General Agricultural Workers' Union of GTUC

FRIEDRICH EBERT STIFTUNG
Ghana Office

Climate Change and its Impact on the Livelihood of Farmers and Agricultural Workers in Ghana

Climate Change affects all countries in the world. Draughts and floods are destroying especially the crops and harvest of farmers in developing countries, leaving them in a miserable situation. In most of the African countries, the majority of the workforce is working in the agricultural sector but contributes just a little percentage to the national GDP. Most of the farmers are living in sincere poverty, struggling with life and are often forced to accept a second or third job in order to survive.

Climate Change is one aspect or explanation of how the livelihood of farmers can be threatened. In Ghana, the climate has changed over the last years. Crops are getting destroyed due to periods of extreme heat and heavy rains.

FES and the Ghana Agricultural Workers Union (GAWU) conducted a survey on the impact of climate change on the livelihood of farmers. This study should be used for discussion within the trade union GAWU and amongst political decision-makers in order to formulate recommendations on how to address the issue in the country.

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1 Introduction

1.1 Climate Change and Its Effects on Social, Political and Economic Development in Africa

by Kristina Müller-Kuckelberg

Today, global climate change is one of humanity's greatest challenges. Within the next fifty (50) years, global warming will increase to the detriment of the world's population. Weather extremities such as droughts, floods and cyclones will occur more frequently and forcefully, causing insecure living conditions, food shortage and forced migration. It is the pressing responsibility of the international community to work together and reverse global warming, as well as to provide assistance to those most vulnerable to global weather extremities. Countries in sub-Saharan Africa increasingly need to deal with the practical consequences of this phenomenon and need to manage the specific political challenges that lie ahead.

1.2 Global Climate Change and Its Origins

Especially in the last twenty (20) years, a drastic rise in global temperatures has become evident. Global warming is a human-caused phenomenon due to an increase in carbon dioxide (CO2) emissions and other greenhouse gases (GHG) into the earth's atmosphere. An overwhelming body of scientific evidence supports this interrelation, which was discovered in 1824 by the French scientist, Jean Baptist Joseph Fourier. Generally speaking, CO2 and other GHGs in the atmosphere entrap part of the outgoing solar radiation, thereby raising the earth's temperature. This natural "greenhouse effect'' ensures that our planet (earth) remains habitable and maintains a balanced temperature. However, we are currently facing a rapid warming cycle with CO2 concentrations in the atmosphere with increasing evidence from ice cores that show that current atmospheric concentrations exceed the natural range of the last six hundred and fifty thousand (650,000) years. Industrialization in the nineteenth (19^{th}) and twentieth (20^{th}) century stimulated the process of global warming due to excessive CO2-emissions, resulting from the use of fossil fuels like coal and oil. Although human beings have been releasing CO2 into the atmosphere through for instance burning and land-usage for over five thousand (5,000) years, the recent climate change can be traced back to two significant transformations in the use of energy. First, coal replaced waterpower, fueling the industrialization of the nineteenth (19^{th}) century and unleashing an unprecedented increase in productivity. One hundred and fifty (150) years later, the international harnessing of oil to fuel combustion engines in the early twentieth (20^{th}) century marked the beginning of a transport revolution. The burning of coal and oil, supplemented by natural gases, has transformed human societies, not only providing the energy that has enabled the rapid increases in wealth and productivity but also fueling climate change. Due to these emissions, the CO2 levels in the atmosphere have increased by a third compared to pre-industrial times and the global temperature has increased by 0.8 degree Celsius compared to the early twentieth (20^{th}) century. The current cycle of rising temperatures is unique: For the first time, the actions of human beings are responsible for decisively changing a cycle that is typically a natural phenomenon[1].

In 1988, the United Nations Environment Program and the World Meteorological Organization initiated a panel of experts, the Intergovernmental Panel on Climate Change (IPCC). The main tasks

1 These developments create a need for scientific monitoring and political action., see: Kofler; Müller-Kuckelberg, 2011: 5f and Human Development Report, 2007: 31-32

of the IPCC are to gather and evaluate scientific evidence of global warming, to identify the different causes and to monitor the development of human-induced global warming. In the last twenty-four (24) years, the IPCC has published four monitoring reports, most recently in 2007. Global climate change is occurring at a rapid rate and a further increase in global temperature is irreversible until approximately 2030, regardless of present CO2-emissions. Climate change is a problem resulting from long-term accumulation of CO2-emissions in the earth's atmosphere and it is virtually impossible to predict the timing and magnitude of future consequences. However, it is possible to confirm that the global warming we are experiencing at the moment relates back to human actions within the last decades. To reverse global warming we need to act immediately and consequently or the window of opportunity for successful mitigation will close[2].

1.3 Global Climate Change and the International Political Agenda

In the last twenty (20) years, the issue of global warming has entered the international political agenda. The UN Conference on Environment and Development in Rio de Janeiro in 1992 was a milestone. This led to the adoption of "The United Nations Framework Convention on Climate Change" (UNFCCC), which came into force in 1994. The Convention has been ratified by one hundred and ninety-four (194) states, including those responsible for the largest amount of GHG emissions globally: the United States, Russia, the European Union, China and India. Primarily, the UNFCCC's goal is to ensure that the atmospheric concentration of GHGs is at a level that stabilises the global climate. Internationally, it is agreed that dangerous climate change is preventable by keeping the global temperature rise within a 2°C limit. Global warming will manifest in varying temperature changes from region to region. For instance, in Africa desertification will rapidly spread. In order to stabilise the global temperature by 2050, global GHG emissions must be reduced by at least eighty percent (80%) in comparison to 1990. This requires an international agreement within the UNFCCC framework, including legally binding emissions reduction targets for all countries.

Following the enactment of the UNFCCC in 1994, a Conference of the Parties (COP) has been held annually. The Kyoto Protocol, which was adopted at the international climate conference in 1997, and enforced in 2005, established targets and implementation instruments for global climate protection that are binding under international law. In the first commitment period 2008 to 2012, it prescribes an annual reduction of GHG emissions averaging five point two percent (5.2%) in advanced industrialized nations in comparison to 1990. The Kyoto Protocol represents a decisive step towards realizing international responsibility in combating climate change, despite the fact that one of the nations with the highest per capita emission of GHG, the United States, refuses to ratify it.

In the ensuing years, follow-up conferences dealt with issues not resolved by the Kyoto Protocol, including impetus for a successor agreement to the Kyoto Protocol, which was to be discussed at the Bali COP in 2007. A negotiation period of three (3) years was decided upon and a new agreement was to be reached within the framework of the Copenhagen COP in 2009. However, a legally binding agreement was forestalled, with the achievement of the COP being the Copenhagen Accord, a mere voluntary declaration of intent by one hundred and thirty-one (131) states. This disappointing outcome and the international community's lack of conviction and political will resulted in widespread disillusionment on many levels.

2 see also: Stern, 2009: 48 f

The current state can be summarized as follows: At the climate summit in Durban in 2011, an agreement was reached at the eleventh hour to prolong the Kyoto Protocol beyond 2012. However, key issues such as the length of the commitment period (2017 or 2020) and the emission reduction targets remain to be clarified at the COP in Qatar in 2012. Before a second commitment period can actually commence, these and other important issues must be decided upon. Canada's official exit from the Kyoto Protocol has made it clear that the prolongation of the Protocol is not a viable model for ambitious and effective climate change mitigation. Despite this, the decision to prolong is a step in the right direction towards achieving a legally binding agreement for all UNFCCC signatory states, especially as emerging and developing countries repeatedly cited this as the precondition for their participation in such a treaty. It must however be stressed that this process requires a high level of dedication and a willingness to negotiate and act decisively on the part of all countries, both in the global South and North, if the prevention of global warming is to be successful.

1.4 Political Challenges and Dimensions of Global Climate Change

The human species' capacity to fundamentally alter the basic life-sustaining structures of our planet has reached new and historically unparalleled dimensions. The question is what needs to be undertaken to ensure that global climate change does not continue to develop in such a way that it negatively impacts human life. The present international political strategy is to stabilize CO2 emissions and thus limit global climate change: Future temperature increase will depend on the point at which stocks of CO2 emission stabilize from now on. As previously mentioned, current estimates, state that a worldwide increase of a maximum of 2°C must be ensured. However, it remains unclear how much time is left to avoid reaching this threshold marker and thereby life endangering climate change. The relationship between a stabilization point and temperature change is uncertain: CO2 once emitted into the atmosphere remains trapped there and it cannot be estimated when the effects will materialize[3]. The long-term negative effects of global warming are a reality. The existing technologies in the renewable energy sector would most definitely help to revert the current trend if used consequently as an alternative to fossil energy. This undertaking necessitates global responsibility and commitment: It requires immediate commitment by advanced industrialized countries to change not only their energy policies but also to transform their industries into non-carbon industries. Countries currently on the path of industrial development are obliged to learn from the mistakes of the carbon-industrial-era, and to forge ahead using modern technology and renewable energy sources wherever possible.

The international community will need to assist every developing country undertaking this effort. Furthermore, those countries with the technical and financial resources and transnational institutions are obliged to set a global precedent, which is currently not the case. The European Union, for instance, committed to an average of eight percent (8%) reduction in emissions by 2012; in 2007 a mere two percent (2%) had been reached, with wide variations between countries[4]. The necessary investments to reach energy provision of twenty percent (20%) using renewable sources by 2020 are far from being attained. Advanced industrialized nations must show that development is possible using green energy and that thereby substantial, sustainable and fair growth can be generated. This issue requires solutions on political, economic and social levels, and is a

3 see: Human Development Report, 2007:21 ff

4 for a more detailed breakdown, see for instance: Human Development Report, 2007: 53ff or The Climate Change Performance Index Results 2012, which ranks countries according to emissions trends, climate policy and policy evaluation in order to achieve transparency in international climate policy and action.

responsibility that needs to be globally[5] accepted as such and implemented on a local, national, regional and international level.

Whether or not the search for viable and sustainable solutions to the current and future challenges is being undertaken with appropriate urgency and vigor is yet to be seen. Despite increasing certainty regarding the negative impacts of global warming, hitherto countermeasures have fallen far short of what is needed. The imminent challenge is to act now, to change our behavior and introduce new and binding policies before the crisis erupts and to stop acting reactively and retrospectively. We cannot afford to wait for dangerous climate change to happen before we start undertaking serious measures to deal with it: We have to anticipate the catastrophe in order to avoid it and currently we are rapidly approaching a crisis that requires decisions and actions without hesitation[6]. A strong political will is needed, nationally as well as internationally, to act now. This will has to materialize in every field of political decision-making and in every political action - in energy as well as in economic policy, and most decidedly in environmental and development policy. On national but also on communal or local levels, climate issues must be an instrumental aspect in the political decision-making process: Waste management and traffic planning are equally as important as macro decisions concerning industrial mega projects or national energy concepts.

A transformation to an environmentally-friendly global society is imminent, requiring a global paradigm shift, encompassing international treaties such as the Kyoto Protocol, but most importantly a global responsibility to act now in such a way that does not leave the planet in a worse condition for future generations, ideally in a better one. The transformations mentioned above encompassing various sectors and levels must be combined with a few fundamental courses of action that have the potential to create substantial transformations, in creating a more sustainable and ecologically sound economy and society[7].

Apart from mitigation, adaption represents the second insurance strategy to first, protect vulnerable populations already experiencing adverse effects of climate change and secondly, protect all people in the future. Therefore, adaptation to existing climate change is essential for all countries. Political scientists and the policy-making community have begun to explore potential consequences of climate change, especially for developing countries, describing it as a stress factor with the potential to add to existing development, security and health problems[8]. Adaption is a global necessity; however, it is also a factor fuelling global social injustice, as developing countries are in a more vulnerable position. Inequality in capacity to adapt to climate change is emerging as a potential force widening disparities in wealth, security and opportunities for human development. While countries with adequate resources are in the process of adapting to climate change, it is the countries in the developing world facing extreme and more immediate burdens and adverse impacts, but which are lacking in necessary technical and monetary as well as human capacities to respond to the climate change risks facing their citizens. According to research, developing countries in tropical and subtropical regions will face some of the strongest negative consequences of climate change, thus primarily and adversely impacting the most vulnerable people globally[9].

5 regarding climate change as a global challenge that needs global solutions and responsibility, see for instance Luhmann, Hans-Jochen, 2011: 18ff

6 see for instance: Stern, 2009. *The Global Deal*. The economist suggests a 'global deal' to facilitate the necessary policy adjustments as well as for instance steps that need to be taken by the private sector to ensure the success of generating development based on sustainable models.

