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ATTITUDE AND RISK PERCEPTION OF CLIMATE CHANGE IN FARMING COMMUNITIES IN TRIPOLI, LIBYA

MASTER THESIS

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We certify that thesis is fully adequate in scope and quality for the degree of Master of Arts in Environmental Education and Management.

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ABSTRACT

ATTITUDE AND RISK PERCEPTION OF CLIMATE CHANGE IN FARMING COMMUNITIES IN TRIPOLI, LIBYA

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This study investigated attitudes and risk perceptions of climate change in farming communities in Tripoli, Libya. It focused on understandings the risk perceptions of farmers towards climate in Tripoli. Due to changes in climatic conditions like temperature and seasonal variations in terms of environmental conditions، it is crucial to analyze the farmers' attitude towards climate change considering the research questions, do perceived risks affect attitude of farmers towards climate change, does farmers' attitude towards changing weather affects their perceived risk and belief, does gender of farmers affect their concern about potential problems of their operation, is there a difference between male and female attitude and risk perception about climate change, does education level has any difference in the attitude and risk perception about climate change, does farmers' age affect their perceived risk and belief towards climate change and does farmers' monthly income affect their concern about potential problems for their operation? Quantitative method was used this study and 300 respondents were considered and then analyzed statistically using SPSS. The result reveal that farmers in the region change their practices to cope with increasing weather and climatic variability in order to have a long term success of their farm and in the success of Libyan agricultural sector their attitude towards changing weather they have to adapt, the changes in weather patterns damages farm operation. In the past 5 years there are more variable and unusual weather on farms and across Libya, this extreme weather condition has affected long-term management goals. Farmers attitude towards changing weather is statistically significant to perceived risk and belief, therefore farmers attitude towards changing weather affect their perceived risk and belief. The farmers are concern about increased flooding, longer dry periods and drought, increased weed and insect pressure, higher incidence of crop diseases, frequent

extreme rain, saturated soil and pond water, heat stress on crops, loss of nutrients into waterways and soil erosion. There is no correlation or relationship between farmers' attitude and risk perception about climate with regards to education level and there is no correlation or relationship between farmers' attitude and risk perception about climate with regards to education level.

Keywords: climate change, farmers, agriculture, risk perception, attitude.

ÖZET

LİBYA TRİPOLİ'DEKİ ÇİFTLİK TOPLULUKLARINDA İKLİM DEĞİŞİKLİĞİ İLE İLGİLİ TUTUM VE RİSK ALGISI

Hesham AYOUZ

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Tripoli Libya'da yaşayan çiftçi topluluklarında iklim değişikliği ile ilgili tutum ve risk algısı üzerine yapılan bu çalışmada; çiftçilerin Tripoli'deki iklime yönelik risk algısının anlaşılmasına odaklanılmaktadır. Çevre koşulları açısından sıcaklık ve iklim değişiklikleri gibi iklim koşullarındaki değişimler nedeniyle çiftçilerin iklim değişikliği konusundaki tutumlarını araştırma soruları göz önüne alarak analiz etme, araştırma soruları dikkate alındığında algılanan risklerin çiftçilerin tutumlarını iklim değişikliğine göre etkileyip etkilemediği, çiftçilerin değişen iklim durumuna göre tutumunun algılanan risk ve inaçlarını etkileyip etkilemediği, çiftçilerin cinsiyetlerinin kendi operasyonlarının potansiyel sorunlarına olan kaygılarını etkileyip etkilemediği, iklim değişikliği ile ilgili olarak erkek ve kadın risk ve algısında bir fark olup olmadığı, eğitim seviyesinin iklim değişikliği ile ilgili tutum ve risk algısında fark yaratıp yaratmadığı, çiftçilerin yaşının iklim değişikliğine göre algılanan risk ve inançlarını etkileyip etkilemediği, ve çiftçilerin aylık gelirlerinin operasyonları ile ilgili potansiyel sorunları hakkındaki endişelerini etkileyip etkilemediği, çok önemlidir. Bu çalışmada kantitatif yöntem kullanılmış ve ankete katılan 300 kişi dikkate alınmak suretiyle SPSS kullanılarak araştırma istatistiksel olarak analiz edilmiştir. Sonuç; artan hava ve iklimsel değişkenliği ile başa çıkmak ve bölgedeki çiftçilerin çiftliklerinin uzun vadeli başarısı ve Libya tarım sektöründe başarı elde edilmesi için, adapte etmek zorunda oldukları iklim modelleri ile ilgili tutumları çiftlik işlemlerine zarar verdiğini ortaya koymaktadır. Geçtiğimiz 5 yılda, çiftlikler üzerinde ve Libya genelinde daha değişken ve sıra dışı havalar olmuştur; bu aşırı hava koşulu, uzun vadeli yönetim hedeflerini etkilemiştir. Çiftçilerin hava durumunu değiştirmeye yönelik tutumu, algılanan risk ve inanca göre istatistiksel olarak anlamlıdır; dolayısıyla, çiftçilerin değişen havaya karşı

