagrarianisation as adaptation strategy on the one hand, but on the other hand are the adaptive farming related activities increasing as well. This study showed that these adaptive farming related activities together with the meaning (culture) of farming and the diversifying livelihoods of rural farmers are changing, what requires new investigations. This research demonstrated a more specific aspect of migration that needs further investigation: the perception of the migrant in the process of migration in times of climate change. Research from the point of view of the migrant would embrace the discussion of migration as adaptation strategy by looking at the same phenomenon from a different perspective. How do migrants value their motives behind migration trajectories and at the adaptive responses of their household? Did their mindset change during their migration? Is there a culture of migration emerging in the northern of Ghana and to what extent get the villages in northern Ghana deagrarianised? If so, it may cause villages to become pension homes. Then it will be a place where children and older people live instead of a place of production. So the investigation of these aforementioned phenomena, that this study did not discuss, will enrich the debate about adaptation and migration.

The final scientific recommendations are based on the adaption strategies and practices of Mearns and Norton (2010). This research used the five adaptation practices of their theory particularly, aiming for an easy application in practice. Another reason for the choice of this theory was the presence of the concept of mobility, which is not always a concept that is taking into account in other theories. However, several times during this study it came up that some remarks can be denoted with regard to the use of the theory of Mearns and Norton. In the first chapter of analysis (chapter 4) 'the use of relationships' (or social capital) was added to the practice of communal pooling. The reason for this was the absence of 'relationships' as a tool for adaptation in their theory, what proved to be an important aspect during this investigation. The following analytic chapters showed that the theory of Mearns and Norton (2010) was also lacking (besides the use of relationships) in the saving of livestock as an adaptive response to climate change. This also appeared to be an important aspect in both case studies. So basically a further elaboration and addition of both concepts would create a more comprehensive theory. This can be seen as a research specific remark, although there is also a more general remark to their theory of adaptation practices. Despite the great acceptance of this theory it raised several questions. The theory makes especially a clear distinction between diversification and communal pooling, whereby the relations between both concepts were not explained in detail in their book. Also the relationship between all other adaptive practices remains underexposed. Yet these concepts overlap in several areas, which make it very difficult to use the theory correctly without a specific explanation of the authors. For instance, mobility is a separate concept in the theory, but it could also be incorporated in the practice of diversification. Migration

could be a diversifying strategy for households. A further elaboration of these adaptation practices will contribute to an understanding of the adaptation practices of Mearns & Norton.

#### 7.2.2. Societal recommendations

Drought is a major contributor to adaptive migration and the diversification of livelihoods in the area of Savelugu-Nanton. It contributes therefore drastically to people's vulnerability. These circumstances recommend that policy makers need to help these agrarian communities attain dynamic responses to drought both in coping and adapting to the phenomenon (Jarawura, 2013). Helping with several options, like: the reduction of future vulnerability and dealing with unexpected droughts and floods. *'There should be effective implementation of agricultural policies, including irrigation agriculture and other rural infrastructure to enhance adaptation'* (Jarawura, 2013, p. 190). Despite the fact that in this research irrigation did not contribute significantly to combating climate change, it could be a solution for many farmers in Northern Ghana to counteract the crop failure. The agricultural sector demands an impetus to great extent of the government in order to create sustainable farming livelihoods in Northern Ghana. On the other hand shows this research that the possibility of irrigation does not mean that a higher level of adaption takes place. The possibility of irrigation was clearly not enough for the farmers in Moglaa to adapt to climate change. The possibility of irrigation did not turned people to invest in an irrigation system together in order to benefit along. The government should raise the awareness among the local people concerning irrigation systems and how to use them in order to be a solution to combating the crop failure. Furthermore, the government should map the risk areas to perform some action-oriented operations in those areas. The preparation to climatic risks, or good hazard management, could be a solution for the prediction of, the control of and to minimize the effects of natural disasters.

Another aspect that the government of Ghana, private parties and NGO's should focus on is the non-farming related activities in the Northern part of the country. A lot of respondents kept themselves alive with benefits out of non-agricultural work, for instance through receiving remittances from migrants and by the learning other skills. Policy makers should take these non-farming activities into account and should invest more in non-agricultural processes. Focusing on the aspects which keep people in the villages alive would be a good strategy to pursue by the governmental institutions.

Other more technical solutions could be developing the weather forecast or adequate early warning systems in times of climate crises. Good and specific weather forecasts will allow farmers to seed, plant and harvest their crops with a more accurate timing. Despite the rapidly emergence of clouds around the equator the weather forecast should warn farmers that they need to take action (in case of heavy predicted rainfall) or wait with their planting (in case of low predicted rainfall). Early Warning Systems (EWS) could be a technical solution. This system focus on monitoring dangerous air masses, high water levels in rivers and the amount of rainfall and uses this information to send an early warning signal on a local scale (Dakos et al., 2008). These warnings could ensure the reduction of economic damage (like crop failure) or the prevention of deaths caused by climatic impacts (like floods or severe droughts). Private parties, NGO's and the government could play a role in these technical solutions to improve the vulnerability of people to climatic impacts.

The final recommendation of this research is related to the presence of several NGO's in Northern Ghana. In North Ghana, especially around Tamale, many NGO's were present, all committing to the

Improvement of the living conditions of Ghanaians in this area. The large number of NGOs in this area partially impeded the empirical part of this study. Visiting the villages had to happen unannounced, otherwise the chiefs thought of me as a representative of a NGO, which basically meant that they expected money. It made it impossible to create focus groups in advance, set up meetings or to make appointments for interviews. Next to the large presence of these NGOs, the cooperation between these institutions was very low, which caused a situation that everywhere small, temporary and specific project, took place. A more comprehensive and jointly established policy could lead to more benefits for regional and local communities in the northern part of Ghana.