7 for a detailed description of these different transformation strategies see: WBGU, 2011: 9f

8 see: Human Development Report 2007/2008

9 for more information regarding adaptation to protect those most vulnerable, see for instance: Bals et al., 2008. *Making the Adaptation Fund Work for the Most Vulnerable People.*

Adaptation to climate change is not a scenario for the future; it is an existing reality, already underway in many parts of the world. As mentioned, the contrasts between adaptation in the developed and developing world are striking and in the short-term at least, climate change is creating winners and losers, not surprisingly, the winners are primarily rich, industrially developed countries. In the latter, adaptation planning has grown into a substantial industry, and is being for instance included in public investment in infrastructure, with countries such as Germany, France and the United Kingdom creating national institutions for adaption planning and implementation. This means that in places like London, people are being protected against the risks associated with rising sea levels through foresighted infrastructure planning based on detailed climate studies and risk assessments. In contrast, adaptation in the world's poorest countries is largely a matter of self-help. For instance in Eritrea, where seasonal rains are becoming ever-less frequent and shorter in duration, subsistence farmers lose access to water, requiring that women walk far distances to wells that still supply water. Examples such as these are manifold, and indicate the dire necessity of finding solutions for those most vulnerable to climatic changes[10].

Millions of people globally who are struggling for day-to-day survival are now being forced to direct their meager financial and human resources to foster adaptation to climatic changes that are impacting their existence. Investment in human development itself is the most effective foundation for adaptation. Policies must be put in place that: promote just growth and diversification of livelihoods, improve access to and quality of health care and education, provide social security and improve disaster management. Such measures represent part of a solution to protect those most vulnerable from the consequences of dangerous climate change and this must be viewed as integral in the formation and implementation of wider strategies to reduce poverty and promote human development[11]. That is why climate change adaptation should be seen not as new branch of public policy but as an integral part of wider strategies for poverty reduction and human development.

1.5 The Effects of Global Climate Change and Its Impact on Sub-Saharan Africa

It goes without saying that not all weather phenomena are a result of global warming; however, it is a fact that human induced climate change is already modifying natural weather patterns and aggravating extreme weather conditions. Short-term consequences such as flooding, cyclones and drought are often longer, intensified and more frequent, the impact of which is long-felt on a socio-economic level. Aside from increasing extremities in weather conditions, the mid and long term physical consequences of climate change will be a rise in sea levels, loss of biodiversity and extreme strain on ecosystems.

Assessments of regional impacts of climate change widely agree that the most vulnerable countries and societies are in Africa, especially south of the Sahara. During the last century, a rise in temperature of approximately 1°C was measured on the African continent, higher than the global average. It is beyond a doubt that global warming is proceeding, and that the adverse effects are already being experienced. It must be noted that Africa is especially vulnerable to small changes in temperature and precipitation due to the fact that on the whole its ecosystems and societies are

10 for examples of strategies being implemented in societies and countries most vulnerable, see Bals, Christoph et al. 2008: 150ff

11 compare: Human Development Report 2007/2008: 170 ff

adapted to only a small range of climate changeability. The IPCC has identified environmental and ecological features that are especially vulnerable to climate change and to a rise in overall temperature, many of which are often found on the African continent: Mediterranean-type ecosystems, tropical rainforests, costal mangroves and salt marshes, coral reefs, water resources in the dry tropics, lowland agricultural systems and low-lying coastal systems. A case in point would be the weather conditions on the Horn of Africa, where severe drought due to failing rains two years in a row led to widespread famine in 2011. How much of this is directly linked to climate change is difficult to prove, however what is observed, both by the IPCC, scientists and international agencies in the area is that weather conditions in the region are becoming severely erratic. While IPCC predictions foresee wetter climatic conditions for this area, more recent scientific studies predict the opposite and a mixture would appear to be the case, as the region has suffered both severe flooding and droughts in the recent past[12].

Although many issues and problems in many African states are neither directly related nor caused by climate change, changing climatic conditions exacerbates them. Widespread water stress, prevalence climate related diseases, reliance on rain-fed agriculture, a large fraction of economic productivity occurring in climate-sensitive sectors. All these factors make African societies more vulnerable to the consequences of climate change. Human development impacts will also vary as changes in climate patterns interact with pre-existing social and economic vulnerabilities, but there are several main risk-multipliers for human development reversals that have been identified[13].

One of the most pertinent issues in regards to human development is reduced agricultural productivity. A majority of the world's population officially living in poverty (under US$ 1 per day) depends directly on agriculture for their survival. Climate change scenarios indicate substantial losses in the production of food staples linked to drought and rainfall variation, especially in areas of sub-Saharan Africa, where projected revenue losses due to loss of arable land amount to 26 percent by 2060. Such an impact on agricultural production would directly influence food security, leaving 600 million facing malnutrition by 2080 in addition to predictions that do not take climate change into consideration.

Another crucial risk factor, especially for many African societies, is the heightened water insecurity. By 2080, climate change could increase the number of people facing water scarcity around the world by 1.8 billion. Regions in Sub-Saharan Africa especially susceptible to drought are considerable. Central Africa and the East Coast, as well as all equatorial African countries will be affected by significant and extreme drought hazard that meet with existing conditions of high human vulnerability. Regions in Southern Africa will experience an increase in dry periods. Severe droughts, as well as reduced rainfall, have devastating impacts especially on the livelihood of pastoralists and subsistence farmers in rural areas, who rely on rainfall for survival and grazing their cattle.

Increased exposure to coastal flooding and extreme weather events are equally threatening phenomena. Droughts and floods are the most frequent hazards in a steady increase of climate-related disasters. Rising sea levels and more intense tropical storm activity, resulting from warmer seas, will increase the number of people affected by coastal flooding by between 180 - 230 million. Without appropriate adaptation measures, this will lead to widespread displacement of people. The collapse of ecosystems is an unavoidable consequence of the above-mentioned scenarios. All

12 On this see for instance: IPCC, 2012.

13 Human Development Report, 2007: 27

predicted species extinction rates accelerate beyond the 2 degree Celsius threshold, with 3 degree Celsius marking point at which 20 to 30 percent of species would be at high risk of extinction. Coral reef systems, already in decline, would suffer extensive 'bleaching' leading to the transformation of marine ecologies, with large losses of biodiversity and ecosystem services. This would adversely affect hundreds million of people dependent upon fish for their livelihoods and nutrition.

Apart from the afore-mentioned direct consequences of global warming, the declining living conditions have dire consequences on health and income security. Climate change will impact human health on many levels. Globally, an additional 220 to 400 million people could be at risk of malaria. Exposure rates for sub-Saharan Africa, which accounts for around 90 percent of deaths, are projected to increase by 16 to 28 percent. Accumulatively, the above have a negative impact on income, as well as considerably reducing food security. As most agriculture and food production activities in Africa are sensitive to climatic changes, for instance gradual changes in temperature can effect agricultural yields or production, while climate shocks such as drought or flooding can ruin whole crops, cause food prices to soar resulting in the most vulnerable people facing dire circumstances. Over the last 30-40 years, observations show that Africa is getting warmer: Prognoses predict an overall 2.9°C increase in temperature in sub-Saharan Africa by 2060. Fact is that this region is already extremely vulnerable to food insecurity due to climate variability, which contributes substantially to development problems as key development sectors, i.e. health, agriculture, water, energy and transport are particularly sensitive areas. Examples of far-reaching consequences in Southern and Northern Africa are for instance prognosis that predict a 50 percent decrease in rain-fed agriculture by 2020, number of people suffering from water stress will rise from 15 to 250 million people. Furthermore, local food supplies will decrease due to for instance depleting fish in lakes due to rising water temperatures. In Lake Victoria alone, this could endanger 30 million people who rely on fish as a food and income source. Of course, there are many factors that affect income and food (in)security in Africa, and it is difficult to pinpoint the exact contributing factors of climatic change. For this reason, research is needed to understand not only this but also the effect of other multiple stresses, looking at local, regional and global levels[14].

1.6 Conclusion

Global climate change is one of today's greatest challenges and it is crucial for all countries of the world to act now. We are at a cross-roads and only decisive and immediate action will make it possible to influence the future consequences of climate change and stall global warming. In order to achieve this, we must drastically reduce the amount of green house gases emitted into the earth's atmosphere without delay. The key is mitigation, which is first and foremost the responsibility of advanced industrialized nations; however, all countries now have the opportunity and the obligation to be part of the solution to a global problem. For countries on an industrial development path, the prevention of green house gas emissions in political planning arenas such as urban and industrial development and most importantly in energy policies is significant. It is of fundamental importance that adaptation to dangerous climate change, as well as prevention, is at the top of the political agenda. Policies of developing countries to eradicate poverty, ensure food security, as well as to provide education and health services need to include adaptation strategies. Due to the fact that many African countries are especially vulnerable to negative impacts of climate change, it is of great importance for the governments of these countries to pay special attention to the consequences of

14 for details, see for instance Bals et al. 2008: 150ff

climate change on agriculture and food security. A detailed analysis of the risks and possible solutions could assist in finding appropriate adaptation strategies and play an important role in securing food and in fighting poverty.

2 Methodology

2.1 Study Design

The survey was exploratory in nature as it sought to investigate the views of farmers and agricultural workers on climate change and its impact on their livelihood. It was to get an understanding and an insight on what they knew about climate change and how it affects their livelihood.

2.2 Population and Sampling Method

The ten (10) regions of Ghana formed the population of the survey. Each region was categorized into rural and urban areas for data collection purposes. Using purposive sampling techniques, respondents in the regions were selected for the survey as either been a farmer or an agricultural worker no matter if they were employed or self-employed.

2.3 The Design of the Questionnaire

The goal of the study was to gather statistical data (information) about the views (opinions) of farmers and agricultural workers on climate change and its impact on their livelihood. The questionnaire for the study was divided into nine (9) sections. Section 1 dealt with the personal information or bio-data of the respondents. Section 2 focused on knowledge of climate change while section 3 collected data on the views of respondents on how they explain climate change. Section 4 dealt with the changes in production, productivity, markets and sales of farm produce while section 5 looked at issues of income and food (in)security. Further, section 6 focused on infrastructures, section 7 dealt with the support offered by the state to farmers, section 8 looked at social security and protection and finally section 9 dealt with expectations of farmers on mitigation and adaptation measures to climate change.

With these key issues, staff of FES in cooperation with GAWU designed the seven-page questionnaire (*See Appendix 1*). The questions were mostly closed ended which gave respondents possible answers to select from. One advantage of this was that it made data analysis much easier. Also, it was assumed that closed ended questions would enable the field assistants to conduct much more questionnaires because it takes less time to tick boxes than to write full answers. The closed questions were posed in two ways. Firstly, there were grammatical questions in which the respondent had different options to choose. This methodology was applied, when it was aimed to make a ranking of the most given answers afterwards. However, the respondents also had the possibility to give their individual answers under the option “others”.

The second kind of closed questions were grammatical statements on which the respondent could then give her/his opinion by deciding between five answer-boxes: “strongly agree”, “agree”, “not sure”, “disagree”, strongly disagree”. The main reason for this type of questioning was the simplification of data analysis. By asking for opinions on statements, it was easy to derive trends of opinions from a large number of people to certain issues and at the same time get a picture which was more complex than a trend consisting simply of “yes” and “no”-answers.

With regards to content, the questionnaire was structured as coherent as possible. Therefore we made blocks of certain matters, like “income and food (in)security” or “infrastructure”.

Indeed, in the survey all respondents stayed anonymous as questions on bio data only bothered on age, sex, level of education, nationality, size of the family/relationship status and occupation.

Because of the high sample that was envisaged (3,000), and the different educational backgrounds of the people that were expected to fill out the questionnaire, the questions had to be stated in simple language that could easily be understood by anyone in Ghana. Therefore the questions were formulated in a very simple way meaning with few words and without complicated vocabulary. The use of closed ended questions/statements also enabled the field assistants to ask people and then tick the answers themselves, in cases where the respondent was illiterate. An attached briefing paper also allowed the coordinators to translate the questions into local languages if necessary.

2.4 Data Collection Procedure

The study was conducted from December 2011 to January, 2012. In total, three thousand (3,000) questionnaires were printed and sent out to all ten (10) regions of Ghana. Due to the national character of the survey, the three thousand 3,000 questionnaires were distributed proportionally in the ten (10) regions of Ghana taking into consideration the unequal populations in all the regions. The regional samples selected were representative and this was done using simple random techniques.

