



Institute of Water and Energy Sciences (Including Climate Change)

***ASSESSMENT OF THE ROLE OF MICROFINANCE INSTITUTIONS IN IMPROVING SMALLHOLDER FARMERS' PERCEPTION AND THEIR ADAPTATION CAPACITIES TO CLIMATE CHANGE IN LOUMBILA IN BURKINA FASO***

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## DECLARATION

I Boffoue Kouadio Pierre Stephane, hereby declare that this thesis represents my personal work, realized to the best of my knowledge. I also declare that all information, material and results from other works presented here, have been fully cited and referenced in accordance with the academic rules and ethics.

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## CERTIFICATION

This thesis has been submitted with my approval as the supervisor

Signed



Date: 02/09/2017

**Professor Abdelkrim Khaldi**

## ABSTRACT

Burkina Faso, a low income and landlocked country located in West Africa in the Sahel with limited natural resources, will face challenging changes in temperature, rainfall, storms and extreme weather events which will certainly affect the low agricultural productivity and food security that keeps constraining the country's economic growth. In this vein, Microfinance could be of great help to foster farmers' adaptation capacities to Climate change. Therefore, this Master thesis aimed at assessing the role of Microfinance in improving smallholder farmers' adaptation strategies to Climate Change in Loumbila in Burkina Faso. The specific objectives which were pursued were (i) to assess the awareness of farmers about Climate Change, (ii) to study the challenges encountered by farmers to adapt to CC and (iii) to find out the possible services Microfinance could provide to farmers in order to improve their adaptive capacities. A sample of 52 smallholder farmers aged between 25 and 55 years participated in the study. A questionnaire translated into both French and Mooré (local language) included matters relating to farmers' perception or awareness about Climate change, Farmers' challenges about adaptation to CC and Microfinance role in improving farmers' adaptation capacities were used in the interviews. The nature, objective of the research and the contents of the questionnaire were explained to farmers. Face to face and meeting interviews with farmers were used to fill the questionnaire. The collected data were analysed with Excel. Analysis of the results showed there is still a need to raise awareness of farmers about CC in order to adapt to it, need to be provided by Microfinance green funds, agricultural inputs, flexibility in loan contracts and climate insurance.

**Key words: Microfinance, farmers, Climate Change, adaptation.**

## RESUME

Burkina Faso un pays enclavé à faible revenu situé en Afrique de l'Ouest dans le Sahel avec des ressources naturelles limitées sera confronté à des défis en termes de variations de température, de pluviométrie qui affecteront certainement sa faible productivité agricole et la sécurité alimentaire qui contraignent sa croissance économique. Dans cet élan, les Microfinances pourraient être d'une grande aide pour renforcer les capacités adaptatives des agriculteurs. De ce fait, ce travail de recherche de Master avait pour objectif principal d'évaluer le rôle des Microfinances dans l'amélioration des capacités d'adaptation au Changement Climatique des agriculteurs de petites exploitations à Loumbila au Burkina Faso. Les trois objectifs spécifiques visés étaient (i) l'évaluation du niveau de conscience ou connaissance du Changement Climatique des agriculteurs, (ii) étudier les obstacles rencontrés par ceux-ci pour s'adapter aux effets du Changement Climatique et (iii) déterminer les services possibles que les Microfinances pourraient offrir aux agriculteurs pour améliorer leurs capacités d'adaptation au Changement Climatique. Un échantillon de 52 agriculteurs de petites exploitations dont l'âge varie entre 25 et 55 ans ont participé à l'étude. Un questionnaire traduit en langues Française et Mooré (langue locale) comprenant les questions relatives à la perception des agriculteurs sur le Changement climatique, les difficultés agricoles relatives à leurs capacités d'adaptation au changement Climatique et le rôle que les Microfinances pourraient jouer dans l'amélioration de leur capacités d'adaptation, a été utilisé pour les interviews. La nature et l'objectif de la recherche ainsi que le contenu du questionnaire ont été expliqués aux répondants (agriculteurs). Les méthodes de face à face et rencontre avec les agriculteurs ont été utilisées pour remplir le questionnaire. Les données collectées ont été analysées avec Microsoft Excel. Les résultats ont montré qu'il existe un besoin d'informer les agriculteurs sur le Changement Climatique et que ceux-ci, dans le but de mieux s'adapter et faire face au Changement Climatique, ont besoin que les Microfinances mettent à leur dispositions un fond vert, intrants agricoles, une flexibilité dans les contrats de prêts et qu'une assurance climatique.

Mots clés: Microfinance, agriculteurs, Changement Climatique, adaptation.

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## LIST OF ABBREVIATION

APIPAC	Association des Professionnels de l'Irrigation Privée et des Activités Connexes
AU	Africa Union
CC	Climate Change
CNSS	Caisse Nationale de Sécurité Sociale
ECOWAS	Economic Community of West African States
GDP	Gross Domestic Product
GFDRR	Global Facility for Disaster Reduction and Recovery
IFAD	International Fund for agricultural Development
IMF	International Monetary Fund
INSD	Institut national de la Statistique et de la Demographie
IPCC	Intergovernmental Panel on Climate Change
MFI	MicroFinance Institutions
NAPA	National Adaptation programmes of Action
NGO	Non Governmental Organization
SSA	Subsaharan Africa
RCPB	Reseau des Caisses Populaires du Burkina
UNFCCC	United Nations Framework Convention on Climate Change
UNITAR	United Nations Institute for training and research
UNEP	United Nations Environment Programme
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
USAID	United States Agency for International Development

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## CHAPTER ONE: INTRODUCTION

### 1.1 Research Background

Climate Change is known as the greatest challenge our world is facing today. CC is already affecting life of people and will continue to do so for generations to come. Significant changes and impacts are being observed across the world such as rising temperatures including rising sea levels, less predictable weather and more extreme events such as droughts, floods and storms in natural ecosystems on land and at sea, on farms, and in cities and suburb. However, those observed changes are not happening uniformly. Some areas may actually get a bit cooler for a while. Similarly for rainfall, some parts of the planet will get drier, while others will get more precipitation in more extreme events. Africa's countries which are poorest in the world and the least contributing to GreenHouse Gases emissions responsible for causing CC are the most vulnerable (UNESCO, 2013). According to Boko et Al. (2007), Africa will be the hardest hit region by CC and variability because of its heavy dependence on rain-fed agriculture and its low adaptive capacity due to extreme poverty, poor infrastructure and insufficient safety nets. Like other regions, Africa is experiencing the impacts of human induced by CC. Following are some facts already observed across Africa:

In East Africa temperatures have risen by an average of 1.3°C since 1960. Rain patterns have altered and droughts and floods are becoming more frequent. Since 1912, Mt Kilimanjaro's ice fields have decreased in total area by about 80 per cent (Union, 2012).

In North Africa significant warming has occurred during the summer while winters are becoming drier. Sahelian Sudan experienced a 25 per cent decrease in rainfall during the last quarter of 20th century (Union, 2012).

In Southern Africa decadal warming of 0.1 to 0.3°C occurred between 1961 and 2000, while the duration of the dry season lengthened between 1961 and 2005 (Union, 2012).

West Africa saw substantial reductions in rainfall during the latter half of the 20th century, including prolonged droughts in the 1970s and 1980s, and greater rainfall variability (Union, 2012).

One of the key sectors which is agriculture whose subsaharian african (SSA) countries' economy depend on is expected to be highly threatened by CC. In deed, food security in SSA countries is likely to be severely compromised by CC and climate variability. Many SSA countries such as Senegal, Kenya, Niger and Burkina are already facing semi-arid conditions that make agriculture challenging and CC will be likely to reduce the length of growing season as well as force large regions of marginal agriculture out of production. Projected reductions in yield in some countries could be as much as 50% by 2020, and crop net revenues could fall by as much as 90% by 2100, with small-scale farmers being the most affected (Corner, 2011). Several authors have demonstrated that climate change is very likely to lead to a reduction in yields of major cereal crops in (SSA), (Lobell et al., 2008; Liu et al., 2008; Walker and Schulze, 2008; Thornton et al., 2009a; Lobell et al., 2011; Roudier et al., 2011). This projection is confirmed by the Intergovernmental Panel on Climate Change (IPCC) estimation over SSA with an expected reduction in crop yield by 8% by 2050 as a result of climate change (Porter et al., 2014).

Particularly in Western Africa Region, It is increasingly becoming evident that the effects of climate change are beginning to be observed in West Africa. Burkina Faso is not spared (is no exception). Droughts, floods, migration, crops damage and deaths as a result are becoming more common. Furthermore, recent studies have shown a decline in precipitations over West Africa since 1960s, ranging from 20-40% between the period of 1960 to 1990 (IPCC, 2007; Sissoko et al., 2010). Meanwhile, an increase in temperature has been observed since the 1970s, ranging between 0.2 °C and 0.8 °C (Sarr, 2011). In parts of Western Africa, predictions indicate that by 2020, due to both climate and non-climate stressors, there is a potential 50 percent reduction in yields from rain-fed agriculture if additional adaptation measures are not taken (USAID, 2011).

## 1.2 Key definition

### ➤ CARBON DIOXIDE (CO<sub>2</sub>)

The chemical compound carbon dioxide (also known by its shorthand CO<sub>2</sub>) is the primary greenhouse gas and driver of climate change. It's an integral part of life cycles on earth, produced through animal respiration (including human respiration) and absorbed by plants to fuel their growth, to name just two ways. Human activities are drastically altering the carbon cycle in many ways. Two of the most impactful are: one, by burning fossil fuels and adding more carbon dioxide into the atmosphere; and two, by affecting the ability of natural sinks (like forests) to remove carbon dioxide from the atmosphere (The Climate Reality Project, 2017).

### ➤ EMISSIONS

In the climate change space, emissions refer to greenhouse gases released into the air that are produced by numerous activities, including burning fossil fuels, industrial agriculture, and melting permafrost, to name a few. These gases cause heat to be trapped in the atmosphere, slowly increasing the Earth's temperature over time.

### ➤ WEATHER VS CLIMATE

It's all about timing when it comes to differentiating weather and climate. Weather refers to atmospheric conditions in the short term, including changes in temperature, humidity, precipitation, cloudiness, brightness, wind, and visibility. While the weather is always changing, especially over the short term, climate is the average of weather patterns over a longer period of time (usually 30 or more years).

### ➤ GLOBAL WARMING VS CLIMATE CHANGE

Global warming is an increase in the Earth's average surface temperature from human-made greenhouse gas emissions. On the other hand, climate change refers to the long-term changes in the Earth's climate, or a region on Earth, and includes more than just the average surface temperature.

➤ FOSSIL FUELS

Fossil fuels are sources of non-renewable energy, formed from the remains of living organisms that were buried millions of years ago. Burning fossil fuels like coal and oil to produce energy is where the majority of greenhouse gases originate.

➤ GLOBAL AVERAGE TEMPERATURE

Global average temperature is a long-term look at the Earth's temperature, usually over the course of 30 years, on land and sea. Because weather patterns vary, causing temperatures to be higher or lower than average from time to time due to factors like ocean processes, cloud variability, volcanic activity, and other natural cycles, scientists take a longer-term view in order to consider all of the year-to-year changes.

➤ MITIGATION

Mitigation refers to an action that will reduce or prevent greenhouse gas emissions, such as planting trees in order to absorb more CO<sub>2</sub>. It can also include developing and deploying new technologies, using renewable energies like wind and solar, or making older equipment more energy efficient.

➤ ADAPTATION

Adaptation refers to activities that make people, ecosystems and infrastructure less vulnerable to the impacts of climate change. This includes things like building defences to protect coastal areas from rising seas, switching to drought or flood resistant crop varieties, and improving systems to warn of heat-waves, disease outbreaks, droughts and floods(UNESCO, 2013).

### **1.3 Problem statement**

Climate change poses a significant threat to lives and livelihoods in Burkina Faso. Loubila is an agricultural county of BF located at 10km from Ouagadougou is expected to be highly affected by the changing rainfall and temperature. As Climate change problem is growing worse, international community including governments, institutions and NGOs are making efforts to raise the awareness of people and to especially help smallholder farmers to adapt their agricultural activities to Climate Change effects. Unfortunately, these valuable efforts are not enough because the

used methodologies are not efficient, poorly coordinated and even not known by farmers living in rural area(Corner, 2011). One of the key tool in combating climate change effects is effective communication: if the right information with regard to the most suitable adaptation strategies and the way to implement them is provided to smallholder farmers at the right moment, it can easily help them to make accurate decision and therefore accurate interventions and actions. Noticing the impact of climate change that is expected to occur in Burkina Faso, the need for every citizens including smallholder farmers to be provided accurate and reliable information on adaptation strategies is necessary. For Burkinabe farmers, the need to be offered green finance and capacity building services on adaptation strategies by Micro-Finance Institutions (MFIs) is highly important. However, lack of green fund from MFIs and proper conveyance of information regarding adaptation strategies/interventions that can increase the resilience of smallholder farmers to CC in Burkina Faso in general and Loumbila in particular pose a great challenge. On the other hand, There is still an enormous gap between what is known by scientists and what is known by farmers on the matter of climate change effects on agriculture(Corner, 2011). Additionally to specific knowledge on adaptation strategies needed by smallholder farmers, few information regarding the key role of MicroFinances Institutions in increasing smallholder farmers' perception and on adaptive capacities in Burkina Faso are existing and most of research, studies or surveys conducted to do it in African Countries are rarely included Burkina Faso. Therefore, the aim of this study is to assess smallholder famers' awareness and their adaptive capacities to CC through MFIs in Loumbila, Burkina Faso.

#### **1.4 Objectives of the study**

The study will be guided by a general objective and three specific objectives as stipulated in sections 1.4.1 and 1.4.2 that follow.

##### **1.4.1 Main Objective**

The main focus of this study is to assess smallholder farmers' perception and their adaptation capacities to CC in Loumbila in Burkina Faso through services provided by MFIs.

### **1.4.2 Specific Objectives**

The specific objectives of the study are:

- To assess the awareness of smallholder farmers in Loumbila about CC: consequences, and potential adaptation strategies of Climate Smart Agriculture Technologies.
- To study the main challenges encountered by smallholder farmers and their needs to adopt adaptation.
- To study the possible potential financial products and services that microfinance institutions could provide to improve adaptive capacities of smallholder farmers.

### **1.5 Research questions**

From the above objectives, the study sought to answer the following questions:

- What is the perception (understanding) of Loumbila smallholder farmers on Climate Change?
- What are their challenges and needs to enhance their perception and to better cope with CC effects?
- What are the possible financial products and services that MFIs could provide to improve adaptive capacities of smallholders farmers?

### **1.6 Justification of the study**

This study is conducted in order to improve the adaptation capacities of smallholder farmers through services provided by Microfinance Institutions. On one hand, The result of this study will be used by MicroEnergy International the German Company I am working with to see whether they can implement a country office in Burkina Faso. On the other hand, the result of my study can serve as recommendation to Burkina Faso's Government to better help farmers to adapt to Climate Change by giving them funds that can be easily reimbursed at a suitable rate.

### **1.7 General description of Burkina Faso**

Burkina Faso, literally "Countries of honest Men" with a population of 19,512,533 inhabitants and an area of 277,400 km<sup>2</sup> also called Burkina formerly Republic of Upper Volta, is a country in West Africa without access to It is surrounded by: Mali to the north and west, Niger to the east, Benin to the southeast, Togo and Ghana to the south and Côte d'Ivoire to the south-west. The capital Ouagadougou is located in

the center of the country. Burkina Faso is a member of the African Union (AU) and the Economic Community of West African States (ECOWAS). It is one of the ten least developed countries in the world, with a human development index of 0.343 in 2012. Burkina Faso has a Sudano-Sahelian tropical climate (characterized by considerable rainfall ranging from an average of 350 mm in the north to more than 1 000 mm in the south-west) with two very contrasting seasons: the rainy season With precipitation between 300 mm and 1200 mm and the dry season in which the harmattan, a hot, dry wind, originates from the Sahara, blows. The rainy season lasts about 4 months, between May-June and September, its duration is shorter in the north of the country. We can therefore distinguish three major climatic zones:

- Sahelian zone in the north of the country: less than 600 mm of rainfall per year and high thermal amplitudes (15 to 45 degrees).
- Sudano-Sahelian zone between 11 ° 3 'and 13 ° 5' north latitude. It is an intermediate zone for temperatures and precipitation.
- Sudano-Guinean zone in the south of the country: more than 900 mm of rain per year and relatively low average temperatures.

There are two unequal seasons:

- A very short winter season of 3 to 4 months (June to September).
- A dry season of 8 to 9 months (October to June).