tutumu, onların algılanan risk ve inançlarını etkilemektedir. Çiftçiler; artan sel basma, daha uzun kurak dönemler ve kuraklık, artan yabancı ot ve böcek baskısı, daha fazla tarımsal ürün hastalık vakaları, sık ve aşırı yağmur, doymuş toprak ve su birikintisi, ürünlerde ısı baskısı, besin maddelerinin su yollarında kaybolması ve toprak erozyonu, konularında kaygılıdırlar. Çiftçilerin, iklim ile ilgili tutumları ve risk algıları ile eğitim seviyeleri arasında korelasyon veya ilişki yoktur.

Anahtar kelimeler: iklim değişikliği, çiftçiler, tarım, risk algısı, tutum.

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ABBREVIATIONS

CO_2	Carbon Dioxide
COP	Conference of the Parties
ENSO	El Nino-Southern Oscillation
GDP	Gross Domestic Product
INAPA	Intelligence National Action Adaptation Department
km^2	Square kilometer
KT	Knowledge Theory
mm	millimeter
^{O}C	Degree Celsius
RCT	Rational Choice Theory
SAT	Social Assistance Theory
UNEP	United Nations Environment Program
UNFCCC	United Nation Framework Convention on Climate Change
%	Percentage

CHAPTER I
INTRODUCTION

Agronomic sensitivity to climate change is one of the most serious challenges facing the sustainability of the global food system. The increase in atmospheric carbon dioxide will be a boon in crop production and the negative effects of climate change, such as increased temperature and more variable form of precipitation, will have any benefit for agricultural production (Walthall et al., 2012). Vulnerability is defined as the intersection of exposure and sensitivity to a threat, mediated by the system's resilience or adaptive capacity (Smit and Wandel, 2006). Since agricultural systems are human-originated ecosystems, the vulnerability of agriculture to climate change is not only due to the biophysical consequences of climate change, which Marshall et al., (2009) outline a framework for conceptualizing the connections between the biophysical and human components of agricultural vulnerability to climate change.

Libya is a large North African country and has a desert with a high level of drought and less than 1% of the Libyan soil is arable, which makes it one of the most arid countries in the world with an average annual rainfall of 300-400 mm. The lack of arable land with poor soil quality seriously limits Libya's ability to produce crops; As a result, the country imports about 80% of its food, and most of the population lives along the lush Mediterranean shoreline (LSE 2017).

The country is divided into three distinct climate regions that largely coincide with physiographic differences: (1) the Coastal Plains, (2) the Northern Mountains and associated highlands and plateaus, and (3) the Sahara Desert that extends from the Gulf of Sidra, which divides the Coastal Plains in the center of the country and the Southern and Western Mountains.

The weather condition include dry summers and warm wet winters as the most productive temperate climate conditions. Libyan climate throughout the country is quite different from the Mediterranean. The rainy season is less than 50 mm (Michal et al., 2015), whereas the Sahara Desert dominates the Northern Mountain.