Statistical data[15] from the Ghana Statistical Service gave regional population distributions in both rural and urban areas. Due to the fact that the questionnaires for each region have been classified for the rural and urban population, the percentages have been applied to the total questionnaires which have been sent to each region. Due to the fact that the rural population in Greater Accra was low, but the total population in this region is the biggest, the questionnaire for this region was reduced. The reduced number of questionnaires was allocated to the three regions with the highest rural population, namely Upper East, Upper West and Northern Region.

Map 1 – Ten Regions of Ghana

[15] Ghana Statistical Services: Based on 2000 Population and Housing Census

Table1: Regional Questionnaire Distribution Summaries

Region	No. of questionnaires	% rural population	Rural area - No. questionnaires	Urban area - No. questionnaires
Ashanti Region	606	46.6	282	324
Brong Ahafo	282	62.6	176	106
Central Region	233	62.5	146	87
Eastern Region	287	65.4	188	99
Greater Accra	136	12.3	17	119
Northern Region	386	73.4	283	103
Upper East Region	228	84.3	192	36
Upper West Region	183	82.5	151	32
Volta Region	338	73	247	91
Western Region	321	63.7	205	116

Source: Field Work 2011-2012

Field Assistants were engaged to conduct the data collection from field for the survey. They were members of GAWU or fellows of GAWU. These field assistants were paid for each completed questionnaire as well as the cost of travel to administer the questionnaires. In order to maintain standards, briefing papers were prepared for each field assistant that detailed how to administer the questionnaires. In addition to this, employees of GAWU also called each field coordinator to brief each of them individually. The briefing papers were sent into each region together with the questionnaires via FedEx or hand delivery to the field coordinators in Accra. In order to make sure that it could be identified in which region a questionnaire had been completed, each had a unique code-print which could be identified through the coding system that was developed along with the distribution key.

The practical conduction of the survey went overwhelmingly well. From the 3,000 questionnaires that were sent out originally, FES and GAWU received 2,623 back representing 87.4% of questionnaires sent out. Unfortunately, the field assistants from Greater Accra could not submit the questionnaires to FES or GAWU and therefore the region could not be considered in the study. Finally, all 2,623 questionnaires could be used for the data analysis. Apparently the motivation to finish a maximum number of questionnaires was high due to the monetary incentive offered to the field coordinators. Also, the methodology to choose closed questions was affirmed and justified by the high number of respondents.

The questionnaires were sent back to the FES office in Accra via Fed Ex or hand delivery between January and March 2012. To evaluate the quality of the completed questionnaires, it was taken account of certain control mechanisms in the design of the questionnaires. First of all, each returned questionnaire was counted in order to make sure that the number the field coordinator had given is correct.

2.5 Data Analysis Plan

Using descriptive statistics, the data was analysed in terms of frequency distribution and percentage using SPSS as raw data was difficult to understand for meaningful conclusions to be made. The data was presented using tables, frequencies, figures, and percentages.

3 Presentation of Findings and Analysis

3.1 Bio Data of Respondents

This section of the chapter presents the bio data of the respondents interviewed for the survey.

Table 2: Age Distribution of Respondents

Age	Sex		Total
	Male	Female	
Under 15	1	4	5
15-24	114	30	144
25-34	397	147	544
35-49	656	287	943
50-59	446	190	636
60 and older	190	72	262
Total	**1,804**	**730**	**2,534**
% Total	71%	29%	100%

From Table 2 above, it is very clear that majority of the respondents representing seventy-one percent (71%) were males as against twenty-nine percent (29%) of females. It is also striking to note that majority of male respondents representing thirty-six (36%) were between the ages of thirty-five (35) and forty-nine (49). Similarly, the same age group formed majority of the female respondents representing thirty-nine percent (39%).

The field assistants have been asked to not focus only on one particular group, e.g. defined by age, sex or educational background, employed or self-employed. Due to the fact that the field assistants have been conducting this task alone, it cannot be clearly stated if they have been meet all requirements. Therefore, no explanation can be given why 71 percent of the respondents have been male.

It must be admitted that not all returned questionnaires have indicated if the respondent was male or female. 2534 out of 2623 questionnaires have had information on the sex of the respondents. This error also occurred due to the mistake of (a) field assistant(s) who did not check the questionnaire after completion. They could have ticked the boxes by themselves what kind of sex the last respondent had.

Table 3: Occupation of Respondents

Occupation	Sex		Total
	Male	Female	
Employed	404	104	508
Self Employed Without employees	1,142	555	1,697
Self Employed with employees	207	62	269
TOTAL	1,753	721	2,474
% Total	71%	29%	100%

Majority of the respondents representing sixty-eight percent (68%) are self employed without employees. Out of this, sixty-five percent (65%) are males whiles the remaining thirty-five percent (35%) are females. Aside this most of the respondents twenty percent (20%) are employed as farmers or agricultural workers.

Table 4: Level of Education of Respondents

Level of Education	Sex		Total
	Male	Female	
Primary School	269	213	482
Junior High School	412	196	608
Secondary Education (SHS/Vocational/Technical school)	354	75	429
Diploma	201	32	233
Bachelors/ Masters Degree	101	14	115
Post graduate	4	3	7
Total	1,341	533	1,874
% Total	72%	28%	100.0%

Majority of the respondents, thirty-two percent (32%) are Junior High School graduates.

Table 5: Nationality of Respondents

Nationality	Sex		Total
	Male	Female	
Ghanaian	1810	734	2544
Nigerian	4	1	5
Togolese	4	4	8
Ivorian	3	0	3
others	1	4	5
Total	**1,822**	**743**	**2,565**
% Total	71%	29%	100%

3.2 Knowledge on Climate Change by Ghanaian farmers and description of weather conditions

This section of the analysis focuses on establishing the responses of farmers across Ghana on what climate change is.

Table 6

I know what climate change means.		
	YES	**NO**
% of total respondents	87.4	12.6
% of male respondents	89.2	10.8
% of female respondents	83.1	16.9
% of respondents – employed	95.3	4.7
% of respondents – self-employed without employees	85.2	14.8
% of respondents – self-employed with employees	91.2	8.8
% of respondents – primary school	78.9	21.1
% of respondents – junior high school	88.4	11.6
% of respondents – secondary education	92.8	7.2
% of respondents - Diploma	98.7	1.3
% of respondents – Bachelor/Master	99.2	0.8
% of respondents – Post-graduate degree	100	0

Source: Field Work 2011-2012

From Table 2 above, male farmers representing eighty-nine point two percent (89.2%) who were interviewed on their views of climate change knew what climate change as compared to female respondents representing eighty-three point one percent (83.1%).

A look at the response of the occupational status of farmers across the country also reveals surprisingly a majority of employed agricultural workers responding yes to 'I know what climate change is'; representing a total of ninety-five point three percent (95.3%). Ninety-one point two (91.2%) of the self-employed farmers with employees have knowledge about climate change as compared to just eighty-five point two percent (85.2%) of self-employed farmers without employees responding 'yes' to the statement.

Considering the level of education of farmers who responded to what climate change means, it can be indicated that the higher the education, the more knowledge about climate change and its meaning.

Table 7

I have heard about climate change... (tick where applicable)					
	On television	**In the newspaper**	**On radio**	**On the internet**	**Remarks**
% of total respondents	29	10	57.8	3.2	
% of male respondents	41	4	54.1	0.9	Not every respondent indicated their sex
% of female respondents	35.7	1.3	62.9	0.2	Not every respondent indicated their sex
% of respondents – employed	61.4	6.3	30.5	1.8	Not every respondent indicated their occupation
% of respondents – self-employed without employees	32.4	2.5	64.7	0.5	Not every respondent indicated their occupation
% of respondents – self-employed with employees	39.7	2.1	57.8	0.8	Not every respondent indicated their occupation
% of respondents – primary school	32.8	1.3	65.9	0	Not every respondent indicated their level of education
% of respondents – junior high school	33.9	2.9	63	0.2	Not every respondent indicated their level of education
% of respondents – secondary education	52.9	1.7	39.5	1	Not every respondent indicated their level of education
% of respondents - Diploma	75.5	5.6	16.3	2.6	Not every respondent indicated their level of education
% of respondents – Bachelor/Master	78	9.3	6.8	6	Not every respondent indicated their level of education
% of respondents – Post-graduate degree	85.7	0	14.3	0	Not every respondent indicated their level of education

Source: Field Work 2011-2012

As can be seen from Table 3 above, majority of the respondents rely on information from television (29%) and radio (57.8%) programmes. It is obvious that the higher the education the respondent, the more one relies on television than radio. The respondents with higher education are also reading the newspaper more often than those with lower education, such as Primary Education or Junior High School level. The marginal usage of the newspaper can be explained by the lower incomes of farmers and agricultural workers. Daily newspapers cost for Gh¢ 1.50 and cannot be afforded easily by farmers and agricultural workers with their meager incomes. Lack of wider internet coverage in

the country coupled with the lower education status of farmers and agricultural workers seem to have accounted for the low usage of the internet across the nation. Statistically, it is difficult to estimate how much people do have internet access. Despite the fact that internet cafés are being established in the urban areas, the rural areas are mostly out of the reach for a proper and well-functioning internet network.

Table 8

I have experienced the weather to be steady over the last 5 years. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Total		9.2	25.1	12.4	38.9	14.3	100
Sex	Male	9.5	24.1	12	39.5	14.9	100
	Female	8.1	27.7	12.8	37.8	13.5	100
Occupation	Employed	9.4	26.7	8.6	34.5	20.8	100
	Self-employed – no employees	8.6	23.9	13.3	41.9	12.4	100
	Self-employed – with employees	13.1	25.8	11.2	32.2	17.6	100

Table 9

I have experienced the weather to be steady over the last 5 years. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	8.4	23.4	5.2	44.2	18.8	500
	Brong Ahafo Region	10.7	29	14	36.8	9.6	272
	Central Region	20.9	31.3	11.8	28.4	7.6	211
	Eastern Region	12.4	35.3	18.2	26.7	7.4	258
	Northern Region	8.4	24.3	18.2	39	10.1	346
	Upper East Region	3.4	23.6	15.3	41.4	16.3	203
	Upper West Region	3.5	16.3	11.6	57.6	11	172
	Volta Region	6.4	26	8.4	39.5	19.6	311
	Western Region	9.5	16.9	14.6	36.9	22	295
Total		9.2	25.1	12.4	38.9	14.3	2568
Unanswered							55

Table 3 below reveals that only 34.3 percent of the total respondents are convinced that the weather has been steady over the last 5 years; 12.4 percent have not been sure and 53.2 percent answered that the weather has not been steady.

The study shows that women are slightly more convinced of the fact that the weather was steady in the past. No real difference can be highlighted. Interestingly, self-employed farmers without employees are more pessimistic about the statement than employed agricultural workers, followed by self-employed farmers with employees.

Even if the majority of the total respondents have indicated that the weather was not steady over the last five years, it can be highlighted that especially the Northern regions, Ashanti, Volta and Western Region have disagreed more with the statement than the average percentage nationwide.

This is going along with the agreement of statements throughout the regions that "the weather got hotter, rains became less and unexpected over the years" as well as "the weather becomes more unpredictable from year to year". A clear difference with regard to the answers to both statements cannot be identified.

Table 10

The weather got hotter, rains became less and unexpected over the years. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	28.3	58.2	8.2	5	0.4	502
	Brong Ahafo Region	29.5	63.8	3.7	2.6	0.4	271
	Central Region	35.9	54.1	4.8	4.3	1	209
	Eastern Region	23	57.1	5.7	13	1.1	261
	Northern Region	36.5	53.3	1.4	4.1	1.7	345
	Upper East Region	25.1	60.1	9.9	3.4	1.5	203
	Upper West Region	56.9	35.6	5.7	1.7	0	174
	Volta Region	45.5	48.4	2.6	1.3	2.2	312
	Western Region	30.7	49.1	8.2	9.2	2.7	293
Total		33.7	54.1	6	5	1.2	2570
Unanswered							53

Table 11

The weather becomes more unpredictable from year to year. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	35.5	61.3	1.8	1	0.4	501
	Brong Ahafo Region	37.6	56.2	3.6	1.5	1.1	274
	Central Region	29.9	55.9	8.1	4.7	1.4	211
	Eastern Region	23.4	64	6.1	5	1.5	261
	Northern Region	41.1	56.6	1.1	0.6	0.6	348
	Upper East Region	24.9	71.2	3.4	0	0.5	205
	Upper West Region	60.9	39.1	0	0	0	174
	Volta Region	39.7	56.1	1.6	1.6	1	310
	Western Region	33	60.2	5.1	1	0.7	294
Total		35.9	58.5	3.2	1.6	0.8	2578
Unanswered							45

All respondents from all regions believe commonly that the perceived changes of the weather condition are caused by environmental pollution and climate change.