The scarcity and poor distribution of rainfall is causing increasingly large migrations of populations mainly from the north and central to the cities, southwestern Burkina Faso and coastal countries. The temperature varies from 16 to 45 degrees Celsius; The average annual evaporation is estimated at 3 000 mm and the annual recharge of the underground water table at 40 mm. Burkina Faso has a fairly large hydrographic network, especially in its southern part. The rivers are linked to three main basins: the basins of the Volta, the Comoé and the Niger. The country owes its former name to Upper Volta to the three rivers that cross it: the Mouhoun (formerly Volta Noire), the Nakambé (Volta Blanche) and the Nazinon (Volta Rouge). The Mouhoun is the only permanent river of the country with the Comoé which flows to

the south-west. In Burkina Faso, agriculture is the main source of income for the poorest people and the pillar of food security in the country. It occupies more than 80% of the population and contributes about 33% of the GDP (INSD, 2013). However, food security and poverty are the major concerns, as in all countries of sub-Saharan Africa. These countries are suffering a succession of food crisis due to climate change coupled with an exponential population growth and a strong urbanization. Burkina Faso's geographical situation makes it particularly vulnerable to climate change. As a Sahel country located in the heart of western Africa, Burkina suffers an extreme variable climate: the same area can be affected by both flooding and drought within only a few months. The economy of this largely rural country is essentially based on agriculture. According to various predictions, climate change will have an impact on agricultural production and food security, and will therefore affect inhabitants of rural areas, especially those who are most vulnerable, such as farmers.

### **1.7.1 Climate Change in Burkina Faso**

Burkina Faso experiences high temperatures and variable rainfall. Three climate zones split the country from north to south: the Sahelian zone in the north with rainfall less than 600 millimeters per year (mm/year), the Sudano-Sahelian region on a savanna plateau (Mossi Plateau) with rainfall from 600-900 mm/year and slightly cooler temperatures, and the southern more humid Sudanian zone with rainfall averages between 900-1200 mm/year. Each of these zones experiences a pronounced wet and dry season, with the wet season extending over a two-month period in the north and a six-month period in the south. The rainy season starts slowly in late March to early April in the southwest, extending gradually toward the center of the country in May and June, and reaching the northern extents in June or early July. The length of the growing season varies from less than 60 days in the north to 160 days in the south, with large inter-annual variations. The dry season is influenced by the harmattans, or dry, easterly winds that bring hot air to Burkina Faso from March to May. Potential evapotranspiration (PET) remains high throughout the year across the country, always above 100 mm per month, and can even reach 200 mm in Feb-

ruary and March. Climate variability is already a major constraint on food security, health, environment, and poverty reduction due to the high dependence on the primary agricultural sector, which contributes 86% of the GDP. Droughts, floods, heat waves, locusts, and dust storms are the major climate-related hazards in Burkina Faso, which hamper the country's development and contribute to problems such as desertification, land degradation, epidemics (e.g. meningitis, cholera), food insecurity, increased poverty incidents, migration away from the central area of the country, and overall development. The government of Burkina Faso has provided support to enhance warning systems concerning outbreaks of meningitis (produced by the national Meteorological Service since 2009) and some short-term climate forecast on a monthly basis on cumulative rainfall and waterflow of major river basins.

### **Example of recent climate trend**

- Weather station observations since 1902 show that the dry zone has been extending southwards over the last century (World Bank, 2011).
- Extremes in temperatures are occurring with monthly high temperature averages now regularly exceeding the previous maximums of 35°C, particularly in the north (World Bank, 2011).

### **1.7.2 Climate future trend**

Climate change summary for Burkina Faso:

- Temperatures across Burkina Faso are projected to increase 3-4°C by 2080-2099, in comparison to the 1980-1999 time periods. This represents substantially higher temperature increases than the global average. Projected temperatures will increase in the north at a relatively higher rate than in the south and more in the wet season than in the dry season (World Bank, 2011).
- There is a high level of uncertainty associated with climate projections for Burkina Faso and West Africa in general, particularly for changes in precipitation, meaning that projections should be treated with caution (World Bank, 2011).
- According to the Intergovernmental Panel's Fourth Assessment report published in 2007, the number of extremely dry and wet years will increase dur-

ing the present century, and semi-arid areas will become more arid(World Bank, 2011).

- There are discrepancies between models projecting expansion or contraction of vegetation: some models predict significant drying of land, while others predict a general increase in moisture and expansion of vegetation into the Sahara(World Bank, 2011).

the lack of an efficient meteorological network is one of the main reasons for the high uncertainty of the climate projections in the region. Yet, even with the high uncertainty of long-term precipitation pattern projections, some impacts emerge more clearly. Climate change is expected to increase variability and the incidence of extreme weather events, such as droughts, floods, and intense rainfall events. The variability can be expected to negatively impact crop production, particularly because agriculture is already vulnerable to current fluctuations in climate. Increasing temperatures will cause greater evapotranspiration, which will lead to drier soil conditions in many areas. The increasing demand for water will likely decrease water availability even with an increase in precipitation. An increase in maximum temperatures, and probable increase in drought conditions, will affect pastoralist activities by contributing to land degradation and by directly impacting herd mortality rates. Similarly, climate change decreases the ability for nomadic or semi-nomadic groups to use traditional indicators to plan their movements. The costs of climate change have not been calculated for Burkina Faso, and it would be difficult to do so given the uncertainties in climate change projections. The most vulnerable sectors to climate change in Burkina Faso are water, health, agriculture, pastoralism, and forestry. Expected increases in extreme temperatures will increase heat-related mortality, and extreme events such as heavy rainfall and floods will increase the incidence of diarrheal diseases. Indirectly, if subsistence activities such as agriculture and livestock production are negatively affected by changes in climate, then the overall health of the population will be affected due to decreased food security and ability to gain enough nutrients.

### **1.7.3 Burkina Faso and its adaptation priorities**

Burkina Faso has articulated its adaptation priorities in three national-level documents: its initial national communication to the UNFCCC (2002), its national strategy (2002), and its National Adaptation Programme of Action (NAPA, 2007). Across these three documents, Burkina Faso prioritizes actions supporting agriculture, water resources, and forestry. In the country's initial national communication to the UNFCCC in 2002, Burkina Faso identified cotton, forest products, and Ouagadougou drinking water as the top three adaptation priorities. In the national strategy submitted at the same time, Burkina Faso articulated similar priority areas, but generalized them to the agriculture, forestry, and water resources sectors. Burkina Faso's NAPA, published in November 2007, identified four sectors similar to the two other national level documents as the most vulnerable: Agriculture, Water, Animal Resources, and Forestry/Biodiversity. The NAPA also identified the most vulnerable populations among poor rural populations: women, children, and small agricultural producers. The NAPA further identified and ranked the top 12 adaptation action priorities(USAID, 2012):

- reinforcement of early warning systems for food security
- Promotion of supplementary irrigation for grain cultivation
- Development and management of Lake Oursi
- Forage production and livestock feed stockpiling
- Management of natural resources, including development of non-timber forest products
- Silt deposition prevention
- Irrigation optimization in four provinces
- Securing key pastoral areas
- CES/DES promotion (conservation, protection, and restoration of water and soils)
- Flora/fauna habitat management
- Water pollution protection using protected areas, mechanisms, infrastructure
- Home energy efficiency, renewable energy

The UNFCCC focal point is situated in the permanent secretariat for the National Council for the Environment and Sustainable Development (CONEDD) within the Ministry of the Environment and Quality of Life. This is the only government entity identified as having capacity on climate change, with the issue too often confused elsewhere with general environmental management (USAID, 2012).

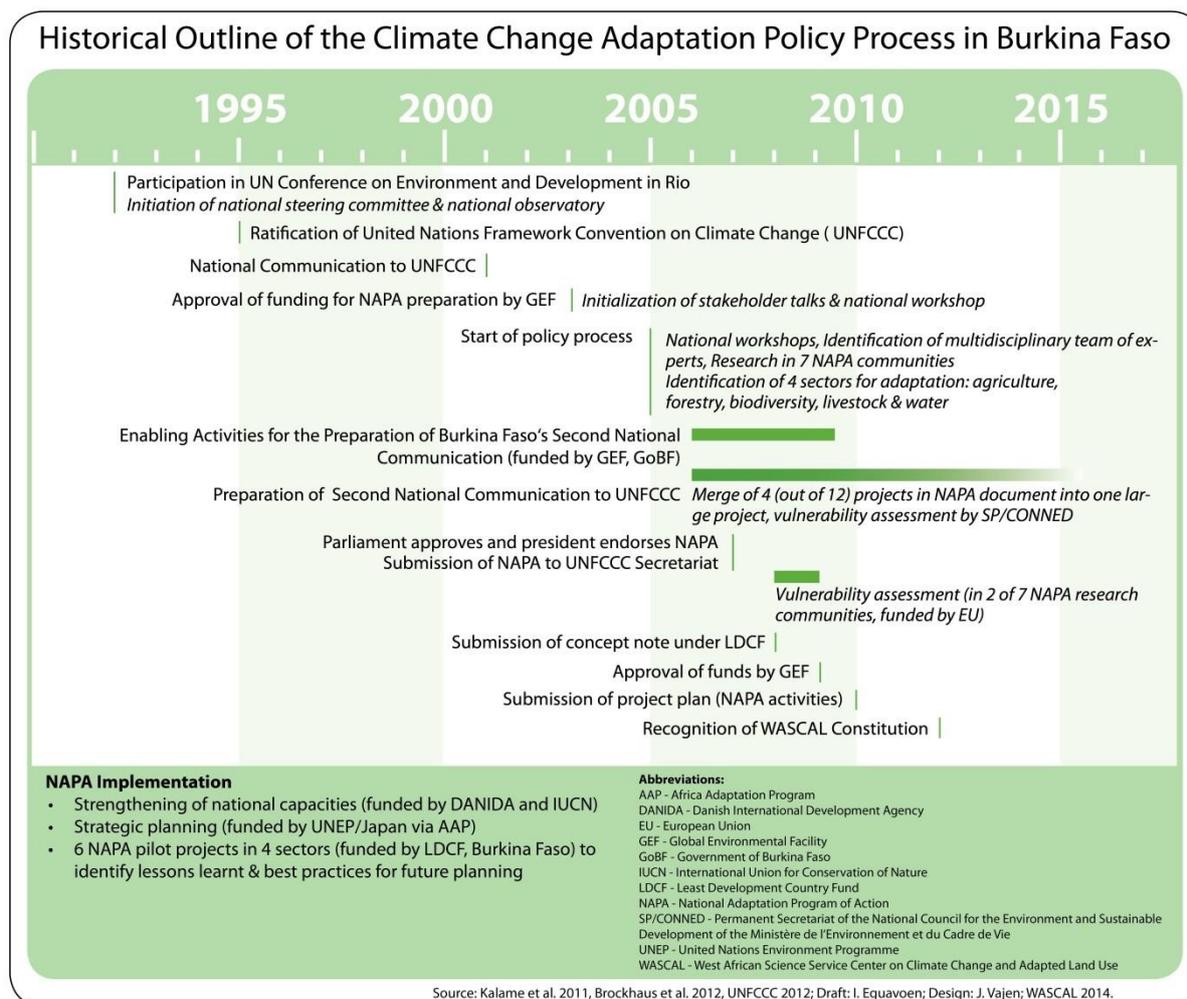


Figure 1.1 : Historical Outline of the Climate Change Adaptation Policy Process in Burkina Faso

### 1.7.4 Brief overview of ongoing adaptation programs in Burkina Faso

Following are several examples of adaptation policies and plans:

- The National Programme for the Rural Sector (NPRS) includes “the improvement of food and nutritional security and sovereignty in a context of climate change, desertification, and demographic growth” as the first of five broad national guidelines (USAID, 2012).

- A UNITAR3-funded ACCCA4 pilot project aimed to incorporate consideration of climate change variability into the growth and development of Ouagadougou (USAID, 2012).
- The government has established perennial institutions such as CONEDD and CONASUR (National Council for Emergency Relief and Rehabilitation) to address disaster risk issues (USAID, 2012).
- As of 2009, the Danish International Development Agency (DANIDA) was implementing a number of climate-related activities in Burkina Faso, with support programs for the Water and Sanitation, Education, Energy, and Agriculture sectors (USAID, 2012).
- UNEP and UNDP started the Climate Change Adaptation & Development Initiative (CC DARE program) to integrate climate adaptation into national development plans, with Burkina Faso as one of the target countries (USAID, 2012).
- Two International Fund for Agricultural Development (IFAD) projects, the Community Investment Programme for Agricultural Fertility (PICOFA) and the Sustainable Rural Development Programme (SRDP) intervene in areas characterized by increasing drought, erratic rains, and land degradation to promote soil fertility management, reduce soil erosion, and reverse land degradation using indigenous soil and water conservation techniques (USAID, 2012).

### **1.7.5 Specific description of Burkina Faso regarding Social, Economical and Ecological Aspect**

#### **➤ ECONOMIC ASPECT**

Burkina Faso's economy grew 5.2% annually on average between 2000 and 2010, with a total GDP of \$10.2 billion in 2011 (World Bank, 2012a). Its GDP per capita was \$1,3002 in 2011, ranking 205 out of 226 countries (CIA, 2012). Agriculture and industry represent 34% and 26.5% of the country's economic output, respectively (State Dept., 2012). Gold mining has been the country's fastest growing industry, increasing by 11.8% of GDP between 2006 and 2011, largely due to government measures to increase foreign direct investment and the rising market value of gold (AEO, 2012). Burkina Faso is Africa's largest exporter of cotton, employing 17% of the population and accounting for 60-70% of export earnings (State Dept., 2012). Furthermore, while formal sector unemployment remains low at 1.8% of the

population living in urban areas, the country suffers from severe underemployment amongst the country's large rural population (AEO, 2012). Economic growth remains a priority as the government seeks to expand the mining industry, improve market access for Burkinabé goods, invest in critical infrastructure, and increase secondary/university education.

### ➤ SOCIAL ASPECT

Burkina Faso has an area of 277,400 km<sup>2</sup> and a population of 17.2 million, which is growing at a rate of 3.1% percent or an average of 6.2 children per woman of reproductive age (CIA, 2012). Population growth of this magnitude has created an overwhelmingly young population with 59.1% of the population under the age of 20 (IMF, 2012). Eighty percent of the population relies on subsistence agriculture, which contributes to the persistence of the country's severe poverty and poor education (State Dept., 2012). The population is an ethnically integrated split between two major West African groups, the Voltaic and the Mande. The population is 60.5% Muslim, 19% Christian, and 21% other religions (CIA, 2012). Despite consistent growth, Burkina Faso remains one of the poorest countries in the world, ranking 181 out of 187 on the 2011 United Nations Development Programme (UNDP) Human Development Index. In 2011, rising government discontent and deep social malaise led to country-wide protests resulting in vandalism, destruction, and mutiny. The protests ended shortly thereafter and the country is undergoing major political reforms with some success. The major priorities for human development are increasing access to proper healthcare and sanitation, reforming the education system to reduce dropouts and increase participation by women, and introducing contraceptives to rural populations to reduce the country's high growth rate. While the vast majority of Burkina Faso's population remains rural, urbanization rates have risen as people migrate from drought-plagued regions in search of job opportunities and food security in cities. The droughts affecting the country since the 1970s and 1980s have led the poor and vulnerable populations to migrate into

the valleys and the small basins of the rivers, which in turn aggravates the aftermath of flooding events, particularly in the outskirts of cities that are in the flood plain. Currently, 20% of Burkinabés are urban dwellers, with the percentage on the rise since 2005.

### ➤ ECOLOGICAL

Burkina Faso is characterized by shrub steppes, arboreal and shrub covered savannah, and open woodland forest as a result of the arid climate in the north and a relatively cooler and wetter climate in the south. The distribution of land across the entire national territory is as follows: cultivated land (13%), arable land (40%), protected areas (classified forest, reserves, national parks, 16%), and grazing land during the rainy season(61%) (World Bank, 2010). The percent of agricultural lands is growing, at the detriment of grazing lands. The soils are poor in nutrients, have little capacity for storing water, and are largely degraded from overuse (GFDRR, 2011). The government recognizes that a majority of the population depends on the land and has made environmental protection part of the country's constitution, with legislative frameworks on water management and rural tenure (AEO, 2012). A priority for sustainable ecological management is to increase the conditions for and sustainability of agriculture.