Agriculture, particularly crop production, depends on relatively consistent weather patterns from year to year. Crop production is reliant on predictable temperatures as well as timing and amount of precipitation, particularly during critical stages of plant development. This leaves this industry particularly vulnerable to expected increases in extreme weather events including extreme heat and drought as seen in the summer of 2012 due to climate change. Agricultural adaptation to climate change includes modifications made to the agricultural system in response to current or future climate changes, which reduce vulnerability to climate change, and capitalize on opportunities propose a typology of agricultural adaptation to climate change organized by sector with four broad categories (Smit and Skinner, 2002):

1) Farm production practices,
2) Technological developments,
3) Farm financial managements،
4) Government programs and insurance.

This study addresses, directly or indirectly, to each of the four types of agricultural adaptation to climate change. At the farmer level, which is the primary focus of this thesis, potential production adaptations include modifying inputs, crop rotations and harvesting methods, reducing or eliminating tillage, utilizing drought tolerant corn hybrids, as well as diversifying into different types of crops expected to be more resilient to new weather patterns. More informed decision-making by farmers that incorporates weather and climate information and forecasts is a strategy that would fall under technological developments to increase Libya agriculture resilience to climate change (Mary et al., 2017).

Libyan soil is arable, which makes it one of the most arid countries in the world with an average annual rainfall of 300-400 mm. The lack of arable land with poor soil quality seriously limits Libya's ability to produce crops; As a result, the country imports about 80% of its food, and most of the population lives along the lush Mediterranean shoreline (LSE 2017).

1.1 Problem

How the farmers perceive climate change and how it affects agricultural activities in Tripoli Libya.

1.1.1 Sub problem

1. Do perceived risks affect attitude of farmers towards climate change?
2. Does farmers' attitude towards changing weather affect their perceived risk and belief?
3. Does gender of farmers affect their concerns about potential problems of their operation?
4. Is there a difference between gender attitude and risk perception of climate change?
5. Does education level have any difference in the attitude and risk perception about climate change?
6. Does farmers' age affect their perceived risk and belief towards climate change?
7. Does farmers' monthly income affect their concern about potential problems for their operation?

1.2 Aim of the Research

This thesis aim at understanding the risk perception of farmers towards climate in Tripoli and due to changes in climatic conditions like temperature and seasonal variations in terms of environmental conditions. It is crucial to analyze the farmers' attitude towards climate change. The main interest in this topic is the anthropogenic activities which contributes to the factors that cause climate change globally and around Tripoli especially industrialization in terms of oil exploration.

1.3 The importance of the study

Increase of greenhouse gas accumulation in global climate system: Scientists believe that land cover and agricultural activities are responsible for the global warming of the earth's surface, (Collier, 2007; IPCC, 2007), which increases greenhouse gases (primarily carbon dioxide, methane and nitrogen oxides), the change in composition of the atmosphere by increasing the amount of change;

(Yanda and Mubaya, 2011; Omambia et al., 2010). There are still debates about climate change, although there is a natural consequence of climate change, even among scientists, on global warming (IPCC, 2001; Sivakumar et al., 2005).

However, climate change and climate variability are designed for some African countries to reduce rainfed yield by 50% by 2020. In addition, projections suggest that in 2020, about 75% people in Africa will experience an increase in water demand and water problems as a result of climate change, which will further increase the problems associated with water (IPCC, 2007).

1.4 Assumption

- It is assumed that the contribution of farmers to this is based on their awareness and their perceived attitude towards climate change.
- It is also assumed and approved that the group of farmers chosen for this research study is appropriate enough to give real research outcomes.
- The answers given by farmers were based on their valid reasoning.
- The farmers lack of knowledge towards climate change shows their attitude and action towards environmental situation related to changes in their yield.
- It is believed that the related literature obtained for this study is satisfactory and sufficient for use.

1.5 Limitations

The limitations of this research were as mentioned below:

- This study was limited to the farmers in the chosen communities of Tripoli only.
- The research participants or respondents were limited to only 300.
- The materials / resources used were restricted.

1.6 Definition

- Risk has been defined in a number of ways, but is often seen as the likelihood that an individual will experience the effect of danger (Short Jr, 1984).