Table 12

I believe that the perceived changes of the weather condition caused by environmental pollution and climate change. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	32.5	54	11.5	1.6	0.4	496
	Brong Ahafo Region	49.1	42.9	6.2	0.7	1.1	275
	Central Region	46.2	46.2	6.7	0.5	0.5	210

	Eastern Region	33.3	54	10	2.3	0.4	261
	Northern Region	40.7	47.7	7	3.2	1.5	344
	Upper East Region	32.7	62.4	3.9	0.5	0.5	205
	Upper West Region	40.8	50.6	8.6	0	0	174
	Volta Region	41.1	53.2	4.1	1.3	0.3	314
	Western Region	35.6	46.9	11	6.5	0	292
Total		38.5	50.9	8	2	0.5	2571
Unanswered							52

All regions announced major decreases regarding soil moisture, fertile grounds and water availability. The following table shows the regional results:

Table 13

Increment or Decrement in .... (%)							
		Soil moisture		**Fertile Grounds**		**Water Availability**	
		Increase	Decrease	Increase	Decrease	Increase	Decrease
Region	Ashanti Region	4.5	95.5	6.7	93.3	9.6	90.4
	Brong Ahafo Region	5.8	94.2	1.9	98.1	4.2	95.8
	Central Region	23.3	76.7	21.4	78.6	16.2	83.8
	Eastern Region	17	83	22.9	77.1	23.3	76.7
	Northern Region	5.3	94.7	4.4	95.6	4.5	95.5
	Upper East Region	9.3	90.7	11.8	88.2	14.9	85.1
	Upper West Region	0.7	99.3	0	100	0.6	99.4
	Volta Region	7	93	5.1	94.9	7.9	92.1
	Western Region	1.7	88.3	9.7	90.3	14.2	85.8
Total		8.9	91.1	8.7	91.3	10.4	89.6

It is quiet striking that Central and Eastern Region have stated higher increments regarding soil moisture, fertile grounds and water availability than other regions. Both regions in the South experienced heavy rain falls in the past. Nevertheless, the major decreases in soil moisture, fertile grounds and water availability is putting farmers and agricultural workers in a difficult position. Without a proper water management facility, the farmers cannot react to the shortages of rain falls and their harvest is at risk.
When it comes to the source of water, all regions quiet depending heavily on rain falls:

Table 14

The source of water is... (please tick where applicable) (% of total respondents in regions)							
		Rain	Tap system at home/nearby	Tap system/ water far away	River/lake	Boreholes /well	Total
Region	Ashanti Region	60	14.7	1.2	9.7	14.3	203
	Brong Ahafo Region	41.7	4	2.5	17	34.8	276
	Central Region	54.8	17.8	7.2	9.1	11.1	208
	Eastern Region	59	5	1.9	11.9	22.2	261
	Northern Region	48.9	11.2	8	22.1	9.8	348
	Upper East Region	48.3	4	0	18.7	29.1	203
	Upper West	60.9	2.3	1.1	9.8	25.9	174

	Region						
	Volta Region	49.8	6.5	21.7	18.4	3.6	309
	Western Region	54.7	1.7	2.1	8	33.6	289
Total		53.3	8.2	5.3	13.9	19.3	2571
Unanswered							52

Nevertheless, the Central Region is also using the boreholes and wells as well as the tap system at home or nearby to water the crops. The Eastern, Brong Ahafo, Upper East and Upper West Region are using boreholes/well. In those regions which have rivers or lakes close by, the farmers are using the natural water resources to water their crops.

4 Changes in Production, Productivity, Markets and Sales

Climate change impacts on the welfare of rural households depend on a number of interrelated factors. "For instance, climate change might reduce physical productivity on an agricultural household's cereal land. But a general decline in agricultural productivity will also raise food prices, benefiting the same household as long as it is a net producer of cereals. Also, the extent to which a decline in agricultural productivity translates into lower rural wages depends on the diversification of the local economy and the ability of labor to move into other occupations."[16]

Production and productivity is a key factor for the success in business and the increment of the income of many workers and self-employed farmers. Especially, agricultural sectors in many developing countries face challenges with regard to the changes in weather (e.g. droughts, heavy rain falls, floods etc.) which is moreover a result from climate change worldwide. The questions we addressed in this survey shall indicate how changing weather conditions also causes changes in production and productivity which may eventuates in the decrease of income and hence in social insecurity.

Referring to the term "vulnerability of the poor", it is important to highlight the general statistics of farmers and agricultural workers in Ghana in order to put the following data into the right perspective.

As the general bio-data of the respondents already indicated, 68.6 percent of the respondents are self-employed without employees. Majority of the respondents (65.6 percent) are peasant farmers as the farm size of 1 to 5 acres indicates; 69.9 percent out of the peasant farmers are self-employed without employees. Furthermore, 70.8 percent of the total respondents produce crops which is a climate-sensitive area of production if there are no adequate tools/means or water management facilities to react adequately to the weather situation.

To further worsen the plight of self employed farmers without employees coupled with their small farm sizes and over reliance on crop production is the number of children these farmers have to cater for. Out of a total of 2,270 farmers and agricultural workers who responded to the questionnaires, the following statistics has been collated:

Table 15

Number of Children	Frequency	Percentage (%)
1-2	489	21.5
3-5	935	62.7
6-7	517	22.8
8 +	329	14.5
TOTAL	2270	100

A total of 85.5 percent of the respondents stated that they have 3 to 7 children. 14.5 percent even have 8 children or more. However, the questionnaire did not specify if "children" would mean biological children, adopted children or children from the extended family the farmers have to take care of. Regardless of this distinction, a commitment to cater for any of these children includes the responsibility of securing their basic human needs, namely food, clothing, shelter or health care. From this statistics, the demands on most peasant farmers who have very little income are

[16] The World Bank (March 2011): The Poverty Impacts of Climate Change. Economic Premise No. 51, p. 3

extremely high as they have to secure the livelihood of their families. The reality, for example, highlights one correlation – the less income and the more children mostly leads to the fact that only a few children in the family can have a chance to higher education[17] after the free basic education[18] provided by the Ghanaian government.

Also the pressure on farmers to make more income or profit in order to better their living standards is extremely high. Being trapped of having little financial resources which makes investments into their agricultural businesses difficult as well as facing the consequences of climate change leaves most of the farmers in Ghana in a desperate situation. Furthermore, the increment of prices in Ghana (electricity, water, food, rental fees etc.) over the last five years threatens a secure livelihood of those farming families even more.

To analyze the current state of production of the respondents' businesses, the survey asks in detail about the losses, the quality and the possible sales markets.

With the declaration of the respondents in mind that the majority knows what climate change means due to the news coverage from mainly television and radio, 90.3 percent strongly agree or agree to the statement that they have lost crops or livestock during the last years due to the bad weather conditions.

Table 16

I have lost more crops/livestock during the last years because of the bad weather conditions.			
	"agree" / "strongly agree"	**"not sure"**	**"disagree" / "strongly disagree"**
% of Total	90.3	3.7	6.1

Focusing on responses of farmers from different regions, it is obvious that respondents in all regions tend to have experienced more losses over the last years. There cannot be a region identified in which a farmer has lost less crops during the last years due to bad weather conditions. This is illustrated in the table below:

Table 17

I have lost more crops/livestock during the last years because of the bad weather conditions. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	24	68.8	2.8	3.8	0.6	504
	Brong Ahafo Region	27	65	4	4	0	274
	Central Region	30	58.6	3.3	5.7	2.4	210
	Eastern Region	18.8	51.7	11.9	16.5	1.1	261
	Northern Region	38.6	55.3	0.9	4.9	0.3	347
	Upper East Region	15.6	75.1	3.9	2.4	2.9	205
	Upper West Region	31.8	63.1	1.7	2.8	0.6	176
	Volta Region	31.5	62.4	2.3	2.9	1	311
	Western Region	29	63	3.7	3.4	1	294
Total		27.6	62.7	3.7	5	1	2582
Unanswered							41

[17] Junior High School, Senior High School, tertiary education
[18] Primary School up to 6th grade

Another interesting factor from the data collected for this study is the loss of crops and livestock in relation to the occupation of the respondents. Comprising the answers of "strongly agree" and "agree", 87.7 percent of the employed farmers and agricultural workers indicated that a loss of crops or livestock was evident, while 91 percent of the self-employed farmers without employees as well as 92.5 percent of the self-employed farmers with employees have chosen the same answer.

As stated above, the loss of crops or livestock can jeopardize the livelihood of larger families and therefore makes it imperative to mention respondents with a lot of children. The following table shows that the vast majority of the farmers with more children than three had to cope with losses of their crops or livestock.

Table 18

I have lost more crops/livestock during the last years because of the bad weather conditions. (related to number of children; % of total)	
Number of children	**"agree" / "strongly agree"**
1-2	90.3
3-5	90.5
6-7	93.7
8 and above	89

In order to make conclusions on the impact of the losses, the survey asked farmers to estimate the percentage of loss of their crops or livestock. The overall results indicate that 20.8 percent had lost fewer than 10 percent of their entire crops or livestock, 42.3 percent lost 10-30 percent, 26.2 percent lost 31-50 percent and 10.7 percent lost over 50 percent of their crops or livestock.

Table 19

How much percentage of crops/livestock do you believe of being lost to bad weather? (%)						
		Under 10%	10-30%	31-50%	Over 50%	Total
Region	Ashanti Region	19	44.6	21.8	14.5	495
	Brong Ahafo Region	21.4	51.1	24.1	3.4	266
	Central Region	39.4	31.5	20.2	8.9	203
	Eastern Region	31.2	40.5	19.4	8.9	237
	Northern Region	19.5	38.9	36.8	4.8	334
	Upper East Region	16.7	57.1	23.7	3	198
	Upper West Region	6.8	20.5	45.5	27.3	176
	Volta Region	20.3	45.8	22.9	1.1.	301
	Western Region	15	43	26.6	15.4	286
Total/Average		20.7	42.3	26.2	10.7	2496
Unanswered						127

The above results indicate that farmers in the North, a region which is more underdeveloped compared to the Southern regions, experienced a higher loss of crops. In all fairness, the question is statistically reflected more of a perception than an accurate measurement of quantitative loss. But nevertheless, this perception gives an overall picture of the current production outcome in the agricultural sector.

With the percentages of losses in mind, those regions are also affected with higher losses in which the farmers have statistically more children compared to others.

Another factor of ensuring a consistent income and profit for all businesses is the quality of the products which will affect prices and the opportunity to sell it on the markets. Droughts or heavy rainfalls could cause a lot of damage to climate sensitive crops.

Table 20

The quality of the harvest/products has become worse in the last years.			
	"agree" / "strongly agree"	**"not sure"**	**"disagree" / "strongly disagree"**
% of Total	75.8	10.5	13.8

The general response of the sampled population highlights that 75.8 percent agree or strongly agree to the statement that the quality of the products decreased over the last years. Respondents in the Upper West, Northern, Brong Ahafo, Central and Ashanti regions especially complained about the worse quality of the products compared to the average response nationwide.

86.1 percent of the overall respondents believe that the worsened quality of the harvest or products has been caused by bad weather conditions. The farmers and agricultural workers in Ghana stated that the uncertainty of weather conditions over the last years made it difficult to plant the right crops at the right time, so that the planning in the agricultural sector turns into a game of luck. Imagine this high risk of losing crops due to bad weather as well as considering worse quality of the products over the years, the peasant farmers who have little income and cannot afford high investments for their businesses, struggling for their very existence. If the losses over the next years will further increase due to the unpredictable weather, the majority of the farmers could be confronted with severe poverty.

Nevertheless, there are a few respondents who believe that other reasons rather than the changing weather are responsible for the losses and decreasing quality of their farm products. The most important reasons listed below are:

- Lack of proper care and timing of planting and harvesting
- The quality of harvest and products are affected by pests and diseases on the farms
- Insufficient nutrition of the soil/land degradation
- The use of manure from animal waste in addition to fertilizers
- Poor infrastructure and personal attitudes of the farmers
- Overuse of agro chemicals
- Lack of maintenance on farms

These responses also highlight the fact that sometimes lack of knowledge in agriculture and the insufficient education or training of the farmers and agricultural workers contribute to loss of farm produce.