## 1.9 Presentation of Loumbila: the case study

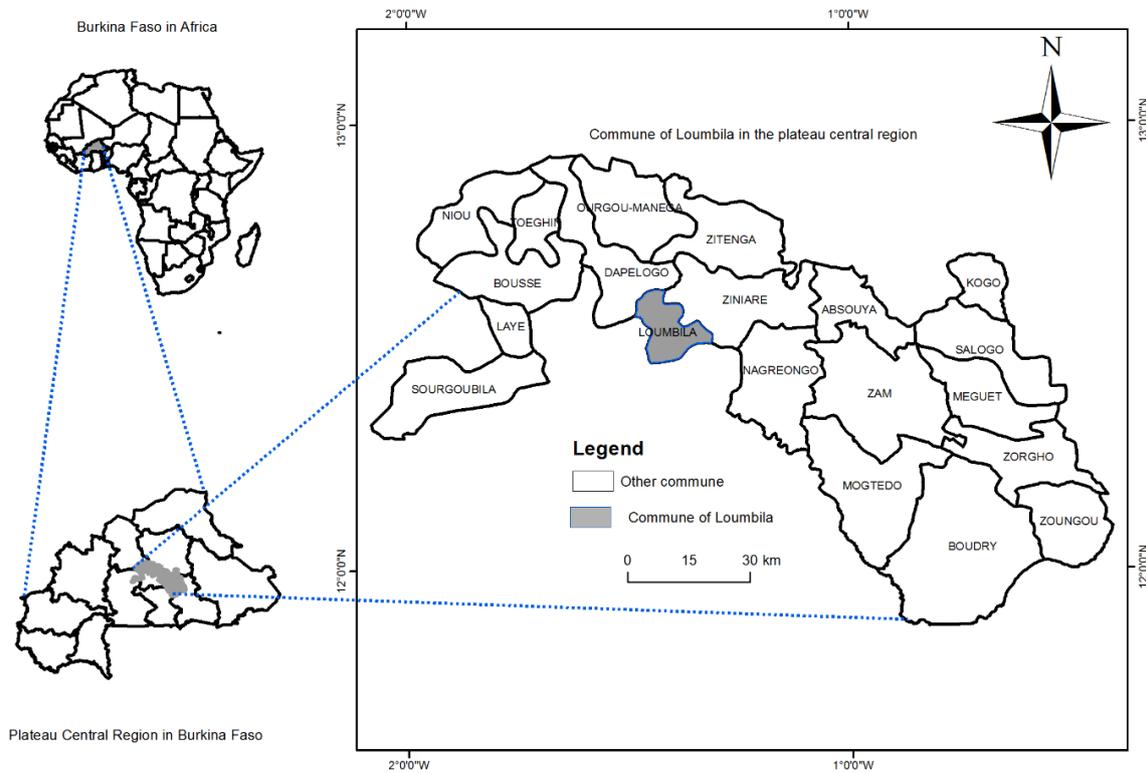


Figure 1.2: Area study : Loumbila

Loumbila is a village of Burkina Faso located in the province of Oubritenga and in the Central Plateau region. In 2012 it had a population of 27,929. Loumbila is a town on the outskirts of the city of Ouagadougou and Supplies the latter with market gardening and food products.

The municipality of Loumbila is located in the Central Plateau Region precisely in the province of Oubritenga. It is limited:

- to the east by the commune of Ziniare;
- in the west by the commune of Pabr  and the arrondissement n   4 (province of Kadiogo).
- in the north by the municipality of Dapelogo;
- to the south by the municipality of Saaba.

The staple foods in the locality are white sorghum, millet and corn. In addition, groupings are working towards improving the conditions for life of the population. These include, among others, groups of rice, Seeds, tomatoes. This locality contains a hydraulic dam which allows intensive agricultural activity.

### 1.10 Climate Change, Development and Microfinance :3 interlinked domains

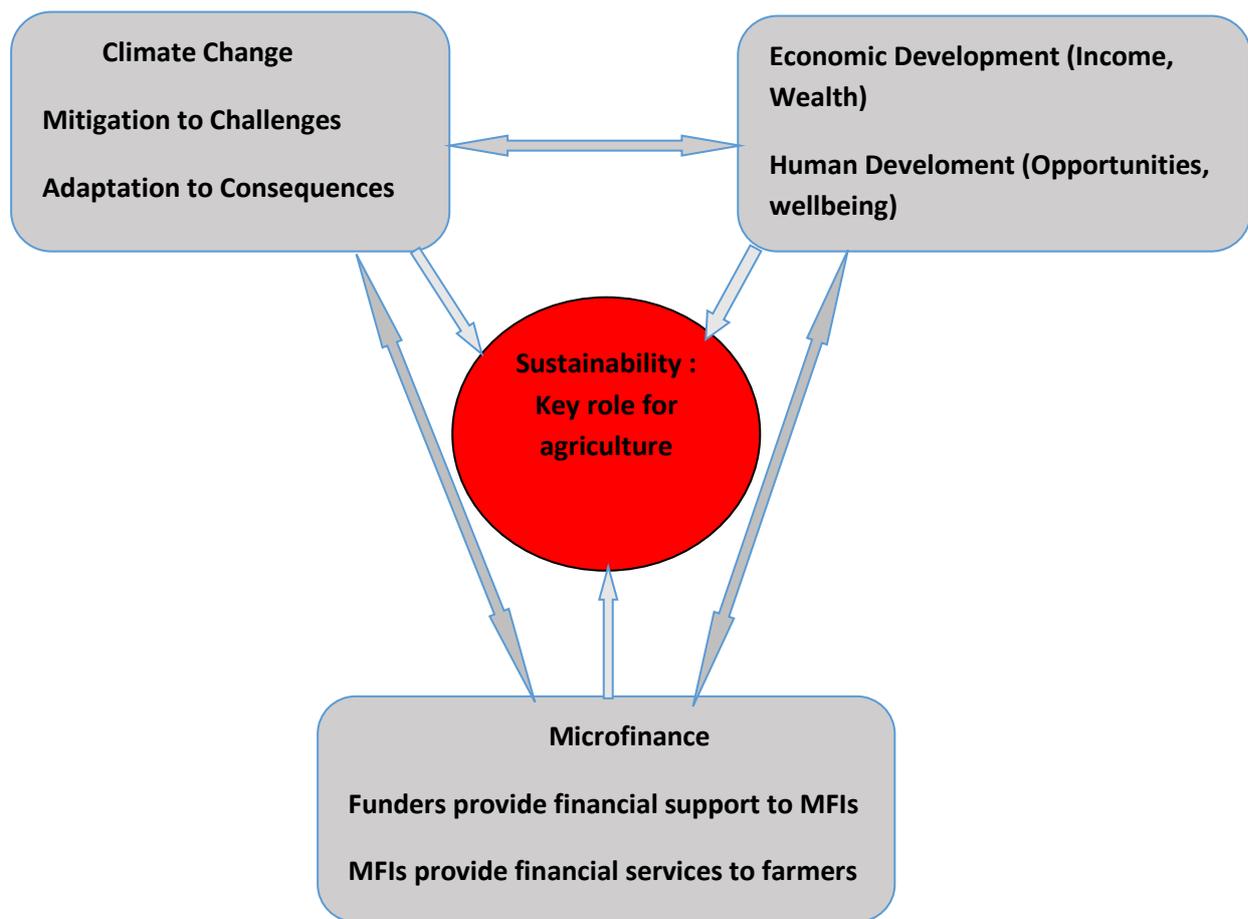


Figure 1.3 Existing link between Climate Change, Microfinance and Development

Microfinance plays a great role to reach sustainability by giving funds they receive from donors to farmers. These received funds can be of great help to farmers to foster their adaptation capacities to CC as they can be used to buy agricultural inputs, seeds. By doing this, crops will increase the GDP of the country and develop the economy of the country.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Status Of Financing Of Agriculture In Burkina Faso

#### 2.1.1 Financing structures

Like modern economies, the financing system of Burkina Faso is quite diverse. It is composed of structures or organizations involved in the financing of the economy either by mobilizing savings or by granting credit or by both activities at the same time. Other agencies also play an indirect role in financing the economy. The main components of the national financial system are as follows:

- Treasury and public financing structures operating in the private sector banks and financial institutions;
- Decentralized Financial Systems (DFS);
- insurance companies;
- the pension funds (CNSS and CARFO).

The national financing system is complemented by regional and international financing instruments and mechanisms that can benefit national private enterprises. These include:

- The Regional Exchange of Securities (BRVM)
- Foreign Direct Investment.

For the specific case of agriculture, three types of structures contribute to the financing of the agriculture, livestock, fisheries and other sectors. These include traditional banks, the decentralized financial system and associations and NGOs.

#### 2.1.2 Classic Banks

The table below lists the conventional banks involved in financing agriculture in general:

Table 2.1: Bank financing agricultural sector in Burkina Faso

S/N	NAME	OBSERVATION
1.	ECOBANK (Ex BACB)	Funding mechanism for MFIs. It has transformed its microcredit program, Linkage, into a Financing Company for Small Enterprises (SOFIPE). Not very sure but, she launched a program approaching the MF
2.	UBA (BIB)	Not very sure but, she launched a program approaching the MF
3.	BOA	BOA Refinances MFIs that meet certain criteria
4.	BCB	in 2003, the bank launched a microfinance product to meet the needs of the informal sector

### 2.1.3 Decentralized Financial System

Microfinance institutions are organized into networks or associations. There is an association and a network.

➤ PROFESSIONAL ASSOCIATION OF MICROFINANCE INSTITUTIONS IN BURKINA FASO (APIM-BF)

The Professional Association of Microfinance Institutions in Burkina Faso (APIM-BF) is the founder organization that brings together a set of microfinance institutions. It has fifty (50) members on some 60 microfinance institutions in Burkina Faso.

Table 2.2 : List of Microfinance Institution in Burkina Faso

N°	SIGLE	LIBELLE	SIEGE
1	ABF	Association Base Fandiman	Fada
2	ACFIME/CREDO	Agence Communautaire pour le Financement de la Micro Entreprise	Ouagadougou
3	APRG	Association d'Appui et de Promotion Rural du Gulmu	Fada
4	ASIENA	Association Inter Instituts « Ensemble et AVEC »	Ouagadougou
5	BTEC	Banque Traditionnelle d'Epargne	Ouahigouya

		et de Crédit	
6	Caisse Nabonswendé	Caisse Nabonswendé	Ouagadougou
7	CBM	Coopérative Baïtoul Maal	Ouagadougou
8	CEC	Communauté Epargne et Crédit	Ouagadougou
9	CEC/SI	Caisse D'Epargne et de Crédit du Secteur Informel	Ouagadougou
10	CECT/Tin Tua/Buayaba	Caisses d'Epargne et de Crédit To-diyaba de Tin Tua	Fada
11	CODEC-Manga	Coopérative Diocésaine d'Epargne et de Crédit de Manga	Manga
12	CODEC-Ouaga	Coopérative Diocésaine d'Epargne et de Crédit de Ouagadougou	Ouagadougou
13	CODEC-Ouahigouya	Coopérative Diocésaine d'Epargne et de Crédit de Ouahigouya	Ouahigouya
14	COOPEC GALOR	Coopérative d'Epargne et de Crédit GALOR	Ouagadougou
15	CPB	Caisses des Producteurs du Burkina	Ouagadougou
16	CRS	Catholic Relief Services	Ouagadougou
17	CVECA Mouhoun/CIDR	Caisses Villageoises d'Epargne et de Crédit Autogérées de la boucle du Mouhoun	Dédougou
18	CVECA Soum	Caisses Villageoises d'Epargne et de Crédit Autogérées du Soum	Djibo
19	ECLA	Etre Comme Les Autres	Ouahigouya
20	FAARF	Fonds d'Appui aux Activités Ré-munératrices des Femmes	Ouagadougou
21	FCPB	Fédération des Caisses Populaires du Burkina	Ouagadougou
22	FICOD/CLECA	Caisse Locale d'Epargne et de Crédit Autogérée "Todima-Mani	Ouagadougou
23	FINANCOM/ODE	Finance COMMUNAUTAIRE de l' Office de Développement des Eglises Evangéliques	Ouagadougou
24	MEC/JOULIMANI	Mutuelle d'Epargne et de Credit JOULIMANI	Ouagadougou
25	MEC/NESSA	Mutuelle d'Epargne et de Crédit de la Nessa	Ouagadougou
26	MEC/Toma	Mutuelle d'Epargne et de Crédit de Toma	Toma
27	MECAD/PO	Mutuelle d'Epargne et de Crédit des Eglises des Assemblées de Dieu de la Patte d'Oie	Ouagadougou
28	MECAP/Burkina	Mutuelle d'Epargne et de Crédit	Ouahigouya

		des Artisans et Producteurs du Burkina	
29	MECP Laafi Sira Kwieogo	Mutuelle d'Épargne, de Crédit et Prévoyance « Laafi Sira Kwieogo »	Ouagadougou
30	MECRA	Mutuelle d'Épargne et de Crédit de l'ASUDEC	Ouagadougou
31	Micro-Finance Plus	Micro-Finance Plus	Banfora
32	MICRO AID	Institut Chrétienne Evangélique de Microfinance	Ouagadougou
33	Micro Start/AFD	Micro Start Action des Femmes pour le Développement	Ouagadougou
34	Microfi-SA	Société Burkinabè de Microfinance	Ouagadougou
33	MUFEDE	Mutualité Femmes et Développement	Ouagadougou
34	PAMF	Première Agence de Microfinance du BurkinaFaso	Ouagadougou
35	PRODIA-AC	Promotion du Développement Industriel, Artisanal et Agricole	Ouagadougou
36	SID	Société d'Investissement et de Développement (SID)	Ouagadougou
37	SOFIPE	Société de Financement de la Petite Entreprise (SOFIPE)	Ouagadougou
38	SONG-TAABA	Mutuelle d'Épargne et de Crédit (SONG TAABA)	Ouagadougou
39	UCEC-SAHÉL	Alliance des Caisses d'Épargne et de Crédit de l'Oudalan	Gorom-Gorom
40	UCVEC	Union des Caisses Villageoises d'Épargne et de Crédit	Saponé
41	URC/Nazinon	Union Régionale des Coopératives d'épargne et de crédit du Nazinon	Manga
42	URCBAM	Union Régionale des Coopératives d'Épargne et de Crédit du Bam	Kongoussi
43	URCCOM	Union Régionale des Coopératives d'Épargne et de Crédit du Centre Ouest et du Mouhoun	Tougan
44	URCPSO	Union Régionale des Caisses Populaires du sud ouest	Diébougou

#### 2.1.4 The Network of the Caisses Populaires du Burkina (RCPB)

The RCPB is active in the field of microfinance. Its main activity is the collection of savings and its retrocession in the form of credits granted to finance members' activ-

ities, with a view to the economic development of the country. In a spirit of solidarity and individual and collective responsibility, with a view to the development of its members and the community as a whole, the RCPB has set itself a mission, while advocating values, He is resolved to respect. The network of caisses populaires in Burkina Faso contributes effectively to the improvement of the living conditions of the working people of Burkina Faso by collecting the savings of the members and redistributing them in the form of loans. With more than 35 years of experience serving the population, RCPB is today the undisputed leader of the microfinance sector in Burkina Faso. The RCPB operates as a cooperative. It is therefore a mutualist structure whose members are co-owners; It constitutes a collective patrimony whose durability depends on the application of the guiding principles of solidarity and the individual and collective responsibility of the members.

### **2.1.5 Products and services offered**

The RCPB's financial institution is an excellent financial institution and is aimed at any natural or legal person living in rural or urban areas who have difficulty accessing the financial services of conventional financial institutions and who wants to take the key to its development. These include traders, farmers, breeders, artisans, civil servants and employees in the private sector, entrepreneurs, groups and associations, etc. The Network offers a range of financial products and services that are accessible, constantly evolving and adapted to the needs of the population.

#### **➤ Covered Areas**

RCPB is present in 43 out of 45 Provinces of Burkina Faso and has 103 Caisses Populaires, 31 Service Points, 4 Regional Unions, 5 Technical Units and one Federation. The RCPB is present in several provinces of Burkina Faso.

### **2.1.6 Diagnostic analysis of the supply of agricultural financing**

From the analysis of the Burkina Faso context, its financial system, the characteristics of the system and the agricultural producers, there was a multitude of concerns about the financing of the agricultural world. Here the most striking findings will be noted.

### **2.1.7 Key Findings on the Funding Offer**

Presented as the engine of development of Burkina Faso's economy, the sectors of agriculture, livestock and environment are the least served by the supply of products and services of the private financing system. Indeed, according to the preliminary results of the general population and housing census (RGPH) 2006, the population of Burkina Faso is estimated at about 14 million. The vast majority of this population (79.7%) live in rural areas. Agriculture (including livestock) contributed 18.9% of GDP and 70% (estimated) of total export earnings (mainly cotton) in 2005, while over 80% Subsistence agriculture. Thus, despite the important contribution of the agricultural sector to GDP and the size of the agricultural population, the rural sector remains one of the sectors that receive less funding.

### **2.1.8 Financial challenges of agricultural sector**

The limited access of the agricultural or rural sector to bank credit can be explained by the weakness or non-existence of financial services in rural areas, as evidenced by the bankerization rate of 5.6%;The specificity of agriculture: a high degree of risk. Indeed, various risks are associated with agriculture. These are mainly meteorological risks (Burkina Faso is particularly vulnerable to drought), health risks (which include plant diseases or pests) and economic risks (price fluctuations or difficulty in selling production ). In addition, agricultural risks are often characterized by their covariance: they often strike all farmers in a specific region at the same time. Due to these risks and other factors (soil condition, technical capacity), the profitability of agricultural activities is variable and unpredictable;

The weakness or even the lack of organization of the sectors other than that of cotton constitutes a considerable obstacle;

The high cost of information and transactions due to poor infrastructure (roads, telecommunications) and the lack of available customer information (lack of personal identification and asset registers);

The lack of property that can be offered in security due to the poor definition of property and land use rights, the cost or delays in administrative procedures for registering and the malfunctioning of the judicial system.