- Rosa (2003) defined risk as a situation or an event where something of human value (including humans themselves) is at stake and where the outcome is uncertain.
- Risk perception is the subjective assessment of the probability of a specified type of accident happening and how concerned we are with the consequences. To perceive risk includes evaluations of the probability as well as the consequences of a negative outcome. It may also be argued as affects related to the activity is an element of risk perception. Perception of risk goes beyond the individual, and it is a social and cultural construct reflecting values, symbols, history, and ideology (Weinstein, 1989).
- According to United nation (UN) (1992), climate change means a change of climate directly or indirectly attributable to human activity which changes the composition of the global atmosphere and, in addition to the observed natural climate variability within comparable time frames.

CHAPTER II
LITERATURE REVIEW

2.0 Overview

This section looks at the published literature on public perception and response to climate change. It includes examining the relationship between climate change and growth, general information about climate change, such as causes, adverse effects and the most vulnerable groups in the changing environment, reviews responses to mitigation and adaptation against the adverse effects of extreme weather events, it investigates the public's awareness, knowledge, beliefs and perceptions of the threats of climate change. As a result, some studies on risk theories and risk perceptions will also be explained.

2.1 Climate and climate change

Dynamic interaction between the atmosphere, the ocean, the cryosphere, and the land and sea biospheres global climates on the Earth's surface (Githeko et al., 2000, Chakraborty et al., 2000). The IPCC report (2014), argues that the total anthropogenic emissions of greenhouse gases continue to increase from 1970 to 2010, the highest observed between 2000 and 2010.The temperatures of the soil are important factors in the rising and global climate change, The ocean and the increase in surface temperatures and precipitation changes (Collier et al., 2008; Challinor et al., 2007). Adler et al., (2003) propose a new methodology to assess the impact of climate change on climate change.

Temperature and precipitation changes are also expected to affect extreme weather events (flood, drought, and storm), water availability and accessibility; nutrition and health status affecting food production (availability) and prices (IPCC, 2007; Omambia et al., 2010). For this reason, socio-economic impacts are likely to be significant and affect people (Heltberg et al., 2009; IPCC, 2007) in a variety of direct and indirect ways. The impact of climate change and climate variability is expected to lead to massive and devastating global consequences on a global scale, but the most negative impact is expected to occur in developing countries in this context, changes in climate and socioeconomics (Stern, 2007, IPCC 2007;

Omambia et al., 2010) and in Africa it will create multiple threats to economic growth and poverty (IPCC, 2007; Stern, 2011).

2.2 Climate change in Africa

Africa is a large tropical continent dividing the Equator into two hemispheres (Sivakumar et al., 2005; Hulme et al., 2003), a wide-range soil from 35 °C to 35 °C, Collier, (2001) and researchers have reported that the climate regimes ranging from arid and semi-arid with equatorial scales, rainfall and temperature scales are varied and the temporal variability of temperature is varied (Haile, 2005). Other areas such as southern and northern Africa experiences changes in some regions, such as the affected regions (Collier et al., 2008; Hulme et al., 2001) by four major global factors in the region around the Equator, the El Nino-Southern Oscillation (ENSO), the Indian Ocean and West Africa monsoon, all circulation patterns (Collier et al., 2008, Rosenzweig et al, 2001. Haile, 2005; Stringer et al., 2009). In addition greater contrast to the African environment and continent is, the presence of water bodies in lakes and rivers has been modified (Semazzi Sun, 1997, Sivakumar et al., 2005).

The total temperature throughout Africa has risen by about 0.7 °C during the 20th century and some general circulation patterns projected to warm the continental increase in the range of 0.2 °C per decade (high scenario) (Hulme et al., 2001, Sivakumar et al., 2005, IPCC, 2007). The warming rate in the 20th century is about 0.05 °C per decade (IPCC, 2007). Sulakumar et al. (2005), Hulme et al. (2001) and Henson (2011) warn that warming will cause a significant increase in East Africa's equatorial region. The dry season can be exacerbated by 5-10% but wet season rainfall can rise between 5 and 20%. Henson (2011) points out that too little of a site is inefficient or can cause excessive rain, flooding while it can make it even deserted (Henson, 2011). Although the temperature trends in Africa seem to be the same, climate change is not always uniform in a large continent like Africa. Instead, it will have different impacts on climate change in time and space in different areas. For example, certain areas will become humid and others will become drier and drift in response to the effects between individuals, households, classes, companies, countries and ecosystems in different parts of the continent

(Rosenzweig et al., 2001; Thornton et al., 2010; IPCC, 2007; Yanda and Mubaya, 2011).