85.5 percent of the total respondents assume that the diminishing quality of the harvest or products has affected the sales as well. This corresponds with the observation that 81.9 percent state that the sales of products, crops or livestock decreased in general. This is presented in the table below:

Table 21

The quality of the harvest affected the sales of products. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	18.4	71.2	3.1	6.1	1.3	479

	Brong Ahafo Region	17.5	63.6	14.9	4	0	275
	Central Region	20.2	64.5	7.4	6	2	203
	Eastern Region	22.6	64.7	4.4	6.7	1.6	252
	Northern Region	36	46.5	5.6	11.7	0.3	342
	Upper East Region	12.2	74.6	8.3	4.4	0.5	205
	Upper West Region	21.8	67.2	6.3	2.9	1.7	174
	Volta Region	20.8	61.4	5.6	11.6	0.7	303
	Western Region	17.7	56.7	4.2	9	0.7	289
Total		22.5	63	6.3	7.3	0.9	2522
Unanswered							101

Responses from the regions differ slightly but nevertheless, despite the fact that the quality of products worsened and the losses of crops or livestock was higher than the average in the Western Region, this particular region claims that the quality did not affect the sales. One reason of this response could be the general increment of prices in the region due to the start of oil production and majority of oil companies are relying on the suppliers of agricultural products on the local markets.

Sales decrement relates either to the loss of crops or harvest, the quality of the product or on the competition on the local, regional as well as international market with regard to the quality and price offers. Also the demand of products on the customers' side is crucial for the sales. The survey evaluates how climate change contributes to the reduction in farm sales which refers to the loss of crops or livestock as well as the quality of the product.

Table 22

If the sales decreased, do you believe that this had something to do with climate change?		
	YES	**NO**
% of total respondents	88.4	11.6

The regional distribution of responses is as follows:

Table 23

If the sales decreased, do you believe that this had something to do with climate change? (%)				
		YES	NO	Total
Region	Ashanti Region	86	14	492
	Brong Ahafo Region	97.3	2.7	262
	Central Region	86.5	13.5	200
	Eastern Region	84.6	15.4	241
	Northern Region	87.3	12.7	330
	Upper East Region	78.7	21.3	183
	Upper West Region	93.1	6.9	173
	Volta Region	94.8	5.2	290
	Western Region	86.9	13.1	275
Total/Average		88.4	11.6	2446
Unanswered				177

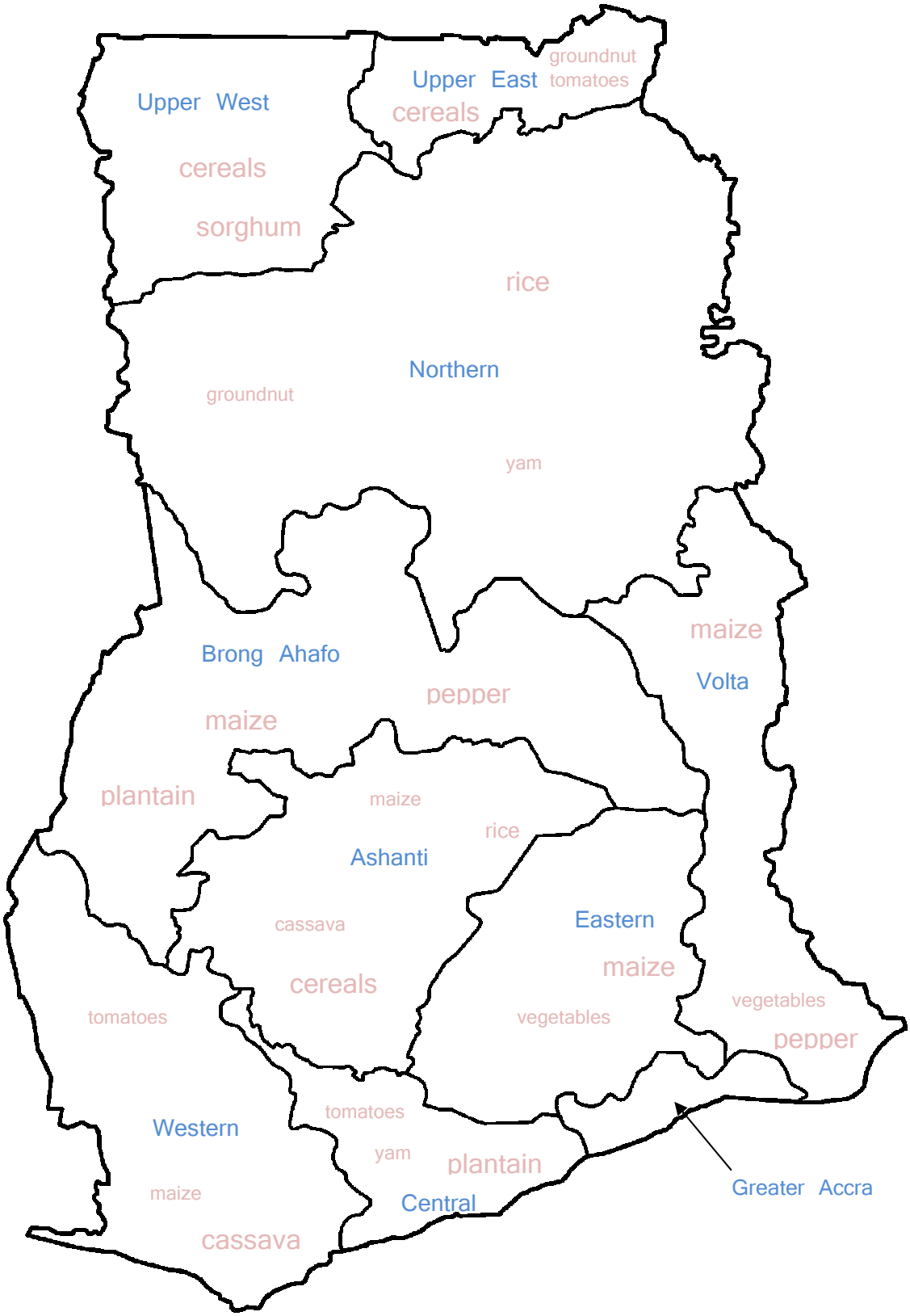
Interestingly, the respondents from Brong Ahafo, Upper West and Volta Region regions, who stated that they have lost major percentages of their crops due to the bad weather and also complained about the bad quality of the products, agree with the above statement more than the other regions or the average responses nationwide.

With all these recent results in mind, the farmers and agricultural workers need to develop strategies to mitigate the loss of their farm produce over the past years. As it happens to every business in crisis, Ghanaian farmers have also tried to re-organize their operating principles and changed their production. Therefore, farmers have been setting themselves the task to find solutions to the unpredicted weather conditions in the country by using fertilizers or by starting or stopping the cultivation of specific climate-sensitive crops.

89.7 percent of the total respondents have observed that with regards to production the quantity of the crops, harvest and products decreased.

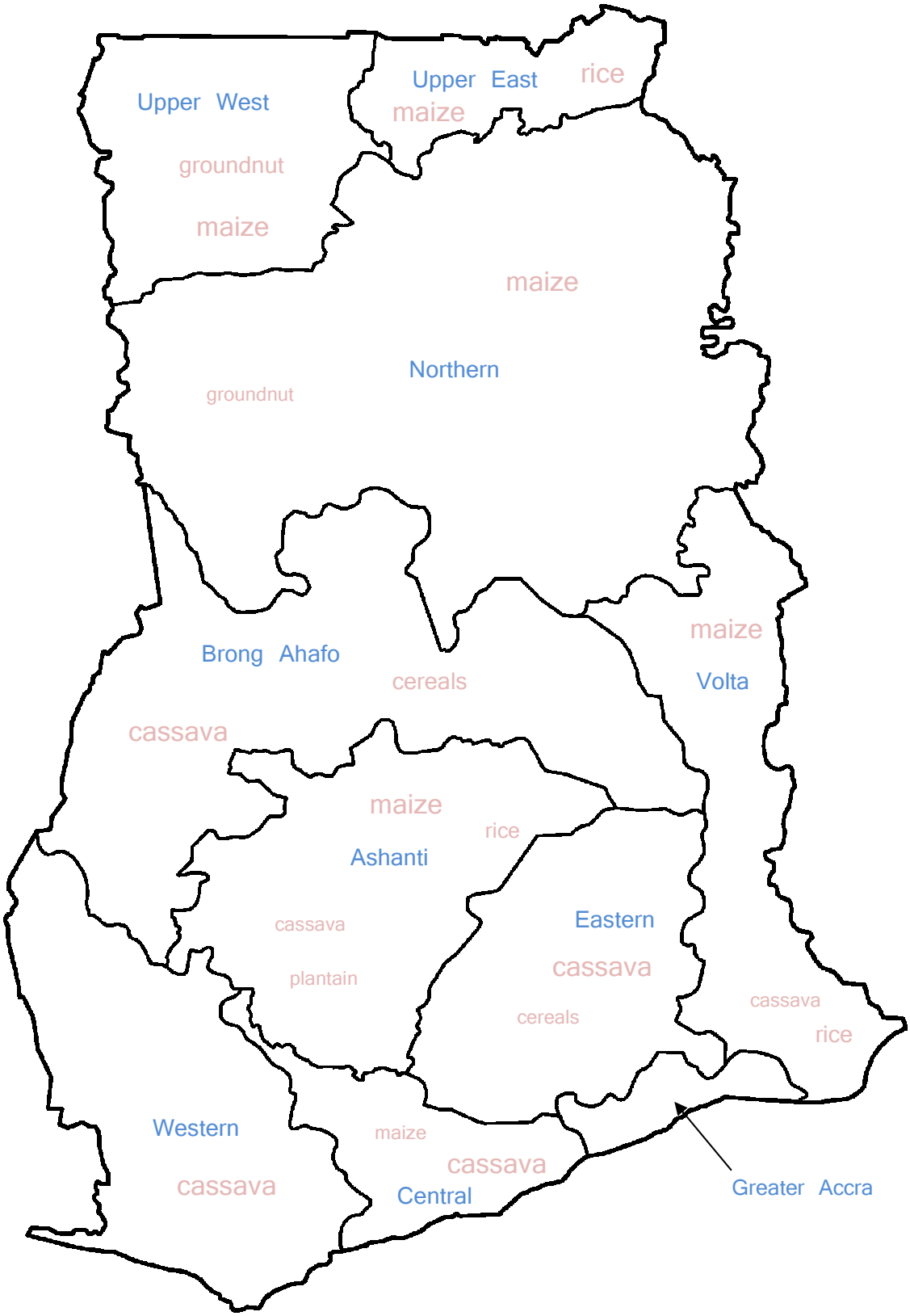
To identify specific crops in the regions in order to find out which crops farmers have stopped cultivating due to bad weather conditions and news crops that have been introduced by farmers because they are more resistant to climate change, the respondent gave a clear picture of their change in production.

The production of specific crops **has been reduced** due to bad weather conditions in the following regions.[19]



[19] The bigger the font size of the product, the more farmers in the region stated that they have stopped the production of the specific product. The position of the product does not implicate the specific area within the region in which the product was stopped producing.

The production of specific crops **has been increased or started** due to bad weather conditions in the following regions.[20]



[20] The bigger the font size of the product, the more farmers in the region stated that they have increased or started the production of the specific product. The position of the product does not implicate the specific area within the region in which the product was started producing.

It can be observed from the figure above that, farmers in Western or Ashanti, have started cultivating specific crops to due to the changing weather while other farmers in the same regions have stopped farming. The unpredicted weather conditions in the spacious regions also vary and can cause this correlation. Another explanation could be the variety of some crops, such as maize. While a specific sort of maize may be climate sensitive, others might be climate-resistant. Nevertheless, bad weather conditions also force farmers to adjust to these circumstances and find solutions to avoid the cultivation of climate-sensitive crops. The reorientation of which crops could be cultivated to secure a profitable production can also be seen as an experiment for farmers and agricultural workers as a process of figuring out which product could be produced in the climate changing environment.

Stating the main reasons for change in production, respondents in all the regions responded as follows:

Table 24

The main reason for change of production is/are... (%)					
		More rains/floods	Less rains	Drought	Total
Region	Ashanti Region	8.7	82.9	8.4	357
	Brong Ahafo Region	2.7	86.7	10.6	226
	Central Region	32.3	61.7	6	201
	Eastern Region	26.7	66	7.33	232
	Northern Region	8.3	87.1	4.6	302
	Upper East Region	12	79.8	8.2	208
	Upper West Region	2.9	84.3	12.9	140
	Volta Region	6.9	87.4	5.8	277
	Western Region	32.5	52.9	14.7	225
Total/Average		14.3	77.4	8.4	2168
Unanswered					455

It is obvious that in the Northern as well as Brong Ahafo, Ashanti and Volta regions the rain becomes less. Respondents in Brong Ahafo (10 percent) and Upper West Region (12.9 percent) are already classifying the missing rain as a drought. The Southern regions, such as Central, Eastern and Western Region, are stating more rains and even floods as main reasons for the change of production.