#### 2.1.9 Major Barriers to Financial Services in Rural Areas

The dispersion of demand for financial services due to low levels of economic activity and population density.

The high cost of information and transactions due to the poor state of infrastructure (roads, telecommunications) and the lack of available customer information (lack of personal identification and asset registers).

The weak institutional capacity of financial service providers in rural areas associated with the lack of educated and well-educated staff in the secondary rural agglomerations.

The unfavorable impact of subsidized credits from projects financed by the Government or technical and financial partners.

Lack of property that can be offered in security due to poor definition of property and land use rights, cost or delays in administrative procedures for registering and the malfunctioning of the judicial system.

The seasonal nature of a large number of agricultural activities and the length of the maturing period of certain crops, and hence the variable nature of the demand for savings and credit, irregular cash flows and delays Between disbursement of loans and repayment of.

Risks associated specifically with agriculture: variations in rainfall, pests and diseases, price fluctuations and limited access to inputs, training / animation and markets.

Given this situation and all the constraints and difficulties raised, actions to promote and / or duplicate certain good practices or local or international experiences have been duplicated in some cases in order to boost the financing of the agricultural sec-

tor by the sector financial. Good practices include strategies adopted by some financial institutions that are successful in providing agricultural loans.

#### 2.1.10 Essential characteristics of lenders successfully offering loans in the field of agricultural microfinance in Burkina Faso

Characteristic 1: Refunds are not related to the use of the loan. Lenders assess reimbursement capacity by examining all sources of household income, not just income (such as the sale of the crop) generated by the investment of the proceeds of the loan. Borrowers understand that they are obligated to repay, whether their use of the loan knows success or not.

Characteristic 2: Lenders use both character-based loan techniques and technical criteria to select borrowers, establish loan conditions and guarantee repayment. To reduce the credit risk, micro lenders who successfully operate in the agricultural sector have introduced credit models using character analysis mechanisms - such as group guarantee or immediate response in case of delays. Payment - and knowledge of agricultural production techniques and markets for farm products.

Characteristic 3: They provide saving mechanisms. Whenever rural financial institutions offered deposit accounts to farm households to help them save capital for the lean period before harvest, the number of such accounts rapidly exceeded the number of loans.

Characteristic 4: Their portfolio risk is highly diversified. Microfinance institutions that have successfully expanded in agricultural lending generally provide loans to a diverse range of farm households, including clients with several types of crops or livestock raising several types of livestock. In so doing, they have ensured that their loan portfolio and client portfolios are better protected against agricultural and natural risks beyond their control.

Characteristic 5: Maturity and lending conditions are adjusted to accommodate cyclical cash flows and large investments. Farm cash flows are highly cyclical. Micro lenders who successfully operate in the agricultural sector have modified the maturity and lending conditions to adapt to these cash cycles, without, however, aban-

doing the essential principle of the repayment obligation, whatever the degree of Success of each production activity, including the one for which the loan was used.

Characteristic 6: The contractual framework reduces the price risk, improves the quality of the production and helps to guarantee the reimbursement. When the quality or the final quantity of a particular crop is a key concern, a contractual framework that combines technical assistance with supply of specific inputs with credit has proved beneficial for both farmers and the market intermediary.

Characteristic 7: The provision of financial services is superimposed on existing institutional infrastructure or uses new technologies. Combining the provision of financial services with infrastructure already in place in rural areas, often for non-financial reasons, reduces transaction costs for lenders as well as for borrowers and creates the sustainability potential for financial services In rural areas even in isolated populations. Different technologies appear to be extremely promising in reducing the cost of financial services in rural areas, including automated teller machines, point of sale (POS) terminals associated with "smart cards", and the presence of loan assistants equipped with digital assistants personal.

Characteristic 8: Member associations can facilitate access to financial services in rural areas and can operate in a sustainable manner in remote areas. In general, lenders incur significantly lower transaction costs when dealing with a farmers' association, as opposed to a large number of dispersed individuals or farmers, provided that the association can manage Effective way. Organizations made up of members can also turn out to be profitable service providers themselves.

Characteristic 9: Insurance products based on regional indices can protect against agricultural credit risks. Although government-sponsored agricultural insurance schemes have rarely succeeded, insurance based on regional indices - for example, in the form of regional rainfall or commodity prices - seems more promising for Protecting lenders from agricultural credit risks.

Characteristic 10: To be successful, agricultural microfinance must be isolated from political interference. Agricultural microfinance can only survive in the long term if

it is protected from political interference. Even the best-designed and best-managed programs can not survive if the government orders a moratorium of reimbursements or other thoughtless measures that run counter to the functioning of a good rural finance system.

Some of the actions must be undertaken by the financial institutions themselves (credit methodology, credit terms and conditions, portfolio diversification), while the others are the responsibility of the beneficiaries (associations or interest groups of farmers), (Policy non-interference, institutional infrastructure and production support services, contractual framework) or technical and financial partners (mechanisms for managing systemic risks).

#### **2.1.11 The experience of a guarantee fund for the financing of agriculture in Burkina Faso: The APIPAC Guarantee Fund**

This assurance support was made with regards to the Irrigation Development Pilot Project. One of the objectives of this venture was to enhance access to monetary administrations for individuals from APIPAC (Association of Professionals of Private Irrigation and Related Activities), whose individuals are makers, processors Agricultural items and merchants of crisp inundated items. The venture arrangement stage confirmed that this objective gathering, which is predominantly made out of poor agriculturists, experiences issues getting to customary credit because of an absence of security. The venture in this way chose to test the approach of the certification support. The Guarantee Fund started working in April 2002. A quick appraisal did in 2004 uncovered that the use impact of the Guarantee Fund (characterized as the measure of advances conceded on the certification subsidize) was low, Thus raising doubt about the viability of the reserve. A more far reaching appraisal in 20065 featured various weaknesses in the organization of the certification support. The frustrating execution of the certification subsidize is symptomatic of more major issues:

- Lack of enthusiasm by banks for little (and in this way more costly) credits,
- The separation of a piece of the potential customer base,

- The nonattendance of extra ensures required by banks (as the reserve just ensures a greatest of half of the advance, the banks require extra certifications),

Moreover, the underlying eagerness of potential borrowers for the certification store may have diminished once it turned out to be evident that it was required to reimburse the credits allowed with the assurance support.

The previous inquiries are not inside the domain of a certification subsidize. Specifically:

- A certification reserve can just reinforce the enthusiasm of banks for little and costly credits,
- An assurance store can not take care of the issue of separation from clients,
- A certification reserve can just permit chance sharing. An assurance reserve ought not go out on a limb. An assurance reserve can not by any means take care of the issues of absence of certifications.

It could consequently be inferred that the formation of an assurance store might not have been the most proper reaction to the issues experienced by APIPAC individuals as far as access to monetary administrations. The 2006 assessment embraced by HORUS gave suggestions on the institutional and operational changes expected to guarantee more noteworthy adequacy of the certification subsidize. The HORUS report focuses on that the APIPAC Guarantee Fund gives just a fractional reaction to the issue of financing horticulture and that a wide approach is required, Institutions and budgetary items. The primary discoveries are that (i) the organization of an assurance subsidize focusing on farming is mind boggling and requires money related ability, (ii) a certification finance is not a panacea for the financing of horticulture, Agriculture. All in all, the conclusion of the supply of money related administrations demonstrates the accompanying:

- The FI segment, specifically the MFIs, which has become emphatically as of late, is right now experiencing challenges, specifically in the recuperation of advances conceded;
- There is a genuinely little broadening of monetary items;
- Most MFIs are encountering development emergencies;
- Credit to horticulture is almost no created and chiefly concerns the cotton part;

when all is said in done, financing for venture is low, the vast majority of the advances allowed by FIs for farming financing are here and now (85%);

- The preparing segment is inadequately created
- when all is said in done, loan costs available are essentially higher than the normal interior rate of return of most horticultural exercises;
- In perspective of the level of wages of family cultivates, the ensures expected of makers are out of reach;
- The primary danger of loaning to agribusiness lies in the ideas of the atmosphere and the high instability of costs of agrarian items;
- Climate change and the subsequent impacts can have gigantic negative effects on rural exercises;
- The low level of information of the world and the working of the monetary framework adversely influences the nature of financing documents and in this way access to credit;
- The sums allowed don't regularly relate to the necessities of the exercises of little makers;
- In many cases, the times of accessibility of the assigned assets don't relate to the cycles of the exercises of the little makers.

Proposal and recommendation to energize the financing of farming area:

Hub 1 : Create and actualize an instrument for farming segment introduction and financing in view of a certified strategy, lawful and institutional system at provincial level.

Hub 2: Imagine and actualize a successful protection framework and adjust to smallholder issues.

Hub 3: Increase mindfulness and responsibility of the keeping money segment on the financing of horticulture. In particular, they are:

- Advance the responsibility of banks officially occupied with farming credit.  
This could make oil work
- Advance the gathering of long haul reserve funds
- Empower the reinforcing of the DFS segment and endow FONDMA with a national guiding part in this sub-area
- Enhance financing costs on family cultivate advances

- Enhance the conditions for the activity of corporate managing an account exercises to energize interest in the handling of agrarian items.

Hub 4: Establish an authentic correspondence between the performing artists constituting the esteem chain of the rural division

- Set up structures for meeting by part
- Building up another way to deal with agrarian credit
- Prepare credit officers of money related organizations in the qualities of rural divisions
- Prepare agrarian helpful directors on the best way to define their financing needs

Hub 5: Work to decrease the perils and dangers related with rural divisions and fuel

- Urge laborer associations to amass themselves into bigger structures, for example, the Unions or the Federation
- Support the making of units and, later, perishable items handling enterprises
- Go with the administration structures of the laborer world

Notwithstanding the worldwide noteworthiness joined to environmental change adjustment, there remains an absence of comprehension of the key hindrances that block the successful execution of adjustment procedures by family units crosswise over SSA. Utilizing contextual analyses from upper east Ghana and a precise writing audit to survey the boundaries that limit successful usage of atmosphere adjustments in sub-Saharan Africa, Antwi-Agyei et al (2013) found that SSA families are compelled by a scope of hindrances including absence of budgetary assets (financial obstructions), institutional hindrances, absence of data on environmental change attributes, social-social hindrances, for example, conviction frameworks and neighborhood standards, innovative obstructions and an absence of infrastructural improvement. The dangers displayed by environmental change to the occupations of these family units are set to increment, yet the components expected to decrease this hazard are not completely bolstered (IPCC, 2007a).

What's more, the conviction frameworks of a specific gathering of individuals can constitute one of the best obstructions to the execution of atmosphere adjustment methodologies by families (IPCC, 2007a). Unequivocally held convictions, social practices and esteem frameworks and the perspectives of people or gatherings, enormously impact the way they see environmental change and consequently their ensuing adjustment methodologies (Jones and Boyd, 2011). Culture is fundamental to the choice to adjust and along these lines, the ID of dangers and the resulting usage of suitable adjustment techniques (Adger, Barnett, Brown, Marshall and O'brien, 2012). Inside the same geological locale, distinctive social gatherings may act diversely in their reaction to dangers including the unfriendly effects of environmental change (Adger et al., 2012), and such reactions might be significantly affected by the previous conviction frameworks and qualities and standards of the gathering (Moser and Ekstrom, 2010). For instance: Social practices kept the Fulbe in northern Burkina Faso from grasping vocation expansion adjustments methodologies, for example, improvement work, work relocation and planting to diminish their defenselessness to dry spell. Opposite, their partners, the Rimaiibe, have utilized work movement and expansion of vocations as adjustment methodologies (Nielsen and Reenberg, 2010). With respect to relocation, Rademacher-Schulz and Mahama (2012) watched that social and social standards compel female movement contrasted with male relocation in the Nadowli region of Ghana. This possibly restrains the adjustment alternatives accessible to such female agriculturists (Antwi-Agyei et al, 2013:19). Thus, other research proposes that people see approaching data through a "social" focal point implying that they comprehend and assess data through a channel that is shaded by their general convictions about society, the world, and right or wrong (Moser and Dilling, 2012). Culture is preceding certainties in the subjective sense that what nationals accept about the exact outcomes of [certain activities or] arrangements gets from their social perspectives (Kahan and Braman, 2006). Approaching data might be rejected upon fast (natural) judgment in the event that it inspires some sort of risk to the audience's feeling of self i.e. on the off chance that it challenges his or her profoundly held convictions or those of the gathering s/he most relates to (Kahan et al., 2007). In this way, individuals have a

tendency to specifically hear and gather prove that backings their convictions and basic esteems (CRED, 2009; Kahan and Braman, 2008). Jones and Boyd (2011) watched that societal standards and qualities go about as real boundary to effective atmosphere adjustment in Western Nepal and found that social hindrances might be intellectual, standardizing or institutional administration and structure. Subjective boundaries include mental and perspectives that impact people's responses to dangers including environmental change (Swim et al., 2011). Regularizing boundaries incorporate social standards and qualities that could impact people's reactions to ecological (counting atmosphere) change. People and gatherings utilize a scope of subjective systems to abstain from tolerating the likelihood of unsavory prospects and the need to act now (Stafford-Smith, Horrocks, Harvey and Hamilton, 2011). These procedures incorporate dynamic and easygoing denials, blame moving, and reinterpreting the danger. In such manner, the energy about the neighborhood setting inside which atmosphere adjustment happens is very basic. To be sure, there is expanding interest for adjustment techniques that recognize neighborhood setting, for example, conviction frameworks and indigenous information (Jennings and Magrath, 2009). In Kenya, as indicated by KCCWG (2013), these variables include: dialect hindrance, detail of environmental change data, absence of important framework and assets, utilization of unseemly method of correspondence, and absence of organizing of environmental change data. It is unquestionably not a simple undertaking to for example impart versatile environmental change data when managing the socio-financially underestimated ASALs groups of onlookers who have high lack of education and destitution levels.

## **2.2 Effective communication of adaptive climate change information**

Therefore, it cannot be disputed that there are serious barriers that need to be addressed for effective application of acquired adaptive climate change information to be possible. As Farauta et al (2011) point out, though the impacts of climate change are being felt by both developed and developing countries, these impacts are likely to be felt more by developing countries not necessarily because they are the highest contributors to climate variations but because they lack economic, social and politi-

cal infrastructures to respond adequately to the effects of climate change. Notwithstanding all moderating factors, the role of information in moving forward the climate change agenda and communicating relevant information to the public is very crucial if there should be appropriate utilization of the abundant knowledge and information on the effects of climate change on agricultural production systems and human survival (CTA, 2008).

### **2.3 Adaptation to climate change in agriculture**

According to Leiserowitz (2007), communication on climate change has been spectacularly successful because across nations, nearly everyone in surveyed populations has at least heard of the issue and many can identify at least some important climate change impacts. However, upon deeper exploration that understanding is superficial (Moser, 2010). Moser and Dilling say that one of the reasons why communicators have failed is because they try to reach the masses through traditional communication channels, while disregarding the power and advantages of different channels especially the interpersonal ones. As such, communicators who seek effectiveness have realized that raising awareness and discussing an issue does not directly result in behavior change because there are other factors such as barriers that come into play. Thus, according to Moser and Dilling, for communication to be effective in leading to active engagement, first, it must be supported by policy, economic and infrastructure changes that allow concerns and good intentions to be realized. Second, a better understanding of the audience will help identify the most appropriate framings, messengers and messages that will most powerfully resonate with different people. Third, forums for direct dialogue and other audience-specific use of communication channels, rather than use of mass communication that speaks to no one really, can take advantage of persuasive power and social capital to ensure achievement of communication goals. Fourth, effective communication is one that serves two-way engagement because people in a democratic society are best served by actively engaging with an issue, making their voices and values heard and contributing to the formulation of societal responses. Opinion leaders are well able to fulfill these four requirements for effective adaptive climate change communication.

According to Hulme (2009), one of the reasons why climate change communication is not effective is because people do not understand climate change as they receive multiple and conflicting messages which they interpret them in different ways. In view of this, Campbell (2011) explored the understanding climate change communication as one of science's uncertain messages. He established that although much work has been done by scientists in developing communications to lay audiences, much less attention has been given by them to the ways in which those messages are interpreted. Campbell concluded that scientists communicating with the public need to develop their methods deliberately, involving their target audiences; and that they need to avoid undue dependence on mass media and public authorities for such communication but instead develop multiple channels especially the traditional social networks. Also, Campbell established that an effective approach to communicating uncertainty should depend on the context. For instance, the experience of impacts of climate change from previous events play a role in recipients' interpretation uncertainty and risk messages because experience of an event greatly amplifies people's awareness of what the risks entailed. From these scholars, it is evident that effectiveness of climate change communication depends on the audience experience and characteristics, the attributes of communicators, the communication methods used and the context within which communication occurs.