However, there is a general consensus on the vulnerable proposal of most African countries because of their dependence on climate change and climate variability, because of the rains and the natural resources that will be most likely to come from the local media, farming (IPCC, 2001). According to the IPCC report, agriculture accounts for 70% of the GDP of some African economies (IPCC, 2007). Moreover, limited resources are increasing the vulnerability of least developed countries to the effects of climate change and volatility. Poverty associated with the highest dependence on natural resources, while at the same time more adaptive choices in the least developed countries community boundaries (Omambia et al., 2010). Developing countries, particularly in Africa, have a and adaptation strategies to manage a range of issues, including extreme weather conditions (drought and floods) (IPCC, 2007).

2.3 Climate change and development

Climate change and development are intertwined. Climate change is increasingly regarded as a real threat to people and development (Corfee-Morlot et al., 2016). Extreme weather events such as droughts, floods, and temperature waves occur and threaten the economy in all the countries of the world (Boyd, 2014). Climate change is not only an unpredictable problem (Johan et al., 2009) but today it is defined as the greatest challenge to people (Morecroft & Cowan, 2010). Other issues such as debt, energy security, food security and ecological insecurity do not mean that they are not as important as climate change, but climate change has the capacity to exacerbate these problems (Morecroft & Cowan, 2010).

On the contrary, developmental or economical processes are important changes in the climate. The 21st century is referred to as the hottest century due to the dramatic increase in greenhouse gas concentrations in the atmosphere, which leads to an increase in industrial production (Matthew, 2012). Greenhouse gases "are gas components of the atmosphere that are both natural and anthropogenic, absorbing and re-absorbing infrared radiation." (UN, 1992) Economy Energy in the

world has caused an increase in greenhouse gas emissions, especially in China (Olivier et al., 2015). In addition, as more than 9 billion of the world's population are expected in 2050, more food and energy resources are needed. As a result, both energy and agricultural production should be expanded. This will cause adverse effects by a changing environment threatening thousands of lives and living resources (Lee, 2010). As a result, development processes are threatened by climate change, which is the same result of development activities. The United Nations is committed to the sustainable development of the United Nations. Climate change can stem from unsustainable growth (Baker, 2006). Sustainable development is perhaps the way to combat climate change (Lee, 2010). The effect of global warming and the solution of economic instability (Lee, 2010).

The green economy was first introduced in 1989 by the London Center for Environmental Economics, but it was seen as a challenge to economic growth because the idea was not widely accepted as in Korea (Lee, 2010). Businesses believed that their products would not compete in global markets, passing green economy, which would be a priority in production because of environmental economic concerns, Green economy is defined by the United Nations Environment Program (UNEP) as" one that results in improved human welfare and social equality while significantly reducing environmental risks and ecological gaps" (Abaza, 2012) .In this sense, a green economy is an alternative form of production that develops income generation and does little harm to the environment. The key element of the green economy is low carbon emissions. Significant efforts are needed to ensure a green economy or sustainable development (Lee, 2010).

Firstly, there is vigorous political will and direction and strong policy enforcement are needed. The second requirement is perception and behavioral changes in the acceptance of the green economy concept. This requires some regulation and policy change, such as carbon pricing and taxation as both an incentive and a punishment. The most important requirement is the advanced technology that will support the green economy. As part of this, a sustainable infrastructure is recommended as one of the solutions to climate change (Corfee-Morlot et al., 2016). Infrastructure refers broadly to both man-made (energy,

transports, buildings, and services) and natural (forests, water, and landscapes) infrastructure types. Sustainable infrastructure is believed to have the potential to increase economic growth, achieve sustainable development goals and reduce the impacts of climate change. In this paper, we propose a new methodology for the development of sustainable development. In short, as climate change and development are interrelated, new platforms of development are required to maintain economic growth and reduce impacts on the environment (Corfee-Morlot et al., 2016).

While adaptation adjustment is regularly viewed as an administration strategy response in agriculture, it likewise includes basic leadership by agro-business and makers at the farm level.