As Ghana's climate is tropical with a dry as well as rainy season, it seems that those seasonal weather conditions are turning into the extreme and also getting prolonged. Dry seasons become hotter, while during the rainy seasons more heavy rainfalls will be reported with increasing liters per cubic meters which cause floods.

Reports of 2011[21] show that especially in the South of Ghana the rainy season lasted from March until October with storms and heavy rain falls.

The respondents also indicated that 70.8 percent are using fertilizers of natural or synthetic origin which are added to the soil to supply one or more plant nutrients essential to the growth of plants. To ensure a high-yield harvest, 55.8 percent of the farmers and agricultural workers use more

[2121] Mainly news paper coverage

fertilizers because of changes in weather. This fact refers also to the increment of investments to ensure a plentiful harvest or to keep the production on a level which compensates for the losses due to bad weather.

Sales markets are crucial for the farmers in order to distribute their products and ensure the profit hereinafter. The respondents use the following sales markets below:

Table 25

The following places are used to sell the crops/livestock... (%)						
		Local/domestic markets	Export to region/international	Local processing industry	Household use only	Total
Region	Ashanti Region	97	0.6	1	1.4	501
	Brong Ahafo Region	98.8	-	-	1.2	254
	Central Region	87.6	6.7	3.4	2.4	209
	Eastern Region	91.1	7.3	0.8	0.8	248
	Northern Region	96.5	-	0.6	3	340
	Upper East Region	95.7	1.45	-	2.9	208
	Upper West Region	77.8	1.7	-	20.5	176
	Volta Region	97	0.7	0.7	1.7	304
	Western Region	97	0.6	1.5	0.8	262
Total/Average		**86.9**	**4.1**	**5.2**	**3.8**	**2502**
Unanswered						121

It is evident that respondents in most of the regions produce for the local or domestic markets. In the Upper West Region, 20.5 percent stated that they are just producing for their own household use. The correlation of sales markets and climate change is very difficult due to the fact that other factors have to be considered in the analysis as well. As already stated, majority of the farmers and agricultural workers are working on small farms (1-5 acres) and are self-employed without employees. It can be assumed that most of the farmers do not have the capacities to produce for regional or international markets and therefore have chosen the local or domestic markets to sell their products. The assumption that the decreasing quality and quantity of the products due to bad weather conditions is hindering the farmers of selling their products on the regional or international market would lead into the wrong direction and is not valid in this case.

The production for mainly local and domestic markets correlates with the complaint of the respondents about the lack of infrastructure. 47.8 percent of the total respondents highlight that the roads are not good enough in order to deliver the goods to various markets in different areas of their or neighboring regions.

59.7 percent of all respondents also stated that they have insufficient storage facilities in order to store the harvest properly and over a longer period of time. Therefore the products have to be sold in the nearest future.

With all these factors in mind, there is no direct correlation between climate change and sales markets.

5 Income and Food (In)Security

Having businesses or being employed generates the income of all people. It is the foundation of securing the livelihood of all families in Ghana. A possible income loss especially affects mainly the poorest population in a country the most. The recent discussion in the literature highlights that climate change will compound existing poverty. "Its adverse impacts will be most striking in the developing nations because of their geographical and climatic conditions, their high dependence on natural resources, and their limited capacity to adapt to the changing climate. Within these countries, the poorest, who have the least resources and the least capacity to adapt, are the most vulnerable."[22]

As the Intergovernmental Panel on Climate Change highlighted in their reports of 2001, adaptive capacities in African countries is low due to the low GDP per capita, widespread poverty, inequitable land distribution, and low education levels. There is also a lack of comprehensive and sustainable social safety nets, in particular after harvest failures in various countries.

60 percent of the total Ghanaian workforce is earning their living from businesses or employment in the agricultural sector[23]. The peasant farmers and people with more children need to secure their basic human needs. Climate change with all its impact on the production and productivity can also have a negative effect on the well-being of this specific group.

90.9 percent of the total respondents have stated that their income decreased due to the loss of crops or livestock resulting from bad weather conditions. The responses from the regions are as follows:

Table 26

My income decreased due to the loss of crops/livestock resulting from bad weather conditions. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	20.7	75.5	0.8	2.6	0.4	502
	Brong Ahafo Region	31.9	62	2.5	3.3	0.4	276
	Central Region	29.8	58.7	4.8	5.3	1.5	208
	Eastern Region	17	58.3	12.4	11.2	1.2	259
	Northern Region	37.8	54.8	2.6	4.9	-	347
	Upper East Region	16.12	73	6.6	3.8	0.5	211
	Upper West Region	28.41	63.1	7.4	0.6	0.6	176
	Volta Region	27.4	66.8	2	3.2	0.7	310
	Western Region	33.7	56.4	5.5	4.1	0.4	291
Total		27	63.9	4.3	4.3	0.6	2580
Unanswered							43

[22] Intergovernmental Panel on Climate Change (2001): Impacts, Adaptation and Vulnerabilty
[23] International Food Policy Research Institute, www.ifpri.org

With regard to the respondents in relation to their number of children, the following responses were given:

Table 27

My income decreased due to the loss of crops/livestock resulting from bad weather conditions. (related to number of children; % of total)	
Number of children	**"agree" / "strongly agree"**
1-2	89.9
3-5	91.8
6-7	92.4
8 and above	89.6

As indicated before, an income loss has especially negative effects on the livelihood of farmers and agricultural workers if their number of children increases.

Furthermore, the loss of a self-employed farmer without or with employees is striking for their businesses as well. Related to the occupation of the farmers, their responses are as follows:

Table 28

My income decreased due to the loss of crops/livestock resulting from bad weather conditions. (related to occupation; % of total)	
Occupation	**"agree" / "strongly agree"**
Employed	89.1
Self-employed without employees	91.3
Self-employed with employees	91.5

Without neglecting the difficult situation of self-employed farmers without employees, the self-employed farmers with employees have to take even more responsibility for their staff and despite the losses of profit or turn-over, they have to pay also the salaries of their employees which moreover secure the livelihood of their families as well.
Even if it is just relating to the minority of the respondents, it is nevertheless interesting to look at the correlation of the amount of employees and the number of children in order to highlight the magnitude of pressure those farmers face to take their responsibility as being the one who is taking care of his/her own family as well as their employees.[24]

Table 29

How many employees do you have? *in relation* to Number of Children (counts and %)										
No. of children / No. of employees	1-2		3-5		6-7		8 and above		**TOTAL**	
	Count	%	Count	%	Count	%	Count	%	**Count**	**%**
1-5	59	82	143	82.2	68	71.6	60	76	**330**	**78,6**
6-10	10	13.9	19	11	23	24.2	17	21.5	**69**	**16.4**
11 and above	3	4.2	12	6.9	4	4.2	2	2.5	**21**	**5**
TOTAL	**72**	**17.2**	**174**	**41.4**	**95**	**22.6**	**79**	**18.8**	**420**	**100**

To maintain a certain living standard and to compensate the losses of profit and income, the respondents were asked whether they have to look for an additional income (second job) to ensure

[24] It cannot be specified if the respondents consider their children also as employees.

the livelihood of the family, 86.8 percent of the total respondents responded in the affirmative as illustrated below:

Table 30

I need to look for additional sources of income (second job) to ensure the livelihood of my family. (%)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	22.4	71.5	4.2	1.8	0.2	501
	Brong Ahafo Region	21.7	66.7	6	5.6	-	267
	Central Region	35	44.7	3.9	16	0.5	206
	Eastern Region	23.7	52.5	10.5	11.6	1.6	257
	Northern Region	39.7	49.9	7.6	2.6	0.3	343
	Upper East Region	21.9	64.8	9	3.8	0.5	210
	Upper West Region	33.5	47.2	15.9	3.4	-	176
	Volta Region	27.3	67.2	2.6	2.6	0.3	311
	Western Region	26.2	53.8	6.9	12.8	0.3	290
Total		27.5	59.3	6.8	6.1	0.4	2561
Unanswered							62

It is evident that a vast majority of the respondents either has found a second job or is still looking for some additional source of income to increase their monthly salary/profit. While respondents in the Northern, Brong Ahafo, Volta and Ashanti Regions "strongly agree" or "agree" to the statement below the average percentages, respondents in the regions Upper West, Eastern, Central and Western have been above the average.

The previous assumption that self-employed farmers without employees will be more tempted to look for another source of income has been proved not correct. Even if all respondents, regardless of their occupation are in desperate need to find a second job, 88.1 percent of the employed agricultural workers have the highest percentage, followed by self-employed farmers without employees (86.7 percent) and self-employed farmers with employees (86.3 percent).

The most interesting question of the questionnaire is definitely the approximate amount of income per month. This is illustrated in the table below:

Table 31

Please state your income from the agricultural work! (count and %)					
Income Level 1st Job	Count	%	Income Level 2nd Job	Count	%
Up to 100 GHC	629	25	Up to 100 GHC	603	27.9
101-150 GHC	581	23.1	101-150 GHC	522	24.1
151-200 GHC	474	18.8	151-200 GHC	429	19.8
Above 200 GHC	831	33	Above 200 GHC	608	28.1
TOTAL	**2515**	**100**	**TOTAL**	**2162**	**100**

From the above table it can be assumed that not everybody who responded to the questionnaire has an additional job. 353 respondents who did not respond to the question on the second income either have none or did not want to state it. 48.1 percent of the total respondents are earning just up to 150 GHC per month with their first job. Slightly over one third of the total respondents are

earning more than 200 GHC with their first job. Due to the limitation of the category "above 200 GHC", the results of the questionnaire cannot indicate of how much the total maximum of income per month is.

As noted above, the statistics are becoming extremely interesting in correlation to the number of children the respondents have. It is presented in the table below:

Table 32

Income Level (1st and 2nd job) *in relation* to Number of Children (counts and %)										
No. of children / **Income Level 1st Job**	1-2		3-5		6-7		8 and above		**TOTAL**	
	Count	%	Count	%	Count	%	Count	%	**Count**	**%**
Up to 100 GHC	125	26.7	202	22.3	115	23.2	75	23.4	**517**	**23.6**
101-150 GHC	109	23.3	203	22.4	131	26.4	62	19.4	**505**	**23**
151-200 GHC	84	17.9	181	20	95	19.2	55	17.2	**415**	**19**
Above 200 GHC	150	32.1	320	35.3	155	31.3	128	40	**753**	**34.4**
TOTAL	**468**	**21.4**	**906**	**41.4**	**496**	**22.6**	**320**	**14.6**	**2190**	**100**
Additional Income (2nd Job)										
Up to 100 GHC	97	22.7	190	24.6	134	32.3	89	33.6	**510**	**27.1**
101-150 GHC	112	26.2	187	24.3	97	23.4	63	23.8	**459**	**24.4**
151-200 GHC	90	21	161	20.9	74	17.8	41	15.5	**366**	**19.5**
Above 200 GHC	129	30.1	233	30.2	110	26.5	72	27.2	**544**	**29**
TOTAL	**428**	**22.8**	**771**	**41**	**415**	**22.1**	**265**	**14.1**	**1879**	**100**

The data shows that 44.7 percent of the respondents having 3 to 5 children, 49.6 percent of the respondent having 6 to 7 children and 42.8 percent of the respondent having 8 children or more are just earning up to 150 GHC per month. Despite the fact that they still earn more than the minimum wage per day[25] or month, but having a maximum of 5 GHC per day[26] and more than three children to feed, it seems almost impossible to maintain the livelihood and fulfill the basic human needs of their children. Therefore, it is clear that the possibility of having an additional income has to be considered to increase the monthly income. Unfortunately, the statistical data cannot analyze the number of respondents within each income level earn specific additional income in different levels in order to have an imagination of how much in total each respondent is earning as a maximum. This is presented below as follows:

Table 33

Please state your income from the agricultural work (**1st Job**) (%)						
		Up to 100 GHC	101-150 GHC	151-200 GHC	Above 200 GHC	Total
Region	Ashanti Region	25.4	19.4	13.2	42	500
	Brong Ahafo Region	18.9	16.7	15.9	48.5	264
	Central Region	24.2	24.6	25.6	25.6	207
	Eastern Region	24.3	18	23.9	33.7	255
	Northern Region	24.4	29.7	17.2	28.8	344
	Upper East Region	27.6	31.2	19.6	21.6	199
	Upper West Region	30.3	22.4	18.2	29.1	165
	Volta Region	23.4	27.1	16.9	32.5	295

[25] Minimum wage in Ghana is 4.48 GHC per day (date: February 2012)
[26] Average of 30 days a month

	Western Region	29.1	21.6	25.9	23.4	282
Total						2511
Unanswered						112

Table 34

Please state your income from the agricultural work (**2nd Job**) (%)						
		Up to 100 GHC	101-150 GHC	151-200 GHC	Above 200 GHC	Total
Region	Ashanti Region	15.4	28.9	21.4	34.4	454
	Brong Ahafo Region	37.6	19.7	13.3	29.5	173
	Central Region	22.7	18.2	19.9	39.2	176
	Eastern Region	33.3	17.2	22.1	27.5	204
	Northern Region	25.4	32.4	22.3	19.9	327
	Upper East Region	36.3	25.1	22.9	15.6	179
	Upper West Region	35.7	16.4	15.8	32.2	171
	Volta Region	31.4	19.1	19.9	29.6	277
	Western Region	32.2	29.1	15.6	23.1	199
Total						2160
Unanswered						463

The analysis of the income by regions shows that the income level in the Northern regions, especially Upper East and Northern Region, is lower than in the rest of the country. Respondents in the Brong Ahafo region (48.5 percent) and Ashanti Region (42 percent) stated that their income is above 200 GHC. With this in mind, it has to be acknowledged that the costs of living are also higher in the Southern part of Ghana compared to the Northern regions.