#### **2.4 Adaptive capacity of agricultural systems**

Agriculture is one of the most sensitive sectors to the impacts of climate change. Floods, droughts and changes in irrigation systems and supplies are some of the problems that most affect this sector (Escobar, 2013; Speranza and Feres, 2010; Thomas et al., 2007; Abelson, 1992). Thus, adaptation has become one of the policy responses to tackle such vulnerability and reduce the risk of damage (Ramírez-Villegas et al., 2012; IPCC, 2007). Many adaptation strategies have been implemented in agricultural systems. These have ranged from small scale, such as diversification of seeds or insurance, to large scale such as water management systems and changes in regional or national policy (Challinor, 2007; Thomas et al., 2007; Burton, 2004; Bradshaw, 2004). Adaptation involves making adjustments in the

processes or structures of ecological, social or economic systems as a response to actual and predicted effects of climate change (IPCC, 2003). Adaptation in agriculture is more complex because it involves making changes in all these components since it is aimed at people who are economically dependent on land use. The goal of adaptation is that through these adjustments, the community can moderate the potential damage or even benefit from opportunities associated with climate change (IPCC, 2003). However, some authors (Smit et al., 1999; Smit and Skinner, 2002; Bradshaw et al., 2004) have distinguished many types of adaptation in agriculture according to purpose, times, scale and responsibility. The purpose behind an adaptation strategy leads to an adaptation that is undertaken spontaneously and autonomously or consciously and planned (Smit and Skinner, 2002). The former is usually implemented by the private sector or individuals who, faced with such shocks, decide autonomously to change their scheme to mitigate the effects of climate change. Its benefits are usually private (Bradshaw et al., 2004). For instance, in agriculture, peasants could adapt to climate change by choosing the crops they may grow using a large variety of seeds that are more resistant to higher temperatures, droughts or flooding (Abelson, 1992). On the other hand, within the public sector and socio-economic systems, adaptation tends to be consciously and centrally planned, as it is usually part of governmental programs or multisectoral schemes (Smit et al., 1999). This type of adaptation seeks to enhance the adaptive capacity of an economic system, encouraging adaptation for all the members (Bradshaw et al., 2004; Escobar et al., 2013). Agriculture is a good example to which this strategy can be applied as it motivates all members of a community to follow a specific adaptation strategy, such as crop diversification. Timing in adaptation refers to the point at which the adaptive response is undertaken. Anticipatory strategies are those which are implemented before the shock in order to mitigate its impacts. Other adaptations are concurrent as they are implemented during the shock, while others are reactive responses (Smit and Skinner, 2002; Bradshaw et al., 2004). However, some adaptation strategies can fall into more than one of these categories. For instance, if a farmer experiences droughts every year, he or she may plan to change their agricultural practices in the future to cope with the risk from droughts. In this case, the response is reactive and

anticipatory at the same time (Abelson, 1992). For this reason, it is important to consider the duration of the strategy. Adaptation responses can be tactical when they apply in the short-term or strategic when their scope is for longer term (Smit et al., 1999; Smit and Skinner, 2002). Although tactical adaptations can be applied during one season to deal with climate conditions, they also can include selling of livestock, asking for a short-term loan, and provisional trades. Strategic responses go beyond this and imply structural changes in the agricultural practices or in the production process of a company, land use, crop diversification or insurance (Bradshaw et al., 2004). Microfinance favours adaptation in both tactical and strategic scenarios since it provides access to financial services, such as microcredits, loans and insurance; advantages that will be explained in the next section. In terms of scale, adaptation in agriculture can extend from a plant or a farm to a whole region. Consequently, the responsible participants might change according to the spatial scale - farmers, producers, private sector, local governments- (Bradshaw et al., 2004). Table 1 shows how the attributes explained generate different responses to adaptation. A good adaptation strategy involves knowing the status of many of these attributes of the place where it is expected to occur: local policies, institutions, the affected population, uncertainties, natural processes, the scope of the strategy and opportunities to adapt.

Table 2.3 : Attributes for different types of adaptation

General Differentiating Concept or Attribute	Examples of Terms Used																		
Purposefulness	<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Autonomous</td> <td style="width: 40%; text-align: center;">←————→</td> <td style="width: 30%;">Planned</td> </tr> <tr> <td>Spontaneous</td> <td style="text-align: center;">←————→</td> <td>Purposeful</td> </tr> <tr> <td>Automatic</td> <td style="text-align: center;">←————→</td> <td>Intentional</td> </tr> <tr> <td>Natural</td> <td style="text-align: center;">←————→</td> <td>Policy</td> </tr> <tr> <td>Passive</td> <td style="text-align: center;">←————→</td> <td>Active</td> </tr> <tr> <td></td> <td></td> <td>Strategic</td> </tr> </table>	Autonomous	←————→	Planned	Spontaneous	←————→	Purposeful	Automatic	←————→	Intentional	Natural	←————→	Policy	Passive	←————→	Active			Strategic
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Spontaneous	←————→	Purposeful																	
Automatic	←————→	Intentional																	
Natural	←————→	Policy																	
Passive	←————→	Active																	
		Strategic																	
Timing	<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Anticipatory</td> <td style="width: 40%; text-align: center;">←————→</td> <td style="width: 30%;">Responsive</td> </tr> <tr> <td>Proactive</td> <td style="text-align: center;">←————→</td> <td>Reactive</td> </tr> <tr> <td><i>Ex ante</i></td> <td style="text-align: center;">←————→</td> <td><i>Ex post</i></td> </tr> </table>	Anticipatory	←————→	Responsive	Proactive	←————→	Reactive	<i>Ex ante</i>	←————→	<i>Ex post</i>									
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Proactive	←————→	Reactive																	
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Temporal Scope	<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Short term</td> <td style="width: 40%; text-align: center;">←————→</td> <td style="width: 30%;">Long term</td> </tr> <tr> <td>Tactical</td> <td style="text-align: center;">←————→</td> <td>Strategic</td> </tr> <tr> <td>Instantaneous</td> <td style="text-align: center;">←————→</td> <td>Cumulative</td> </tr> <tr> <td>Contingency</td> <td></td> <td></td> </tr> <tr> <td>Routine</td> <td></td> <td></td> </tr> </table>	Short term	←————→	Long term	Tactical	←————→	Strategic	Instantaneous	←————→	Cumulative	Contingency			Routine					
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Spatial Scope	<table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Localized</td> <td style="width: 40%; text-align: center;">←————→</td> <td style="width: 30%;">Widespread</td> </tr> </table>	Localized	←————→	Widespread															
Localized	←————→	Widespread																	
Function/Effects	Retreat - Accommodate - Protect Prevent - Tolerate - Spread - Change - Restore																		
Form	Structural - Legal - Institutional - Regulatory - Financial - Technological																		
Performance	Cost - Effectiveness - Efficiency - Implementability - Equity																		

The IPCC defines adaptive capacity as “the potential or ability of a system, region, or community to adapt to the effect or impacts of climate change” (IPCC, 2003; 881). In agriculture, the impacts of climate change to which communities must adapt not only include the average annual climate conditions, but also its variability and the magnitude of extreme weather events (Smit et al., 1999; Smit and Skinner, 2002). Consequently, adaptive capacity in agricultural systems must implicitly incorporate the ability to adapt to inter-annual events including predicted increasing frequency of extreme events due to climate change. To strengthen adaptive capacity in agricultural systems, it is essential to tackle the vulnerability to specific climate stimuli through non-climatic factors such as economic conditions, other aspects of the environment, society, politics and technology (Smit and Skinner, 2002; IPCC, 2003). Smit and different stakeholders in Canada identified four categories within the non-climatic factors in which adaptation can be undertaken in agriculture: i) technology developments, ii) government programs and insurance, iii) farm production practices and iv) farm financial management. Table 2 shows the examples of

adaptation options for each category. These categories are widely defined and one might think that they apply to almost any agricultural system; however, the particularities of each agricultural system would change the way in which these categories can be undertaken. For instance, in a developing country as Colombia where the access to technology is low, the adoption of technology will be limited to the financial situation of farmers who probably will adopt a less advanced technology. Usually, technological developments involve considerable financial investments in research targeted to deliverables such as purchase of equipment, human capital and implementation and the exploitation of the new technology. Once implemented, continued support will deliver significant potential benefits at larger economic scales beyond the local community (Smit and Skinner, 2002). In fact, if the results are positive, the same technology can be replicated in other locations subjected to the same economic conditions and climate stresses. Creation of new and more resistant seed types, software for regional climate change prediction including hydrological management are part of the technological developments in agriculture. Technology helps to deal with uncertainties, especially in climate variations (IPCC, 2007). Farming practices are associated with changes in the operational phase through which exposure to climate-related risks is reduced. It increases the flexibility of farmers to adapt to constant variations in climate conditions as well as the efficiency of the farm (Smit and Skinner, 2002). Examples of this adaptation are the diversification of crop and livestock varieties, substitution to hybrid species, use of fallows and tillage periods, changes in the intensity of chemicals in fertilizers and pesticides, changes in capital and labour inputs, among others. It is important to highlight that many of these are aimed at reducing the economic risks associated with climate change, making the economic stability at farm-level a key attribute to reducing vulnerability. For this reason, Smith and Skinner (2002) identified one major component for financial management at farm-level. Farm financial management uses both governmental and private resources to reduce the risk of income loss. Usually, it includes people in income stabilization programs and spreads their exposure to impacts of climate change (Smit and Skinner, 2002).

Government programs and insurance-based adaptation encompass the economic risks related to climate change. The aim of these responses is to provide farmers financial means, such as subsidies, insurance or compensation for climate-related damage, so their livelihoods will not be irreversibly affected and they will be able to stabilize their income. However, in some countries, such as Colombia, where a significant proportion of the population depends on agriculture, it is not possible to provide these universally. In these cases the private sector may play an important role by filling the gaps imposed by the limitations in government policies and regional budgets. It can bring economic resources to those communities that are not covered by governmental programs (Hammill et al., 2008). Private insurance, as is shown in Table 2, is one of the multiple adaptations offered by the private sector.

Table 2.4 : Adaptation options to Climate change

<p><b>TECHNOLOGICAL DEVELOPMENTS</b></p> <p><b>Crop development</b></p> <ul style="list-style-type: none"> <li>• Develop new crop varieties, including hybrids, to increase the tolerance and suitability of plants to temperature, moisture and other relevant climatic conditions.</li> </ul> <p><b>Weather and climate information systems</b></p> <ul style="list-style-type: none"> <li>• Develop early warning systems that provide daily weather predictions and seasonal forecasts.</li> </ul> <p><b>Resource management innovations</b></p> <ul style="list-style-type: none"> <li>• Develop water management innovations, including irrigation, to address the risk of moisture deficiencies and increasing frequency of droughts.</li> <li>• Develop farm-level resource management innovations to address the risk associated with changing temperature, moisture and other relevant climatic conditions.</li> </ul> <p><b>GOVERNMENT PROGRAMS AND INSURANCE</b></p> <p><b>Agricultural subsidy and support programs</b></p> <ul style="list-style-type: none"> <li>• Modify crop insurance programs to influence farm-level risk management strategies with respect to climate-related loss of crop yields.</li> <li>• Change investment in established income stabilization programs to influence farm-level risk management strategies with respect to climate-related income loss.</li> <li>• Modify subsidy, support and incentive programs to influence farm-level production practices and financial management.</li> <li>• Change <i>ad hoc</i> compensation and assistance programs to share publicly the risk of farm-level income loss associated with disasters and extreme events.</li> </ul> <p><b>Private insurance</b></p> <ul style="list-style-type: none"> <li>• Develop private insurance to reduce climate-related risks to farm-level production, infrastructure and income.</li> </ul> <p><b>Resource management programs</b></p> <ul style="list-style-type: none"> <li>• Develop and implement policies and programs to influence farm-level land and water resource use and management practices in light of changing climate conditions.</li> </ul> <p><b>FARM PRODUCTION PRACTICES</b></p> <p><b>Farm production</b></p> <ul style="list-style-type: none"> <li>• Diversify crop types and varieties, including crop substitution, to address the environmental variations and economic risks associated with climate change.</li> <li>• Diversify livestock types and varieties to address the environmental variations and economic risks associated with climate change.</li> <li>• Change the intensification of production to address the environmental variations and economic risks associated with climate change.</li> </ul> <p><b>Land Use</b></p> <ul style="list-style-type: none"> <li>• Change the location of crop and livestock production to address the environmental variations and economic risks associated with climate change.</li> <li>• Use alternative fallow and tillage practices to address climate change-related moisture and nutrient deficiencies.</li> </ul> <p><b>Land topography</b></p> <ul style="list-style-type: none"> <li>• Change land topography to address the moisture deficiencies associated with climate change and reduce the risk of farm land degradation.</li> </ul> <p><b>Irrigation</b></p> <ul style="list-style-type: none"> <li>• Implement irrigation practices to address the moisture deficiencies associated with climate change and reduce the risk of income loss due to recurring drought.</li> </ul> <p><b>Timing of operations</b></p> <ul style="list-style-type: none"> <li>• Change timing of farm operations to address the changing duration of growing seasons and associated changes in temperature and moisture.</li> </ul> <p><b>FARM FINANCIAL MANAGEMENT</b></p> <p><b>Crop insurance</b></p> <ul style="list-style-type: none"> <li>• Purchase crop insurance to reduce the risks of climate-related income loss.</li> </ul> <p><b>Crop shares and futures</b></p> <ul style="list-style-type: none"> <li>• Invest in crop shares and futures to reduce the risks of climate-related income loss.</li> </ul> <p><b>Income stabilization programs</b></p> <ul style="list-style-type: none"> <li>• Participate in income stabilization programs to reduce the risk of income loss due to changing climate conditions and variability.</li> </ul> <p><b>Household income</b></p> <ul style="list-style-type: none"> <li>• Diversify source of household income in order to address the risk of climate-related income loss.</li> </ul>
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As demonstrated, all the adaptation options identified by Smit and Skinner (2002) suggest the importance and need of providing financial services, because these are

the means to develop reliable adaptation strategies at multiple levels and directions. Microfinance is one of the tools most suited to implement these adaptation options in agriculture.

## **2.5 Microfinance as an adaptation mean to climate change**

Microfinance has the ability to help poor people to adapt to climate change by providing them access to basic financial services. Microfinance is the delivery of loans, savings, and insurance to poor individuals or households in order to enable them to accumulate and manage assets, establish or develop a business, protect against risks and stabilize consumption (Hammill et al., 2008; Agrawala and Carraro, 2010). But, what is interesting about microfinance is that it is not intended to serve the poorest of the poor but the “economically active poor”. This means that it is designed for those who are close to the human poverty line but still have the ability to pay for small credits (Hammill et al., 2008). With this criterion, the microfinance institutions avoid the problem of economic assistance programs where beneficiaries become dependent on the program, which does not help them out of their poverty. Precisely, one of the aims of microfinance is to help keep people from falling below the poverty line by combining microfinance with educational and training loans, health and nutrition workshops, health loans and advice on agricultural practices (Agrawala and Carraro, 2010). According to Agrawala and Carraro (2010), Microfinance Institutions (MFI) serve about 100 million of the world’s poor as their clients, of which 90 per cent are women. MFI have been implemented all over the world, especially in those countries where the poor are the most vulnerable population to effects of climate change.

## **2.6 The case study of Microfinance in Colombia**

Microfinance in Colombia is reduced to microcredit. MFI were created as a response of a governmental policy which was enhancing the development of the country through the banking expansion (Serrano, 2009). However, their field of action is limited since, by law, they are not allowed to collect money from their clients either offer insurance as it is restricted only to insurance companies (Serrano, 2009). This means that microcredit is the principal financial product offered by MFI, limit-

ing the access of poor to saving accounts, self-insurance among other services. However, the opportunities to finance the agricultural sector are better. In 2008, Agricultural Bank, the government bank that is aimed to provide credits to small farmers, participated with 55 per cent of the total of microcredits in the financial market in Colombia (Serrano, 2009). This big participation demonstrates the demand and need for those financial services from the agricultural sector and suggests the expansion and diversification of the portfolio of the financial products offered to agricultural producers. With this participation in microfinance, Colombia is creating a good business environment to promote microfinance. Despite the big demand for microcredits from farmers, there is no evidence that they have been used to mitigate the effects of climate change. Barbosa-Arias (2005) argues that only 18 per cent of the total credits awarded by Agricultural Bank in 2004 were addressed to financing agricultural production mainly of rice, cotton, maize, oil palm, sugarcane and plantain. According to Pedroza (2012), there are 39 Microfinance Institutions in Colombia which offer microcredits at an average of US\$ 1,049. The PNUMA (2013) (United Nations Environmental Program UNEP, for its initials in Spanish) has identified some institutions that are offering, particularly, MFI to farmers to cope with the effects of climate change in Colombia.