Subsequently, adaptation in agriculture change as for the climatic boosts to which modifications are made (i.e. different qualities of climate change, including variability and extraordinary events) and as indicated by the diverse farm types and areas, and the financial, political and institutional conditions under which the climatic stimuli are experienced and management choices are made. Numerous potential agricultural adaptation choices have been recommended, speaking to measures or practices that may be received to lighten the feasible unfavorable effects. They include an extensive variety of structures (technical, monetary, administrative), scales (worldwide, regional, local) and members (governments, industries, farmers).

Their applications have been impacted by phenomena of intrigue (organic, financial, social etc.) and by time scale (quick, month, years, centuries) (Smit and Wandel, 2006). A large portion of these techniques speak to just potential adaptation measures, instead of ones really received. Climate change affect investigations regularly assume certain adaptation, despite the fact that the adaptation procedure itself stays indistinct. There is a need to comprehend what sorts and types of adaptation are conceivable, practical and likely; who might be associated with their execution and what is required to encourage or support their improvement or selection (Robert et al., 2012).

Hence, understanding farmers' knowledge and perceptions of the impacts of climate change may stimulate adaptation initiatives and incorporate information and insights of knowledge from the partners who settle on choices in the agriculture segment, and from producer organizations, farm groups and government offices. Keeping in mind the end goal to comprehend the conceivable adaptation measures equipped for diminishing vulnerability to the effects of climate change and enhancing agriculture-dependent livelihoods, more practical adaptation techniques will help in lessening vulnerability to climate change.

2.4 Causes of climate change

In fact, it is important to note that changes in climate are a result of the development of the industrial sector. Industrial countries are the world's largest producers of greenhouse gases in the past and today (Boden et al., 2015; Olivier et al., 2015). The industrial sector has increased three times since 1970 fossil fuel production, and combustion by threefold (approximately two-thirds) of contributing greenhouse gas emissions (Olivier et al., 2015).

The burning of fossil fuels releases CO_2 into the atmosphere, leading to a thicker layer of CO_2. As fast-growing economic industries still motivate high-carbon infrastructures, with increasing demand for energy and transport, the concentration of greenhouse gas emissions in the atmosphere will double, consequently leading to a much warmer planet. Another form of development, agriculture, is considered to be one of the major contributors of greenhouse gas emissions. Agricultural activities such as using chemical fertilizer and animal-raising are the major contributors to climate change because both chemical fertilizers and animal manure emit methane, a type of greenhouse gas (Lappé, 2011). For instance, nearly half of New Zealand's greenhouse gas emissions were contributed by agriculture (Ministry for the Environment, 2014). In short, industrial and agricultural activities have led to an increase in temperature globally by more than 1 degrees in 2015, and will continue to increase the global temperature (Blunden & Arndt, 2016).

Figure 1.
Global greenhouse gas emissions by economic sector in 2010 Source: (IPCC, 2014)