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## Appendix: Questionnaire field research

### Questionnaire: perception farmers on climate change and adaptation strategies

#### Demographic data

1. Name of village: .....
2. Sex of respondent                      a. Male                      b. Female
3. Age of respondent
  - a. 20 – 30                      c. 40 – 50                      e. 60 >
  - b. 30 – 40                      d. 50 – 60
4. Position of respondent in household (relation to household head)  
.....
5. How many people live in your household?  
.....
6. What is your religion?.....

#### Perception on climate change/ environmental changes

7. Has this household ever experienced a changing duration and/or rainfall pattern of the rainy season?  
Yes                      No
8. From your experience from as a child until now, how would you describe the nature the rain in terms of **frequency** and **intensity** of occurrence in this village?  
**Frequency:**    a. Decreasing                      b. Increasing                      c. Stable d. Non  
                         e. Other .....
- Intensity:**                      a. Decreasing                      b. Increasing                      c. Stable d. Non  
                         e. Other .....

#### Perception primary effects

9. Has this household ever experienced drought?                      Yes                      No
10. If yes, from your experience from as a child until now, how would you describe the nature of drought in terms of **frequency** of occurrence in this village?  
a. Decreasing                      b. Increasing                      c. Stable                      d. Non                      e. Other  
.....
11. What year(s) was the drought more severe than the regular/seasonal droughts?  
.....  
.....
12. What do you think are the causes of drought?  
I.....  
II.....  
III.....  
IV.....
13. Has this household ever experienced floods?                      Yes                      No



14. If yes, from your experience from as a child until now, how would you describe the nature the floods in terms of **frequency** of occurrence in this village?

- a. Decreasing                      b. Increasing                      c. Stable d. Non                      e. Other

.....

15. What do you think causes the floods?

I.....

II.....

III.....

IV.....

16. Do you think that your crop productivity has changed during your life?                      Yes                      No

17. If yes, how would you describe the change in crop productivity?                      a. Increased                      b. Decreased

- c. Stable                      d. Non                      e. Other

.....

18. What are the causes of low yields in crop production? (multiple answers possible)(do not suggest)

- a. Birds                      b. Floods                      c. Animals                      d. Rodents                      e. God                      f. Failure to  
harvest in time                      g. Failure to weed adequately                      h. Bush Fires                      i. Soil infertility                      j. Too much  
rain                      h. Bad people                      k. Water scarcity                      l. Drought  
m. other.....

19. Do you think that your animal productivity has changed during your life?                      Yes                      No

20. How would you describe the change in animal productivity?

- a. Increased                      b. Decreased                      c. Stable                      d. Non                      e. Other

.....

21. What causes according to you the changing animal productivity?

I.....

II.....

III.....

Adaptation strategies, secondary effects:

22. How would you normally survive the consequences of **drought** in your life? What measures do you take to survive?

I.....

II.....

III.....

IV.....

23. How would you normally survive the consequences of **floods** in your life? What measures do you take to survive?

I.....

II.....

III.....

IV.....

24. Do you have besides farming and animal breeding another source of income (non farming activities)?

- Yes                      No

25. If yes, what is/are that source(s) of income?

I.....  
II.....  
III.....  
IV.....

26. What is the main reason for these other source of income?

.....  
.....

27. Do you make use of fertilizer? Yes No

28. Do you stall (storage) any of the following: a. Water storage b. Food storage  
c. Animal/Livestock storage

29. What are the main reasons for these kinds of storages? (In what context are you using this kind of stored food/water/animals)

I.....  
II.....  
III.....  
IV.....

30. What kind of crops does this household cultivate?

a. Oranges b. Mango c. Maize d. Millet e. Sorghum f. Rice  
g. Groundnut h. Cowpeai. i. Tomato j. Pepper k. Onion l. Okro  
m.(soy)beans n. Cotton o. Cassave p. Yam q. sheanuts r. Other

.....

31. Which of the above mentioned crop(s) are most important for you?

.....  
.....

32. Why did you choose to cultivate these kinds of crops?

I.....  
II.....  
III.....  
IV.....

33. Did the timing of the planting of the crops changed over time? Yes No

34. If yes, explain what changed in the timing of the planting?

.....  
.....

#### Migration

35. Do you know someone in your household who has migrated? Yes No

36. If yes, what are the reasons for migration of these members of this household?(Multiple answers possible)(do not suggest)
- a. Bad/poor harvest    b. To know the city    c. Poverty    d. Marriage preparation  
 e. To gain freedom    f. Lack of jobs in the dry season    g. Search for wealth    h. Migrants taking girls to cater for small kids    i. Chasing girls    j. Parents sending kids to relations for cultural of other reasons    k. increasing droughts    l. increasing floods    m. Education    n. witch craft  
 o. Health reasons    p. Other
- .....
37. What is the current trend of migration in your household/family?
- a. Increasing    b. decreasing    c. Stable
38. Comparing males to females, which of them migrates the most in your household/family?
- a. Males    b. Females    c. Equal amount
39. In general, is the migration most of the time:    a. Temporarily    b. Permanently
40. If temporarily, how long will they normally stay away?    a. One month    b. Multiple months    c. Half a year    d. One year    e. Longer than one year
41. If temporarily, in what season do they normally migrate?    a. Rainy season    b. Dry season  
 c. Other.....
42. Have there been any changes in the period that migrants normally migrate out of this village? Yes, what kind of changes?
- I.....  
 II.....  
 III.....
43. From your experience from as a child until now, is there a change in the period that migrants stay away? The period is:    a. Longer    b. Shorter    c. Same  
 d. Other.....
44. Where do themigrants normally go to?
- I..... (Rural – Urban)  
 II..... (Rural - Urban)  
 III..... (Rural - Urban)