## **2.7 What should Burkina Faso do to adapt its agricultural systems to climate change**

As there are many drivers that affect the Burkina Faso agriculture, many responses should be applied to overcome the impacts of climate change. These responses should combine economic, social and ecosystem adaptations. Therefore, the proposal of this literature review is the role of microfinance in adaptation to climate change. The UNEP (2013) has identified many possible adaptation strategies associated to the susceptibility of ecosystems that could be implemented through microfinances, such as sustainable management of land and water, reduction of disaster risk, establishment of diverse and more resilient agroforestry systems, among others. MFI as insurance could allow farmers to protect against risks, such as hurricanes, landslides, flooding or earthquakes. Elbaz (2007) even proposes the creation

of weather derivatives or parametric insurance. It is new microfinance services which, unlike insurance contracts, allow farmers to protect against minimal changes in climate that can result in large losses in agricultural production. Weather derivatives are a financial contract where farmers would receive a fixed amount of money when meteorological conditions as temperatures, rains, wind and snowfall exceed significantly the estimated daily average. For instance, if the precipitation exceeds by 10 per cent the limit established by the insurance company, the company will pay 10 per cent of the total production. This type of insurance could reduce the risk of producers of maize and cotton to increasing precipitation as these crops are the most affected by changes in rainfall (Suárez-López, 2008).

## **2.8 Farmers' Adaptation to Climate Change**

Research has been undertaken by scholars around understanding farmers' awareness of climate change, options for adaptation to these changes and the factors influencing choice of adaptation methods. Mixed evidence has been presented as to whether farmers are aware that the climate is changing in their areas. For example, Ishaya and Abaje (2008) report a lack of awareness and knowledge by farmers in Jema'a, Nigeria. On the other hand, working in the Nile Basin of Ethiopia, Deressa et al. (2009) report that 50.6% of the surveyed farmers had observed increasing temperatures over the past 20 years, whereas 53% of them had observed decreasing rainfall over the past 20 years. Thus, in line with the current definition of climate change, the majority of the surveyed Ethiopian farmers demonstrated awareness. According to Deressa et al. (2009), it appears that the easiest way of assessing this awareness is to inquire from a sample whether they have observed a change in the climate across two adjacent decades (e.g., between the 1990s and the 2000s, both in terms of the means and the variances of precipitation and temperature). With that goal, our study will use that approach in its investigation. It might be expected that farmers who recognize climate change will take some actions to cushion themselves against its adverse effects. In the Ethiopian study, 58% of farmers who claimed to have observed changes in climate over the past 20 years had responded to it by undertaking some adaptation measures. In fact, several studies report agricultural adaptation

measures such as the use of crop varieties, planting trees, soil conservation, changing planting dates, diverging from crops production to livestock keeping, and irrigation as the most used adaptation methods in African countries (Deressa et al. 2009; Kabubo-Mariara 2008; Mideksa 2009; Ajao and Ogunniyi 2011; Bryan et al. 2009). However, it is clear that, for various reasons, not all farmers will adapt. In this study, the reasons for failing to adapt mentioned by farmers included lack of funds, shortage of water, poor planning, and shortage of seeds. Several factors have been put forward to explain the presence or absence of adaptation to climate change. Downing et al. (1997) explore fairly standard variables to explain adaptation in Africa. Nhemachena and Hassan (2007) identify the important determinants of adaptation in South Africa, Zambia and Zimbabwe as access to credit and extension, and also awareness. Their study suggests enhancing access to credit and information about climate and agronomy so as to boost adaptation. Ishaya and Abaje (2008) find that lack of awareness and knowledge about climate change and adaptation strategies, lack of capital and improved seeds, and lack of water for irrigation played an important role in hindering adaptation in Jema'a, Nigeria. Gbetibouo (2009) proposes that the major driver influencing farmers' adaptation in Limpopo basin, South Africa, is the way that they formulate their expectations of future climate in dealing with the changing weather patterns. According to that study, the major factor restraining farmers' adaptation is inadequate access to credit. The study also argues that, among other things, the main factors that promote adaptive capacity are farmers' income, the size of the household, farmers' experience, and engaging in non-farm activities. Below et al. (2012) acknowledge the role of public investment in rural infrastructure, a good education system that allows females equal education opportunities, availability of microcredit services, availability and technically efficient use of agricultural inputs, and availability of agricultural extension in improving adaptation in Mlali and Gairo villages in Tanzania. While analyzing farmers' perceptions of climate change, governance and adaptation constraints in the Niger Delta region of Nigeria, Nzeadibe et al. (2011) also point out that the factors responsible for hindering adaptation are inadequate information, limited awareness and knowledge about adaptation methods, and poor government attention to the

phenomenon of climate change. Deressa et al. (2011) also find that education level and gender of the head of the household, size of the household, livestock ownership, availability of credit, and temperature significantly influence the presence of farmers' adaptation in Ethiopia. Ogalleh et al. (2012), in analyzing perceptions and responses in Kenya, find that smallholders' perceptions are that climatic variability is increasing. In dealing with the negative impacts of this variability, the smallholders in this community use diversification of crop varieties, migration and sale of livestock. In addition, West et al. (2008) analyzed the local perceptions and regional climate trends on the central plateau of Burkina Faso and found that rural households in the study area vary their agricultural practices, for example, integrating different crop varieties in their agricultural activities and implementing a host of soil and water conservation practices in order to respond to drought. For those farmers who undertake any adaptation at all, the choice of specific method depends on a number of elements, including socioeconomic, environmental and institutional factors, as well as the economic structure of the country. Thus, the choice of adaptation methods depends on a range of variables which are considered important for the availability, accessibility and affordability of particular adaptation procedures. Several studies have identified specific variables which may positively or negatively affect the choice of particular adaptation methods. Deressa et al. (2009) conclude that farmers' education level, access to extension and credit, climate information, social capital and agro-ecological settings greatly influence their choices, while financial constraints and lack of information hinder farmers' uptake of other adaptation methods. Adesoji and Ayinde (2013), investigating the methods used by arable crop farmers to mitigate the negative impact of climate change in Osun State, Nigeria, suggest that age, household size, income, source of information and farm size are the main determinants of the choice of adaptation strategies implemented by farmers. In that study, the authors mention that the adaptation strategies which are regularly employed are use of different planting dates, multiple cropping, and cover cropping. In analyzing options and constraints in adaptation in Ethiopia and South Africa, Bryan et al. (2009) insist on a better understanding of climate change by farmers as a way of reducing its negative impacts. That study finds that government

farm support, farmers' income, and access to fertile land and credit influence the choice of adaptation methods in South Africa, while access to extension and credit, farmers' income and information about climate change influence the choice in Ethiopia. The study further finds that the main barrier to uptake of other adaptation methods in both countries was lack of access to credit. Each of the studies discussed above has something to offer the big picture. However, as mentioned earlier, what is important for the uptake of adaptation methods is the availability, accessibility and affordability of such techniques. Indeed, many socioeconomic variables have been investigated for their impacts on the choice of adaptation methods in different agro-ecological zones. For example, Downing et al. (1997) explore the standard variables to explain adaptation strategies in Africa but investigate specific factors affecting choice of adaptation strategies in the case of specific countries.

## **CHAPTER THREE : METHODOLOGY**

### **3.1 Introduction**

This chapter provides an overview of the methods and tools used in addressing each of the objectives of this study. Since the aim of the MSc Thesis is to assess the role of microfinance in improving smallholder farmers adaptation capacities to Climate Change in Loumbila in Burkina Faso, it is important to assess the awareness of these farmers about Climate Change, to study the challenges they have encountered and their needs to adopt adaptation and finally the possible products and services that Microfinance could provide to improve adaptive capacities of smallholder farmers.

### **3.2 Research Design**

To achieve the aim, this study obtained data from the field particularly from smallholder farmers. The methodology of this research used was a qualitative questionnaire that was responded by smallholder farmers from Loumbila in Burkina Faso. The designed questionnaire, shown in appendix, was essentially composed of 3 main components. The first one was about assessing the awareness or perception of smallholder farmers, the second one about assessing challenges farmers have faced to better cope with climate change effects and the final one which is about finding out the key role Microfinance could play in order to foster adaptive capacities of smallholder farmers.

### **3.2 Data collection**

The study targeted the agricultural locality called Loumbila in Burkina Faso. This study focused on smallholder farmers whose ages are above 25 years old. Structured questionnaire interviews were used to gather qualitative data from farmers. The questionnaire has been designed in English and translated into French given that Burkina Faso is a French country speaking. Moreover, a person coming from Burkina Faso and understanding local language called "Mooré" has been helpful as translator to facilitate the communication with smallholder farmers. A sample of 52

smallholder farmers has been selected to respond the questionnaire. The picture below (see figure 3.1) is an overview about the way the interview has been done.



*Figure 3.1: Data collection*

### **3.4 Data analysis**

To analyse the data, Excel was used to prescribe descriptive statistics of the collected data. In addition, it was also used to draw graphical patterns and trends in order to come up with a better understanding and interpretation of the data.

### **3.5 Results**

According to Smallholder Farmers responses, the main crops they produce are beans, tomatoes, potatoes, carrots, pepper, salad, onion and cucumber. Figure 3.2 shows that all of the respondents were at least 25 years old and Figure 3.3 gives an idea of the level of education of our sample (52 respondents). Explicitly, four respondents did not go to school, one respondent got the university level, twenty seven reach the secondary school and nineteen did the primary school.

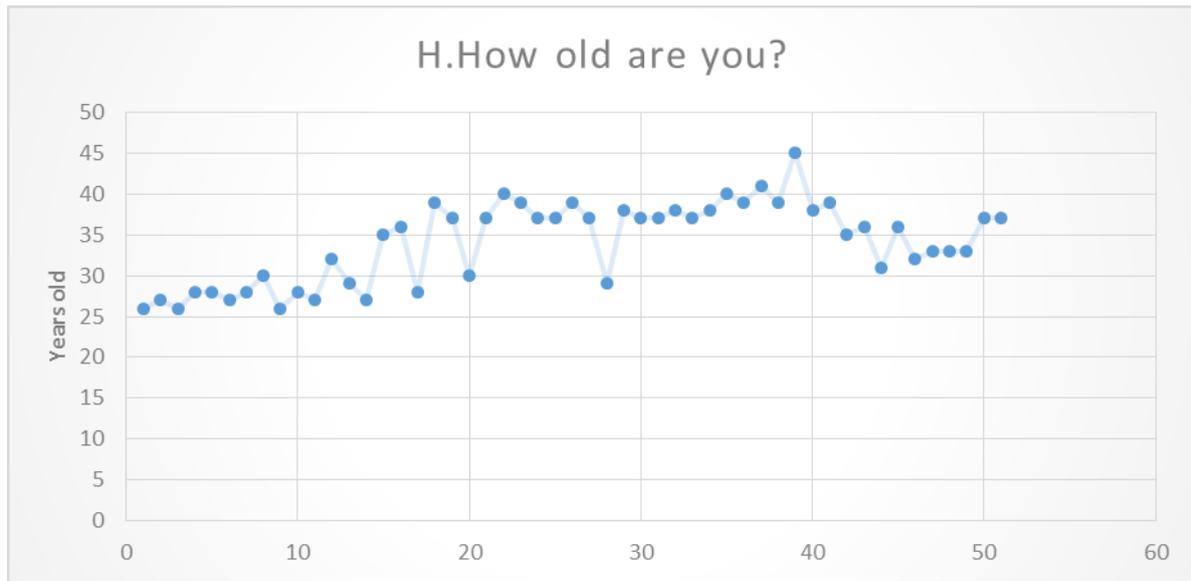


Figure 3.2: Ages of Respondents

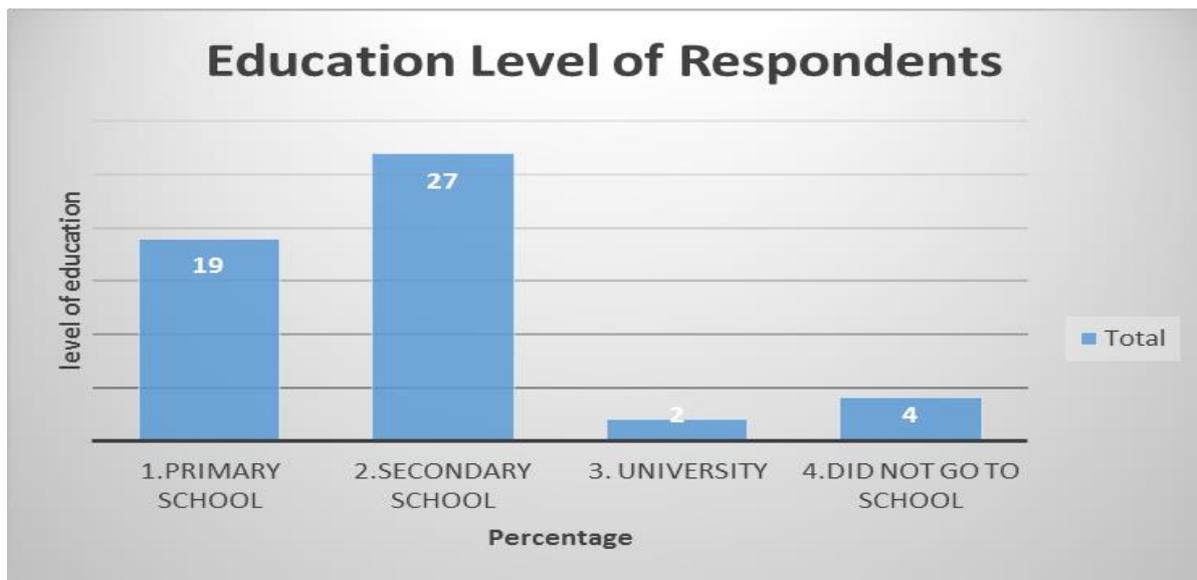


Figure 3.3: Education Level of Respondents

### 3.5.1 Smallholder Farmers awareness about CC

In order to answer the first Research Question which was to assess the perception or awareness of smallholder Farmers about CC in Burkina Faso, some key questions were asked to 52 respondents which were focused on Farmers' understanding about Climate Change, the frequency of the change in Climate they noted, the type of organisations communicating them CC information and the relevance and impact of these information on their agricultural activities. Almost all of them mentioned that they have received information about CC through some meeting and face to face. The main languages used were French and Mooré (Local Language). As far as the result is concerned, picture 3.4 shows that 45% of respondents have noticed the Change in Temperature against 55% who noted the Change in Rainfall.

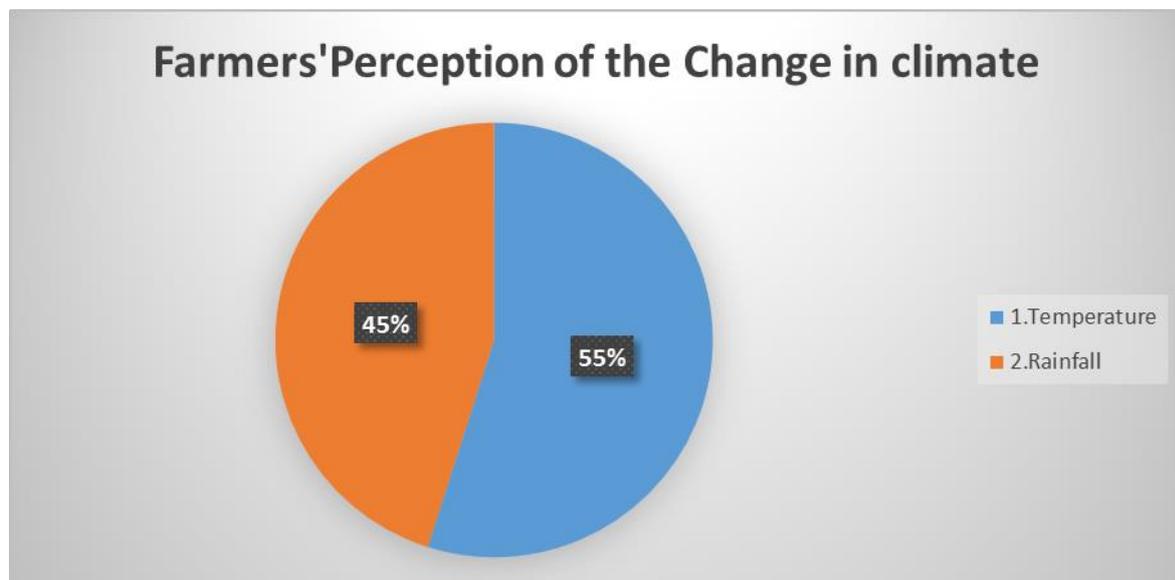


Figure3.4: Farmers' Perception of the Change in Climate

The information given in the Figure 3.5 about the frequency of the Change in Climate is that 88% of respondents think that the change happens yearly while 12% opt for each 2 years.