Interestingly looking at income levels in relation to the occupation of the respondents, the following pertains:

Table 35

Income Level (1st and 2nd job) *in relation* to Occupation (counts and %)								
Occupation / **Income Level 1st Job**	Employed		Self-employed without employees		Self-employed with employees		**TOTAL**	
	Count	%	Count	%	Count	%	**Count**	**%**
Up to 100 GHC	100	20	456	27.5	33	12.5	**589**	**24.3**
101-150 GHC	91	18.	407	24.6	68	25.7	**566**	**23.4**
151-200 GHC	97	19.4	319	19.3	44	16.6	**460**	**19**
Above 200 GHC	213	42.5	474	28.6	120	45.3	**807**	**33.3**
TOTAL	**501**	**20.7**	**1656**	**68.4**	**265**	**10.9**	**2422**	**100**
Additional Income (2nd Job)								
Up to 100 GHC	89	18.7	443	31.7	56	26.4	**588**	**28.2**
101-150 GHC	79	16.6	369	26.4	40	18.9	**488**	**23.4**
151-200 GHC	103	21.6	276	19.8	38	17.9	**417**	**20**
Above 200 GHC	206	43.2	309	22.1	78	36.8	**593**	**28.4**
TOTAL	**477**	**22.9**	**1397**	**67**	**212**	**10.2**	**2086**	**100**

A total of 52.1 percent of the respondents who are self-employed without employees has only up to 150 GHC per month to pay their living expenses. What was quiet striking, is the fact that 38.2 percent of the self-employed farmers with employees stated that their income is also only up to 150

GHC per month. It is not clear if the question was well understood by the respondents. Income could have been defined as profit, personal "salary" to cover the expenses of the family or turn-over of the business. The questionnaire actually meant to ask for the personal "salary" to cover the expenses of the family. Nevertheless, if this definition also was in mind of the respondents while answering the question it is striking that 38.2 percent of those who have a farm with employees just took a small amount of money home. The question of the cost-benefit-analysis is crucial in this regard. It can be assumed that the farm is a family business as well and so profit will be shared. In addition, the farm might be maintained and managed by employees, but the owner has a main profession outside the agricultural sector.

Due to the relatively low income of a substantial amount of farmers and agricultural workers, 82.3 percent of the total respondents have highlighted that family members had to look for a job to support the family. It is not evident which kind of family members are supporting the family, e.g. spouse or children (at which age). The correlation of members of the family who took up a job and the number of children as well as the occupation is almost equal to the total average percentage with regard to that statement. Therefore, no striking evidences can be selected from this comparison.
The regional analysis concerning this statement shows that especially in the Upper East (85.6 percent), Northern (85.5 percent), Volta Region (89.1 percent) and Ashanti Region (92.3 percent) more respondents declared that family members had to look for jobs as well to support the family.

The assessment of the statement "My income from the agricultural sector is enough to pay for the living expenses of the family" is validating the reduced income of the majority of the farmers and agricultural workers in Ghana. 72.8 percent of the total respondents "strongly disagree" or "disagree" with the statement and give evidence that the source of income is not enough to pay the monthly costs of living only from the salary or profit which is coming in regularly.

Table 36

My income from the agricultural sector is enough to pay for the living expenses of the family. *in relation* to Number of Children (counts and %)										
No. of children / **Possible Answers of statement**	1-2		3-5		6-7		8 and above		**TOTAL**	
	Count	%	Count	%	Count	%	Count	%	**Count**	**%**
Strongly agree	21	4.4	41	4.5	26	5.1	19	5.8	**107**	**4.8**
Agree	47	9.8	111	12.2	54	10.6	37	11.4	**249**	**11.2**
Not sure	52	10.8	80	8.8	58	11.4	42	12.9	**232**	**10.4**
Disagree	238	49.4	462	50.6	231	45.5	162	49.7	**1093**	**49**
Strongly disagree	124	25.7	220	24.1	139	27.4	66	20.3	**549**	**24.6**
TOTAL	**482**	**21.6**	**914**	**41**	**508**	**22.8**	**326**	**14.6**	**2230**	**100**

The statement in correlation with the number of children does not show significant differences between families with a low or high amount of children. It can be assumed that the difficult situation of being not able to pay for all living expenses can be applied to all the majority of the farmers who fall within these categories. The same findings are valid for the statement in correlation with the occupations of the respondents. Employed agricultural workers (76.2 percent) as well as self-employed farmers with no employees (73.4 percent) approximately assessed the statement as same as the total respondents nationwide. Only the self-employed farmers with employees (64.6 percent) are slightly below the average percentage of the total respondents.

But how much does it need for each family or individual to secure the livelihood? How can a living standard be defined? And when are the basic human needs fulfilled?

Standard of living refers to the level of wealth, happiness, comfort, material goods and necessities available to a certain socioeconomic class in a certain geographic area. The standard of living includes factors such as income, quality and availability of employment, class disparity, poverty rate, quality and affordability of housing, hours of work required to purchase necessities, gross domestic product, inflation rate, number of vacation days per year, affordable (or free) access to quality healthcare, quality and availability of education, life expectancy, incidence of disease, cost of goods and services, infrastructure, national economic growth, economic and political stability, political and religious freedom, environmental quality, climate and safety. The standard of living is closely related to quality of life.[27]

Standard of living is generally measured by standards such as real (i.e. inflation adjusted) income per person and poverty rate. Other measures such as access and quality of health care, income growth inequality and educational standards are also used. Examples are access to certain goods (such as number of refrigerators per 1000 people), or measures of health such as life expectancy. It is the ease by which people living in a time or place are able to satisfy their needs and/or wants.

The idea of a 'standard' may be contrasted with the quality of life, which takes into account not only the material standard of living, but also other more intangible aspects that make up human life, such as leisure, safety, cultural resources, social life, physical health, environmental quality issues etc. More complex means of measuring well-being must be employed to make such judgements, and these are very often political, thus controversial. Even between two nations or societies that have similar material standards of living, quality of life factors may in fact make one of these places more attractive to a given individual or group.

The Living Standard is subsequently subjective and each individual may have a certain threshold of what the standard has to definitely include. The important aspect in this discussion is the fulfillment of basic human needs, such as food, shelter etc.

Moreover, every person living in poverty would like to overcome their difficult situation and increase their basic living standard. Especially with the influence of the media and the information on living conditions in other countries, the desire to have a better life is just a plausible consequence. Unfortunately, the rising living expenses in Ghana after the oil find could worsen the already desperate situation of most of the peasant farmers who have to live with little income. While the living expenses as well as the living standard in the North of Ghana are still low, the farmers in the Southern regions (especially at the coast) have to cope with the increasing costs for rent, electricity, water and food.

74.6 percent of the total respondents agreed to the statement that the living standard of their families have decreased in the last five years.
Interestingly, it can be illustrated that the percentage of respondents who agreed to the statement increases with the number of children within the family; except the category “8 children and above” with 72.8 percent – below the average percentage of the total respondents.

[27] Standard of Living Definition, Investopedia.com

Table 37

In the last 5 years, the family's living standard decreased. *in relation* to Number of Children (counts and %)										
No. of children / **Possible Answers of statement**	1-2		3-5		6-7		8 and above		**TOTAL**	
	Count	%	Count	%	Count	%	Count	%	**Count**	**%**
Strongly agree	76	15.8	155	16.9	108	21.4	71	21.9	**410**	**18.4**
Agree	276	57.4	540	58.9	293	57.9	165	50.9	**1274**	**57.2**

Asking for the areas in which the living standard decreased so far, all respondents stated as follows:

Table 38

The living standard decreased in the following areas... (% of total; multiple choice)		
Areas – Living standard	**Count**	**% of total respondents**
Food/clothes	1196	45.6
Education of children	1678	64
Housing and electricity/water	568	21.7
Health care	819	31.2
Transportation	386	14.7

It is striking that 64 percent of the total respondents stated that the living standard decreased in the area "education of children". It can be assumed that with less income and the unsecure financial situation the parents have difficulties in paying the higher education for their children, e.g. Junior High, Senior High or tertiary education. Ghana has introduced the Free Compulsory Universal Basic Education in 1996. Children up to the 6th grade can go to public school free of charge. After their exams, the continuation of education will be charged. For example, Togbe Afede XIV, President of the Volta Regional House of Chiefs, stated publicly that the tuition fees for the public Senior High Schools would be too high. He presented a bill for the first term 2011/2012 which claimed 490.40 GHC for each boarder and 219.50 GHC for day students.[28] Even if the school fees of public school vary from region to region as well as rural and urban areas, it would mean that the recipient of the bill in the Volta Region should pay approximately 73 GHC per child per month to ensure a higher education. With the statistic on the income level in mind, it is financially impossible for the majority of the farmers and agricultural workers to allow their child or children to have a higher education. Ghana has indeed made a major impact with the introduction of the Free Compulsory Universal Education. Nevertheless, having free education up to the 6th grade does not guarantee the possibility of having well-educated school-leavers. Baring also the quality of education and the lacking facilities of the schools in mind, 12 year old school leavers have to cope with the fact of supporting their families to generate income or stay at home waiting until they are old enough to get a job. Moreover, while leaving the school at the age of 12 may implicate a minimum knowledge of reading and writing (functional illiteracy), but the minimum practice of the learnt skills in future may worsen the ability to read and write at an older age.

45.6 percent of the total respondent stated that the living standard decreased with regard to the category "food and clothes". Food prices on the market increased over the years and little income cannot compensate the increment. With regards to food security, 66.9 percent of the respondents have stated that the access to food is mainly secured by their own crops. 36.1 percent of the total

[28] Vibe Ghana: Senior High School Fees are too high, http://vibeghana.com/2012/01/14/senior-high-school-fees-are-too-high-togbe-afede/

respondents have 2 meals per day; 62.7 percent having 3 meals a day. Nevertheless, access to food does not necessarily include the fact that the nutrition is adequate.

31.2 percent of the total respondents have indicated that the living standard with regard to health care decreased. It can be assumed that respondent with little income (up to 150 GHC per month) and a higher amount of children cannot afford to pay their fees voluntarily to the National Health Insurance Scheme. It would be difficult for the self-employed farmers without employees to spend the money. The survey did not cover the question if the employed agricultural workers are formally or informally employed. Formally employed workers and their employers are legally obliged to make financial contributions to the Social Security Schemes. For all those respondents without a health care insurance, they are requested to pay high fees to the doctors to get any treatment and medication. Again, with little income it is difficult to raise the money in order to get treatment.