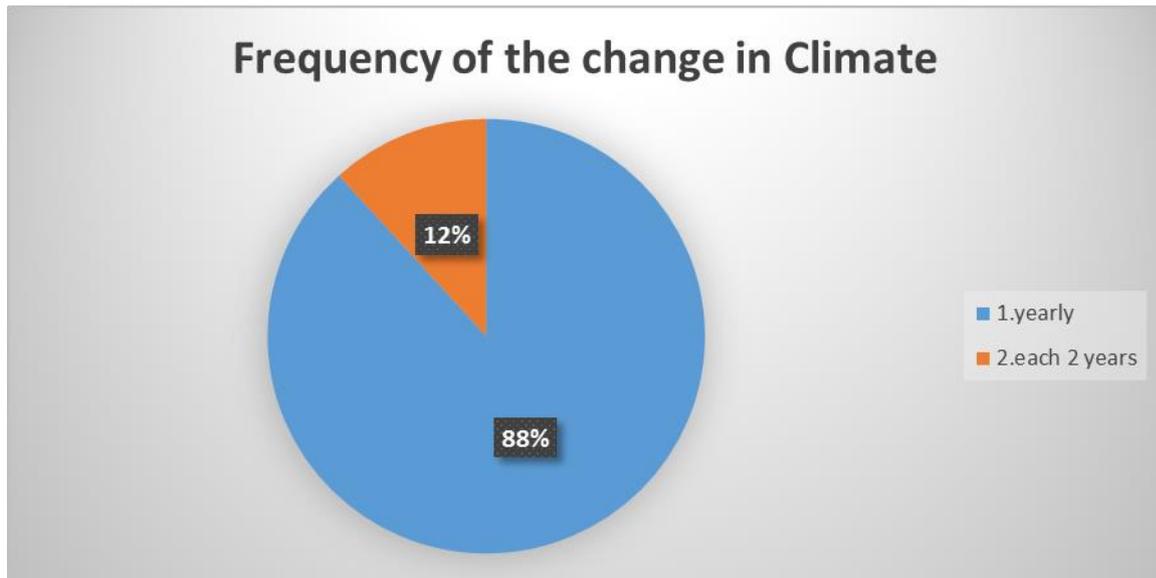


Figure 3.5: Frequency of the Change in Climate

Additionally, Farmers also noticed impacts of CC on their agricultural activities such as decrease of their yield and their income as shown figure 3.6 .

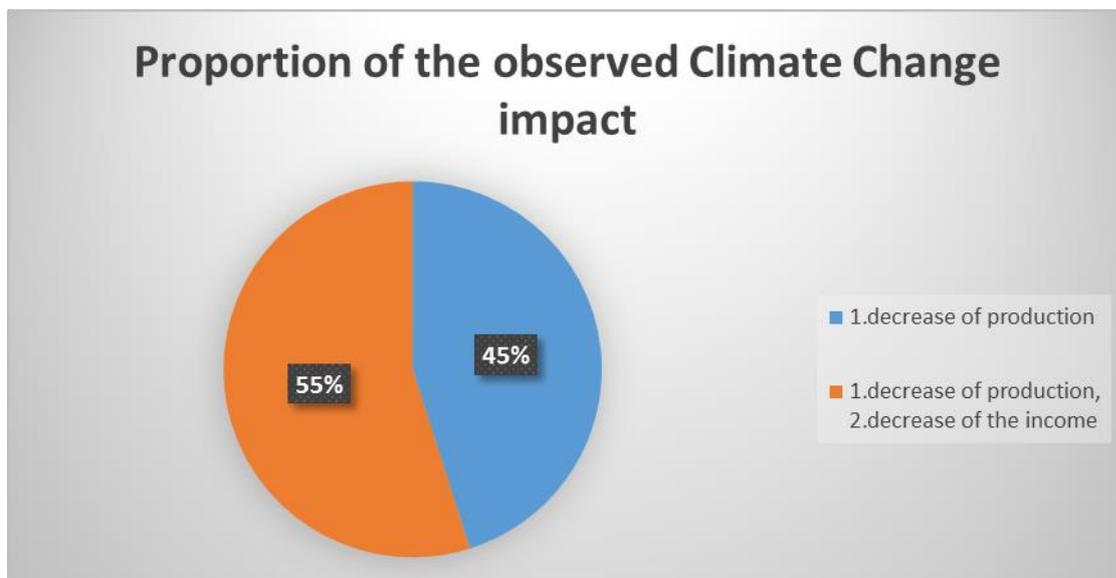


Figure3.6: Proportion of the observed Climate Change Impact

Figure 3.7 allows to understand that the main organisations which provided CC information to Farmers were NGOs and Climate Change Young Leaders.

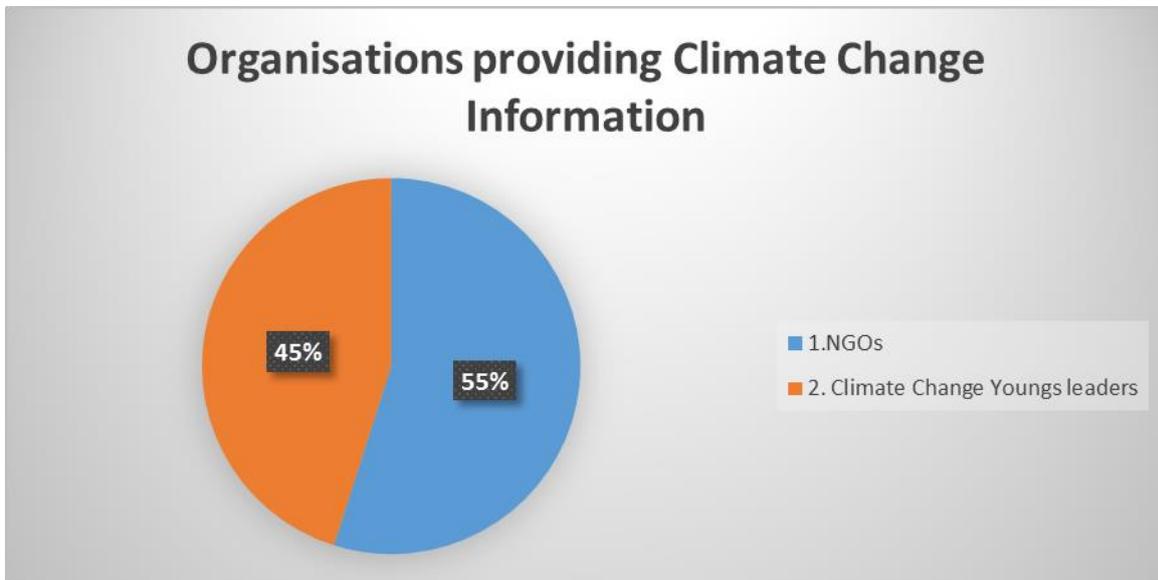


Figure3.7: Organisations providing Climate Change Information

Finally, according to the Picture (3.8), 80% of the respondents esteem that the CC information provided to them was not impactful.

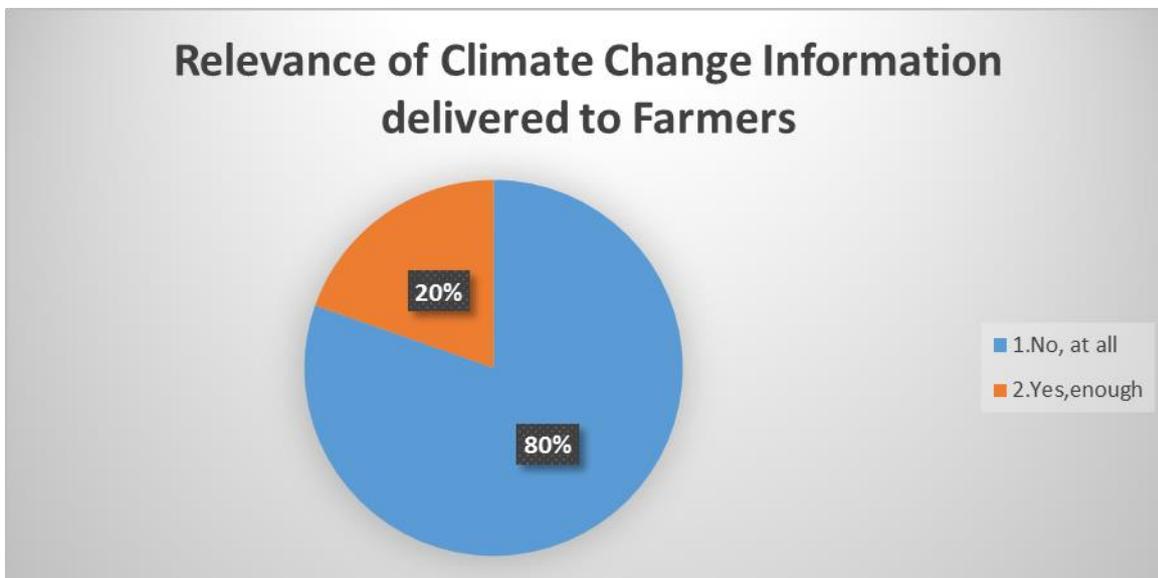


Figure3.8: Relevance of Climate Change Information delivered to Farmers

### 3.5.2 Challenges encountered by Smallholder Farmers to better adapt to CC

To answer to the second research question which was to identify the challenges encountered by smallholder Farmers, following are the main questions that have been

respectively asked to 52 respondents. The first question asked was about the irrigation method used by farmers lets us know the type of agricultural technics used. Figure 3.9 shows up the main technics used are Rain fed (30 respondents) and Traditionnal method with poor technics (18 respondents).

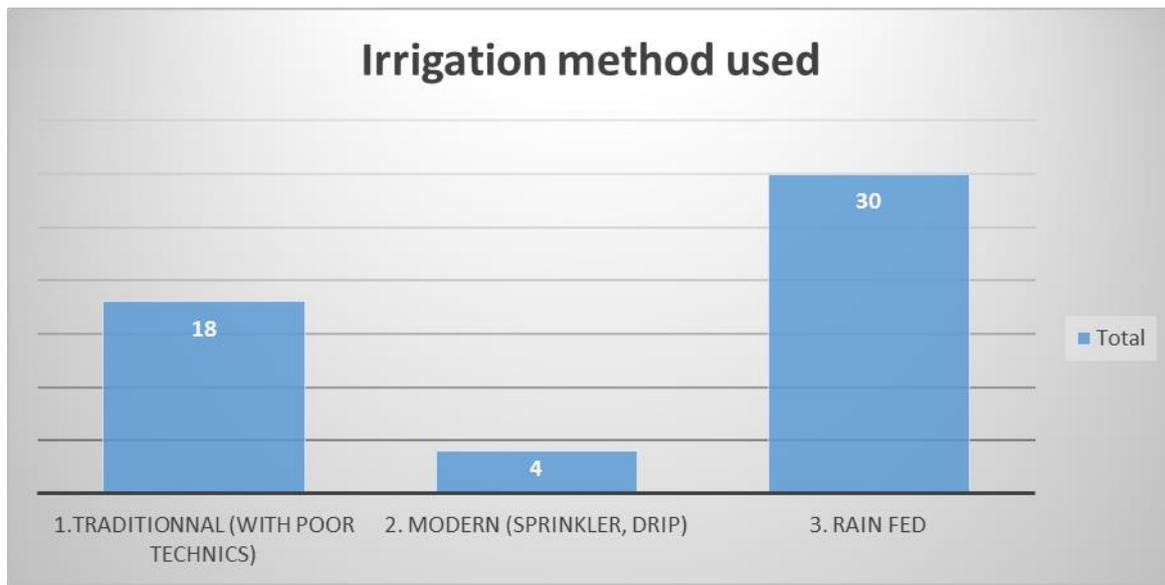


Figure3.9: Irrigation method used

Figure 3.10 gives an overview on the impact of Climate Change Information which was communicated to farmers in Loumbila. Over 52 respondents, 88 % of them mentioned CC information was impactless.

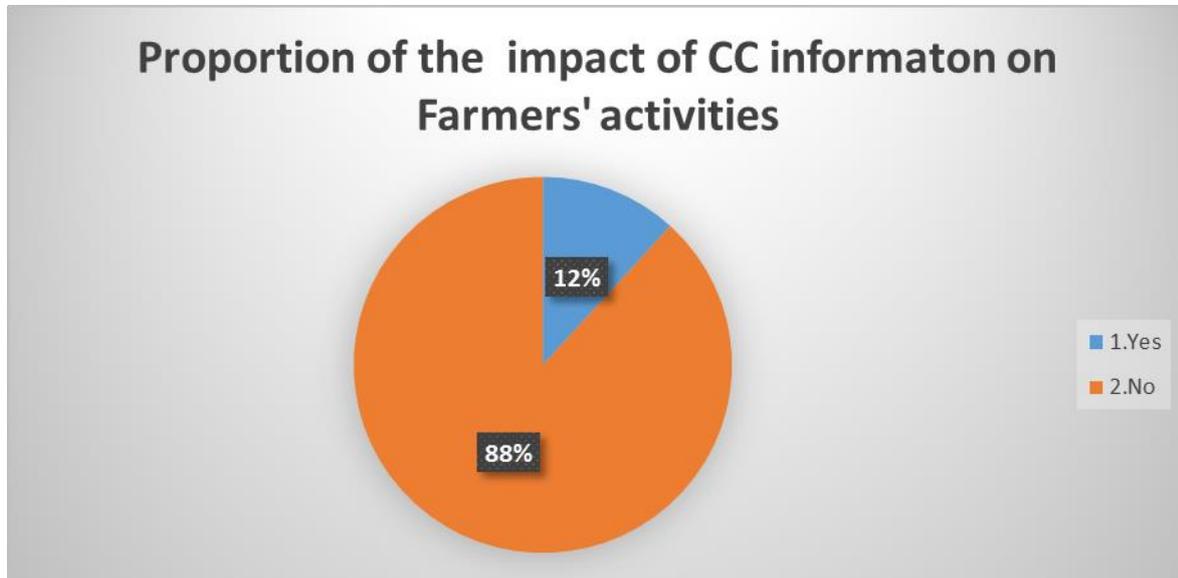


Figure 3.10: Proportion of the impact of CC information on Famers' activities

As for the Figure 3.11, it clearly indicates the main challenges encountered by farmers in Loumbila which are basically lack of green fund (financial constraints) and lack of agricultural inputs (fertilizers, machineries, agricultural equipments and seeds).

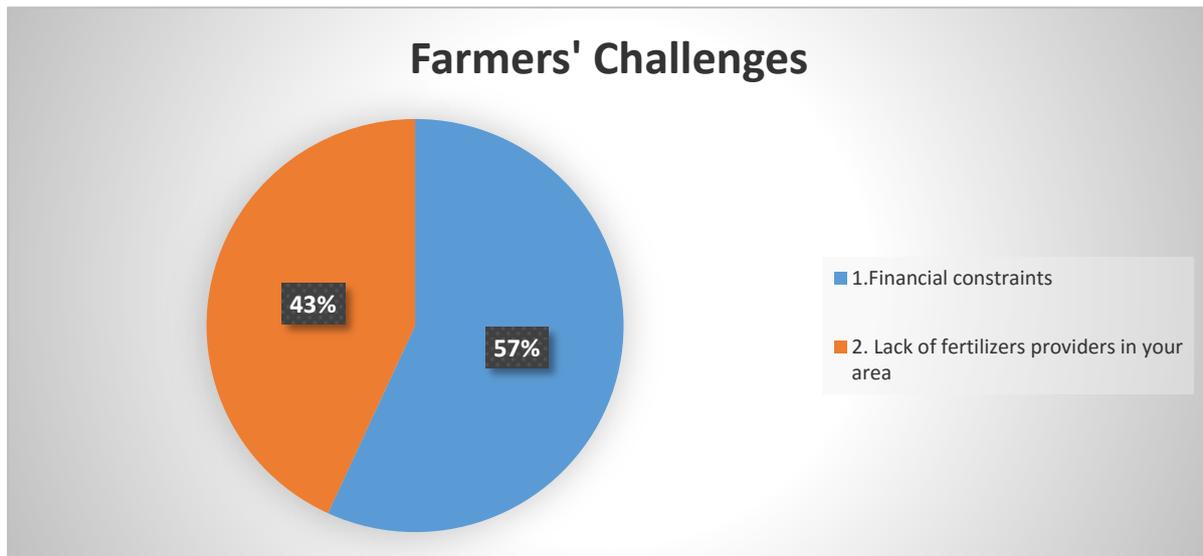


Figure 3.11 : Farmers Challenges

### **3.5.3 Possible financial products and services that microfinance institutions can provide to improve adaptive capacities of smallholder farmers.**

To answer to the third research question which was to find out the possible financial products and services that MFIS can provide to improve adaptation capacities of Smallholder Farmers, some keys questions were asked to come up with the proportion of famers who are members of MFI, the reasons for those who are not members and the financial capacity of farmers to pay back their agricultural loans they borrow from MFI. Figure 3.12 shows us that 80% of respondents are not Microfinance's member, only 20% are. Additionnaly, two open questions were asked to farmers to know what kind of products and services do they need to strengthen their adaptation capacities. Most of them noted they need green fund, loans,equipments, fertilizers, training.

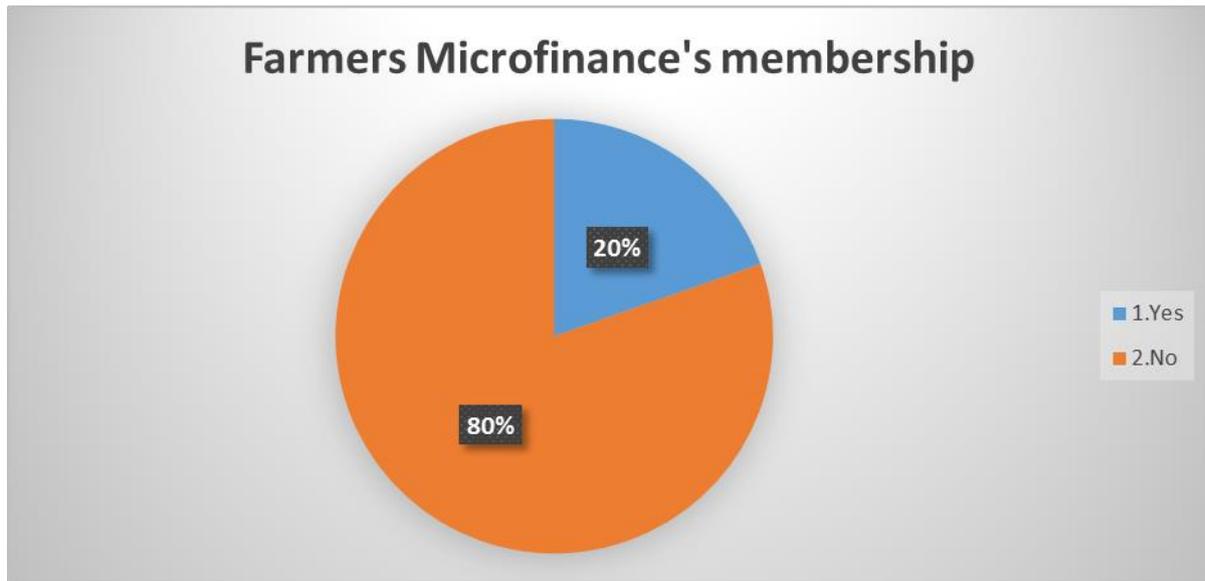


Figure 3.12 : Farmers Microfinance's membership

The reasons explaining the fact that 20% are not MFI member are given by figure 3.13. In fact, 65% of them esteems that they do not have a financial capacity to pay back the loans and 35% think that they do not know how MFI system is working.

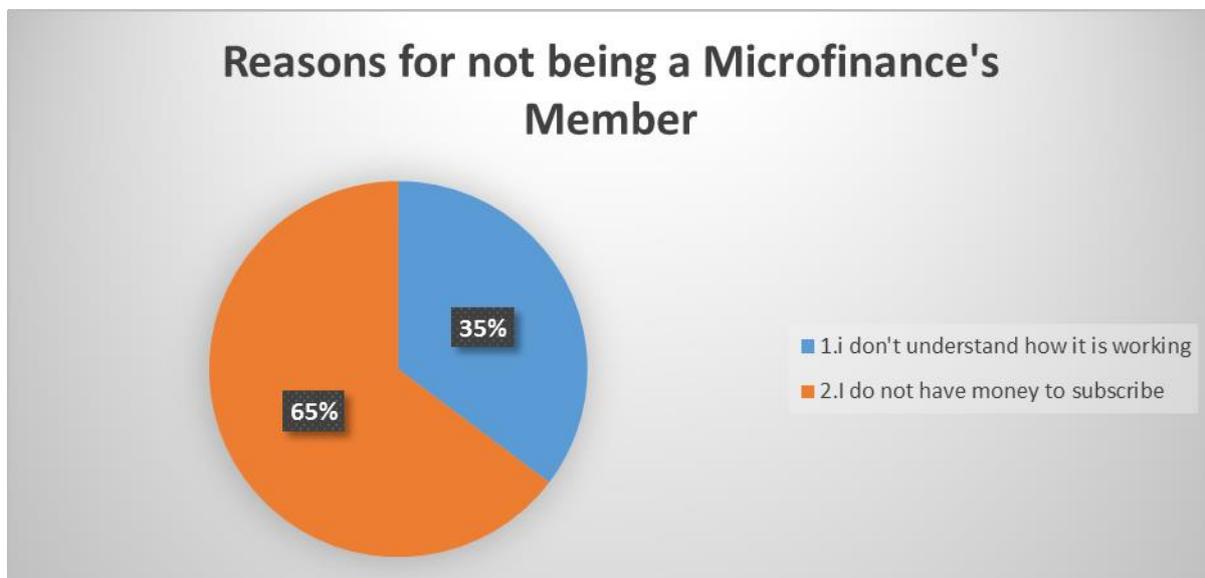


Figure 3.13 : Reasons for not being a Microfinance's Member

Figure 3.14 shows up how difficult was for the famers who took loans from Micro-finance to reimburse. Indeed, only 14% of them were able to pay back against 86% who were not.

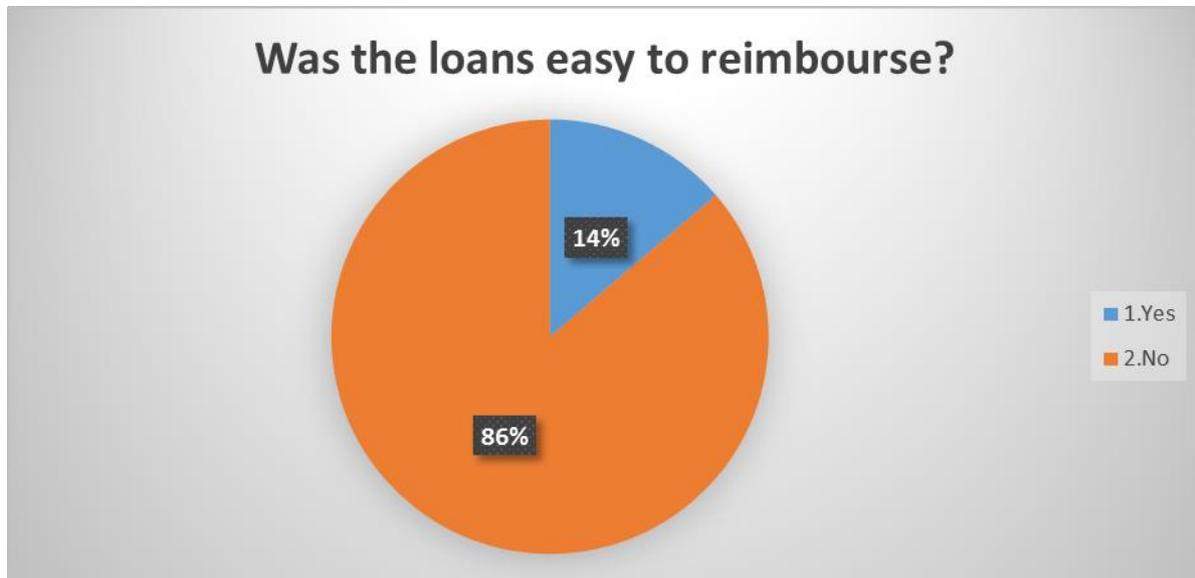


Figure3.14: Information with regard to easo to reimburse loans

### 3.6 Discussion or Interpretation of results

#### 3.6.1 Smallholder Farmers awareness about CC

Figures and Results from the questions asked to farmers about their awareness on Climate Change showed that most of them are aware of Climate Chang because they noticed they change in Temperature and Rainfall ( see figure 3.4). They also noted the impact of CC on their agricultural activities such as decrease of their yield and their income. However, although they are provided Climate Change information, they esteem that this information is not sufficient meaning that training in order to raise their awareness is still needed. Additionally, They need to be provided weather information, Climate adapted agricultural technics and training which was confirmed through their answer given to the open question what information and other thing would you need in order to improve your capacity to decrease the effects/consequences/impacts of CC.

### **3.6.2 Challenges encountered by Smallholder Farmers to better adapt to CC**

Results concerning the challenges encountered by Smallholder Farmers clearly presented above showed that the main challenges are lack of green funds, financial constraints due to the fact that it seems difficult for them to back the loans they borrow and lack of agricultural inputs such as fertilizers, machineries, agricultural equipments and seeds.

### **3.6.3 Possible financial products and services that microfinance institutions can provide to improve adaptive capacities of smallholder farmers.**

Results about possible services and products MFIs could provide to Farmers showed systems that could suit them. Meanwhile, results have showed that 35% of respondents do not understand how microfinance systems work meaning that there is a need to educate them and train them on it. Results from open questions to know their expectation from MFIs showed that they basically need green fund, loans, agricultural equipments Farmers'. Their low registration to MFI meant that there is an opportunity to implement or open a Microfinance in this locality to make business and allow farmers to develop their activities. The fact that many of them are not able to reimburse the money they borrowed meant that a pro-poor approach must be developed for them by clearly studying their financial constraints, their agricultural performance, their goods in order to propose a green loan (at an affordable rate), fertilizers and training. Following are some recommendations highlighting what MFIs could do to improve smallholder Farmers' adaptation strategies :

#### **➤ CREDIT, SAVINGS**

MFIs should be flexible into their loan contracts in order to allow farmers to adapt to CC. This flexibility can be done by permitting variable portion installments and in addition the alternative to reschedule advanced loans. MFIs can provide credit to farmers for planting less water-intensive crops. To prevent or reduce unemployment caused by extremes (droughts), MFIs can provide credit to develop new businesses, which are not too much vulnerable to drought such as livestock and agroindustry; for farmers who might lose their jobs because of drought.

### ➤ INTRODUCING REMITTANCE SERVICES

It is usual to notice that poor rural households are given funds from their family living and working in urban areas or in Europe. This remittance can be seen as an insurance households, given that it permits them to develop activities in order to have different sources of income and therefore building adaptive capacity. Remittances can allow famers to cope with CC effects and face crop failures and natural disasters. Remittances can be useful and helpful in dealing with CC due to the fact that they can be a kind of source of income unaffected by local disasters. Such Funds usually stems from countries in Europe or America that have already a strong adaptation capacity to CC and where the effects of CC will not be too much. In addition to be used for dealing with negative impact of CC on agriculture that might happen, remittances can be useful for building smallholder farmers(borrowers) safety nets. MFIs can foster farmers'adaptation capacities by using remittance services as a product. For instance, MFIs can be used to facilitate the receipt of remittances from family members by providing remittance services at a low cost compared to other bank or even providing value-adds to the services.

➤ CLIMATE INSURANCE

Lack of familiarity with potential products and lack of farmers' financial capacity have limited the insurance's service MFIs can provide to farmers. Insurance can protect farmers from the worst financial consequences of flood, drought that may happen. Insurance can be used as one of the most important tools in MFIs' climate change arsenals. Goods such as animals, gold, lands farmers possess can be used as guarantee for the insurance contract.

➤ NEED FOR INFORMATION SHARING

Farmers' Adaptation to CC in poor countries will be challenged and almost impossible because of lack of information about CC. Many farmers have little understanding of the potential consequences of CC and the strategies for dealing with these consequences. MFIs can improve adaptive capacities of farmers by building up their human capital. This can be done via the dissemination of information about climate change, its possible impact and solutions to cope with. Some information related to weather conditions in particular, the beginning of seasonal rainfall could be of great help farmers to adjust their farming practices according to long-term weather forecasts. MFIs can use their cell-phone networks by sending SMS to disseminate weather forecasts, flood warning.

## CHAPTER FOUR: CONCLUSION

Climate change is the most pressing issue that is expected to challenge agricultural sector in Burkina Faso which is a country whose economy is based on agriculture. Relevant Adaptation strategies will be needed to help farmers of Loumbila who will be the most vulnerable to CC. MicroFinance Institutions can be of great help for farmers to cope with CC impacts. Following are some recommendations about the role of MFI in improving adaptive capacities of farmers to CC.

- providing loans, savings plan and insurance, to deal with climate change. Change the conditions of loans; introduce flexibility in savings products;
- Build partnership with Meteorological Service in Burkina Faso to get relevant Climate information that be commucated to farmers by sms or radio
- Develop new insurance products—weather-based index insurance—to deal exclusively with climate change related weather fluctuations.
- Develop disaster funds locally as well in the head office.
- Work with government and civil society in the preparation of NAPA.
- Work with multilateral institutions and donors to develop concessional funding facilities for dealing with catastrophes.

### ➤ LIMITS OF STUDY

To deepen research about the same topic and come up with an accurate results some key recommendations are needed. The sample size of the study should be increased( 52 respondents is small). The time needed to conduct this kind of research must be more than 6 months.

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## APPENDICES :questions asked to farmers

### Questionnaire to be answered by farmers in Loumbila in Burkina Faso

#### Introduction

*This questionnaire serves the purpose of collecting data from smallholders farmers for conducting survey on Microfinances' role assessment in improving smallholder farmers' adaptation capacities to climate change in Loumbila (rural area) in Burkina Faso. The survey team would like to assure the respondents that any data obtained during the survey shall be used for the intended. Hence, the respondents are appreciated to freely offer the correct responses.*

*Thank you in advance for your time and cooperation.*

Interviewer's name	Date of interview	Name of the place
Name of the farmer	Start time of the interview	End time of interview

#### Information Background of the respondent

**Name of the farmers:**

**What do you produce as famers? :**

**A. Which method are you using to practice agriculture or how do you cultivate?**

1. Traditionnal (manually)                      2. Irigation system

**B. If irrigation system, what energy sources are you using for pumping water?**

1. Solar    2. Conventiounal one

**C. Are you using fertilizers?**

1. Yes                      2. No

**D. is your gaining income regular and satisfying?**

1. Yes                      2. No

**E. What is your level of education?**

1. primary school                      2. secondary school                      3. University

**F. What is your gender?**

1. Male                      2. Feminin

**G. What is your age?** ( this questionnaire should be addressed to farmers whose age is above 25 years old)

#### Understanding of farmers about Climate Change

**H. What change in the climate did you experience?**

1. Temperature                      2. Rainfall                                      3. Drought                                      4. Flood

**I. Could you give us more information about the period?**

1. less than 1 year    2. 1 year    3. 2 year    4. More than 3 year    , precise:

**J. Could you give us more information about the frequency?**

1. yearly    2. each 2 month    3. Each 3 months ,    please precise:

**K. What were the observed consequences or impacts on your yield or production?**

1. decrease of production    2. decrease of the income    4. All of them

**Climate Change communication to farmers in Loumbila**

**L. What institutions provided you information about Climate Change in Loumbila?**

1. NGOs    2. Climate Change Youngs leaders    3. Cooperative    4. any other precise:

**M. Did the information (content) about CC impact on agriculture you have been communicated was relevant and useful ?**

1. Bad    2. Good    3. Excellent

**N. What are the means that the experts used to communicate CC impact to you ?**

1. Radio    2. meeting    3. face to face    4. Tv    5. any other (specify):

**O. Which language did they use to communicate to you?**

1. French    2. local language    3. both of them

**P. Did this communication really helped you to adapt to CC impacts?**

1. Yes    2. No

**Q. If No, Why it did not help you?**

1. Financial constraints    2. Lack of fertilizers providers in your area    3. not clearly understanding

**Opened question: what do you suggest to improve the CC communication to you and your adaptation capacities?**

**Possible Services and Products MFIS could provide to Farmers to improve their adaptations capacities**

**R. Are you a member of Cooperative or MFIs?**

1. Yes    2. No

**S. If No, Why you are not member?**

1. I am not aware of their existence    2. I do not have money to subscribe    3. I do not understand the functioning    4. Any other reason, specify

**T. If yes, did you apply for loans From them to afford fertilizers, machineries, agricultural equipments, to organize agricultural technics training?**

1. Yes    2. No

**U. If No, why you did not apply for?**

1. I do not have money to apply for    2. I do not understand the functioning    3. Any other reason, specify

**V. If Yes, was it really helpful and easy for you to reimburse?**

1.Yes            2.No

**W.Apart from financial aspect, what other kind of products and services did Cooperatives or MFIs provide you?**

1. agricultural training (mentoring) 2. Giving agricultural inputs fertilizers 3.agricultural equipments

4. agricultural materials 5. Any other, specify:

**Opened question: What do king of financial and technical assistance do need to boost activities and adapt to CC?**