Climate change and its resulting losses in productivity cause a fatal downward spiral for farmers and agricultural workers in Ghana. The findings of the survey indicate that the most vulnerable workforce in a country becomes even more susceptible due to external influences which cannot be controlled. The individual adaptation strategy comprises a change of cultivating certain climate-sensitive crops to climate-resistant ones as well as finding other sources of income, e.g. second job or employment for family members. Weather predictions in the near future cannot be made. Forecasts even indicate that the weather conditions will worsen in the next years. The crucial point is therefore, if the farmers and agricultural workers in Ghana should be left alone with their economic and social challenges or if the state has to find mitigation and adaptation strategies to contribute to a reduction of poverty instead of ignoring the vulnerability of the poor which leads to a backlash in the fight against poverty.

6 Social Security and Protection

The respondents to the multiple answer statement[29] responded to the seeking to find out about their involvement in some formal social security scheme, with particular reference to a health care insurance, a pension fund, and a savings account. 65.7, 3.4 and 11.4 percent pay into a health insurance, a pension fund and a savings account respectively. The National Health Insurance Scheme is generally the most accessible to most respondents.

Table 39

I pay into…		
	Count	**% of total respondents**
A health care insurance	1723	65.7
A pension fund	88	3.4
A savings account	299	11.4

The social impact in the old age to be not able to receive pension from the state is enormous with regard to the statistic. Keeping in mind the lower income of farmers and agricultural workers in the country, it can be assumed that the financial means of the majority of the people is not enough to make provisions for one's old age.

It is positive to highlight that more than half of the farmers nation-wide have healthcare insurance.

The table below shows that Upper East region has the largest proportion of respondents paying into some social protection scheme. 82.1% of those paying into health insurance scheme are from the Upper East, followed by Northern region (76.8%). Upper West region accounts for the smallest proportion of those paying into the health care insurance (41.5%).

The respondents from Eastern and Central Region are those with the highest percentage with regard to the savings accounts.

Table 40

I pay into... (% by regions)				
		Health care insurance	Pension fund	savings account
Region	Ashanti Region	70.3	4.2	9.5
	Brong Ahafo Region	49.8	1.8	7.53
	Central Region	71	6	16.1
	Eastern Region	47.2	5.7	29.7
	Northern Region	76.8	1.7	5.5
	Upper East Region	82.1	3.3	9.9
	Upper West Region	41.5	2.8	6.8
	Volta Region	69.5	3.4	12.2
	Western Region	69.4	1.7	8.6
Total		65.7	3.4	11.4

29 To calculate the percentages to the multiple answers of the statement, the total number of respondents of the study has been taken as a basis

A gender breakdown of the data shows that the proportion of females paying into a health insurance is as high as 67.2 percent while pension fund and savings account have 1.9 and 9.4 percent of female respondents respectively. Relatively, less females are paying into pension fund because they are less involved in formal employment.

Table 41

I pay into... (%, sex)		
	Male	**Female**
Health care insurance	65	67.2
Pension fund	3.8	1.9
Savings account	12.2	9.4

Out of 2491 respondents responding to the question about ablitly to contribute to social security scheme, 24.1 and 44.5 percent "strongly agree" and "agree" respectively to the view that he/she "cannot afford to pay for social security with my income". Only 3.8 % strongly disagree that one cannot afford to pay for social security with income.

Table 42

I cannot afford to pay for social security with my income.		
	Count	**% of total respondents**
Strongly agree	601	24.1
Agree	1109	44.5
Not sure	185	7.4
Disagree	501	20.1
Strongly Disagree	95	3.8
TOTAL	2491	100

An examination of the regional data in the Table below shows that the largest proportion of those who strongly agree to the respondents' inability to contribute to social security are in the Northern and Brong Ahafo Region. The Ashanti Region is divided by a high percentage of respondents (61.6 percent) who believe that their income is insufficient to pay into social security schemes, and those (34.8 percent) who believe that financial means are available to bear the costs of such social security. Thus the inability to pay into social security given the present income levels is prevalent in all regions of the country, an indication largely of the low level of incomes, high cost of living and the high level of informal employment.

Table 43

I cannot afford to pay for social security with my income. (% by regions)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	24.4	37.2	3.6	30.4	4.4	500
	Brong Ahafo Region	30.4	46.5	4	15.4	3.7	273
	Central Region	16.3	50.6	7.6	22.1	3.5	172
	Eastern Region	19.9	51.4	4.3	19.5	5.1	257
	Northern Region	32.6	43.4	14.4	6.5	3.2	341
	Upper East Region	8	47.3	10	28.9	6	201
	Upper West Region	17.1	43.4	14.4	6.5	3.2	176
	Volta Region	27.4	41.2	3.3	24.6	3.6	277
	Western Region	28.4	47.4	5.3	16.5	2.5	285
Total							2482

From the table below it is clear that 2436 of those who responded to the questions in relation to the ability to contribute to social security clearly indicated their sex, thus allowing some gender disaggregation of the data. The women have stated with 77.2 percent that they cannot afford to pay for social security; while just 65.3 percent of the men have agreed or strongly agreed to that statement. This is a reflection of the relatively more vulnerable position of women in the world of work, in relation to employment, a fact corroborated by the relatively higher level of women in the precarious informal economy.

Table 44

I cannot afford to pay for social security with my income. (%, sex)		
	Male	**Female**
Strongly agree	22.4	28.9
Agree	42.9	48.3
Not sure	7.9	6
Disagree	22.3	14.9
Strongly Disagree	4.6	1.9

7 Support by the state

The support of the state is very important for the vulnerable people. Ghana has experienced extensive agricultural programmes initiated by government in the past. But farmers and agricultural workers criticize the government to neglect the problems within the agricultural sector since some years. The support by the state is still ongoing; but is it enough to help 60 percent of the workforce in the country?

The survey asked firstly if the respondents believe that the politicians of the country refuse to think about the situation of the farmers. An overwhelming majority of 74.2 percent was “strongly agreeing” or “agreeing” to the statement. This shows the perception of farmers and agricultural workers of being left behind. Honestly speaking, the question has to be also asked of how much is sufficient? How much support should the state provide to “help” without facing the situation that the farmers rely too much on their support?

Nevertheless, it is interesting to look at the answers given by the respondents in certain regions to get a clearer picture.

Table 45

I believe that the politicians of the country do not think about the situation of the farmers. (% by regions)							
		Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree	Total
Region	Ashanti Region	32	40.4	11.1	13.7	2.8	312
	Brong Ahafo Region	55.6	28.9	1.8	8.7	5.1	277
	Central Region	36.5	27.5	14.2	11.8	10	211
	Eastern Region	34.2	40	1.2	15.4	9.2	260
	Northern Region	51.5	18	7.6	12.2	10.8	344
	Upper East Region	30	38.1	8.1	20	3.8	210
	Upper West Region	45.5	22.2	9.1	19.3	4	176
	Volta Region	38.5	42.3	3.8	12.8	2.6	312
	Western Region	48.3	32.7	3.7	13.3	2	294
Total							2587

Especially the highest number of respondents in the Brong Ahafo Region, Northern Region, Upper West Region, Volta and Western Region believe that the politicians do not care about them. For the poorest amongst these professionals who work in a risky business, this mindset or opinion must be disappointing due to the fact that they know that they cannot rely fully on the support of politicians. The danger with this mindset is also the increment of political apathy which can be a result of the feeling to be left behind.

Nevertheless, this opinion contradicts with the statement “We have experienced good support from the state in the past” which has been answered by 43.2 percent of the respondent with “strongly agree” and “agree”. 44.7 percent disagreed or strongly disagreed with the statement. It can be assumed that the support of the state was somehow given; but did it really tackle the problem? Have been the programmes designed to mitigate the effects of climate change? The question of what kind of support is sufficient is again the biggest challenge the state should address.

Interestingly, the question of what kind of support they got from the state in the past and present was answered as the following:

Table 46

What kind of support did/do you get from the state in the past/now? (%)		
	Past	**Present**
Fertilizer Subsidies	69.3	75
Merchanized subsidies	8.7	6.4
Micro-financing/ investment support	12.3	9.3
State procurement of agricultural products	4.2	5.2
Support to rural households (state benefits)	5.6	4.1
TOTAL of respondents	2423	2202

It seems that the only common type of state support is fertilizer subsidies. Even if fewer respondents answered the question about the current type of support it is indicated that the fertilizer subsidies have increased. All other instruments of support are present but seem to be of lower priority. Programmes in this respect could be reviewed and updated to meet the demands of the farmers and agricultural workers, even if that means to increase the allocated budget to these programmes. The question is persisting if fertilizer subsidies are the only method to address the decrement of the harvest. Can other instruments help to make the effects of the changing weather less pronounced? The low percentage of the state procurement of agricultural products is also alarming. The state should buy more agricultural products locally to execute their initiated programmes, such as the School Feeding Program. Even if small-scale farming is common in Ghana, there should be a mechanism to collect the products even from peasant farmers in order to cater for school children in a certain area. Through this, it could be avoided to either import ingredients from abroad or engage just large-scale farmers.

8 Expectations of the farmers and agricultural workers

Due to the fact, that the answers of the respondents from different regions or sexes are similar and do not show any significant differences of opinions, the following results are representing the respondents of all regions.

Table 47

The state must cater for floods, drought and other natural disasters.		
	Count	**% of total respondents**
Strongly agree	1295	50.3
Agree	1131	43.9
Not sure	45	1.7
Disagree	93	3.6
Strongly Disagree	13	0.5
TOTAL	2577	100

Honestly speaking, a critic of this statement could argue why a state should cater for natural disasters if they occur unexpectedly and are a phenomenon of Mother Nature. This is true for the fact that natural disasters may occur continuously in the same regions of Ghana. One example could be the floods in specific districts of the country which occur often during the raining season. Some communities in Ghana settle in regions which are known for floods and they still make the decision to build up their houses in those areas. This means, they are deliberately take a risk. But for droughts and heavy rainfalls which are caused by changes of weather, it is actually unforeseeable and the state should consider programmes which can mitigate the impact (e.g. loss of income) of such natural disasters. The reason for this mitigation is the vulnerability of the poor in the country. With the great loss of harvests, as seen in the earlier chapters, peasant farmers are even more affected and this could lead further to the increment of poverty in Ghana. This aspect should be discussed by decision-makers of what can be done to secure their livelihoods. Nevertheless, it needs to be clear that such interventions by the state have to follow clear criteria and should be planned wisely.

Table 48

The state should care about agricultural workers the most, because we are the biggest labour force of the country.		
	Count	**% of total respondents**
Strongly agree	1673	64.6
Agree	837	32.3
Not sure	42	1.6
Disagree	22	0.8
Strongly Disagree	15	0.6
TOTAL	2589	100

Approximately 60 percent of the labour force in the country is working in the agricultural sector. This indicates also that the poverty trap in this economic sector can be enormous. Therefore, the state cannot neglect this workforce and should have a strategy of how to remedy shortcomings. It would be a good approach by the state to transform the Ghanaian economy in order to create new and better employment opportunities in other sectors to reduce the workforce in the agricultural sector. This implies also to equip the farmers and agricultural workers with new skills in order to make them “fit” for meeting the requirements of jobs in other sectors.

Table 49

The state should take steps to implement projects and measurement to minimize the effects of climate change.		
	Count	**% of total respondents**
Strongly agree	1415	54.6
Agree	1087	42
Not sure	41	1.6
Disagree	38	1.5
Strongly Disagree	10	0.4
TOTAL	2591	100

The vast majority of the respondents believe that the state should implement projects and measurements to minimize effects of climate change. Therefore, a mitigation and adaptation strategy is needed. For a developing country at the stage of wanting to develop as well, it is difficult to find alternative ways of, e.g., industrialize than through using classical energy resources like coal or petrol. The initial costs for renewable energy resources are extremely high, but will pay off in the long run. A classical industrialization which Europe, America and other industrialized countries were implementing in the 19th century caused climate change. It is unwise to even choose this path for developing an economy in Ghana due to the fact that this will favour more climate change and therefore is counterproductive. It is necessary that projects and measurements will be implemented right now to react to the current problems caused by climate change. For the future economic development it is required to come up with a strategy of how this could be done without potentiating the problem of climate change.

Table 50

Everybody should do their best to reduce climate change.		
	Count	**% of total respondents**
Strongly agree	1247	48.2
Agree	1186	45.8
Not sure	70	2.7
Disagree	73	2.8
Strongly Disagree	11	0.4
TOTAL	2587	100

94 percent of the respondents believe that not only the state should react and fight climate change. All people in Ghana should be aware of climate change so that the population as a whole could do their best to mitigate the effects. That requires intensive education on the topic and effective ways of saving the environment. Such enlightenment could start in the basic school and should be communicated throughout the school career and at work places, hoping that the mindset of the people and their attitude will change accordingly.

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