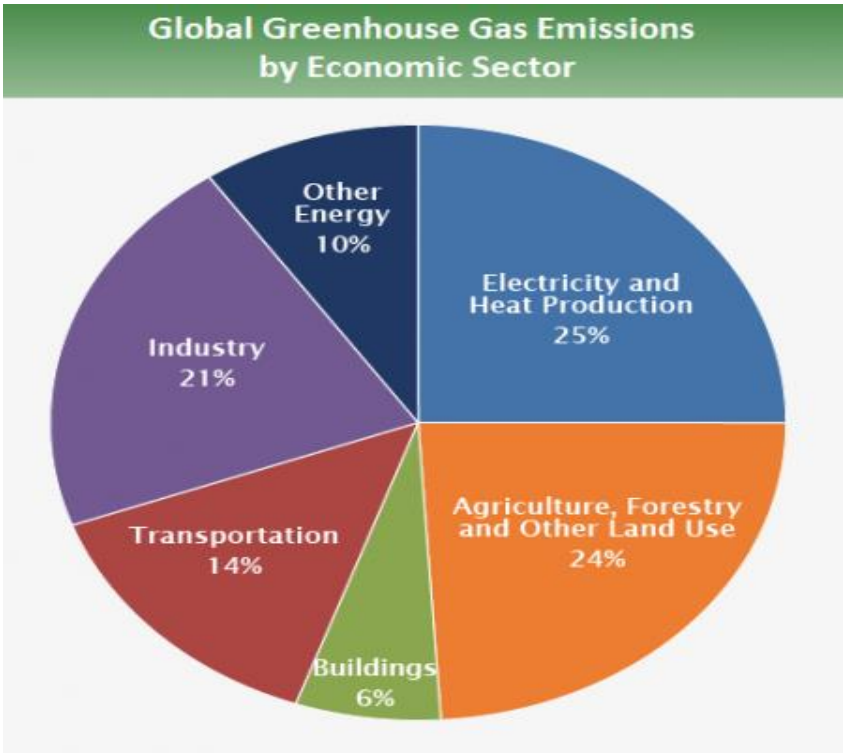

Figure 1 shows the sources of greenhouse gas emissions that are the major cause of global climate change. Emissions of these gases are largely associated with energy consumption (industry, electricity and head production, transportation, building and other energy), accounting for 76% of total emissions. Using power is the largest contributor to greenhouse gas emissions followed by land use and agriculture.

2.5 Impacts of climate change

Climate change has potentially adverse effects on the environment, society and the economy. Minor changes in the world average temperature can cause flooding, drought, heavy rainfall, and frequent and violent ripples. These extreme weather events have serious effects on ecological systems, economic growth and human health (Bardsley & Wiseman, 2012; IPCC, 2007). Poor, young and old people are affected by many problems such as heat waves, extreme climate, malnutrition, food shortages and loss of organs, especially people like sensitive

groups, (Thomas et al., 2014). Details of the effects on the environment, society and economy are described in the following sections.

2.5.1 Environmental impacts

Climate change environmental impacts include the reduction of fish quality of life, underground depletion and destruction (Udmale et al., 2014). Global warming increases water temperature, decreases oxygen content, increases mosses and increases bacteria and fungi (Elshemy, 2013). Global warming leads to drier climates and fresh water depletion (Taylor et al., 2013). Furthermore, CO_2 variations in the ocean and surface ocean high temperatures affect oceanic metabolism and the growth of marine life and marine plants and changing environmental systems (Perry et al., 2005). Climate change and adaptable capacity of organisms are expected to cause massive and irreversible damage to coral reef ecosystems. For example, when the temperature increase exceeds 1 to 2 °C, it is expected to disappear in about 15 to 40% of species (Stern Review, 2006).

2.5.2 Socio-economic impacts

Changes in climatic condition does not only the climate change climate but also the negative consequences for humanity, health, livelihood and economy (Loo et al., 2015; Udmal et al., 2014). Since 1995-2014 more than 15,000 extreme weather events have killed more than 525,000 people, exceeding 29.7 billion USD, and damaging the national infrastructure and economy, from around the world (Kreft et al., 2016). Moreover, climate change has caused health problems such as heat stress, flooding and droughts, diarrhea, physical damage and respiratory diseases caused by heat of death (Haines & Patz, 2004). Collins et al., (2013) investigated the relationship between death and malnutrition in this study. Extreme weather events contribute to livelihoods activities, and economic losses, which reduces agricultural production. The seller has been accused of extreme drought and storms, for example, in crops, horticultural crops and livestock production in harmful and many developing countries, leading to income losses (IPCC, 2007; World Bank, 2009).

Jianjun et al., (2015) relate this drought to 34% of grain yields. They stated that drought threatened families have less grain options for daily consumption of food safety. In addition, dry conditions lead to conflicts between water users and water deficit in the connected area. These combined effects of climate change in agriculture are likely to intensify food because of the widespread uncertainty and many farmers will not be able to drink water and produce plants. The impacts will worsen in the future and will further increase existing problems, especially for developing countries, such as poverty, food insecurity and economic losses.

Finally, the changing climate threatens human life in every sector. The impacts can be seen in damage to ecosystems, destruction of infrastructure, economic losses, and reductions in crop production, leading to difficulty in accessing food and water. These issues have been covered only briefly here, but they indicate the extent of climate change challenges, and demonstrate the interconnectedness of vulnerabilities.

2.6 Vulnerability to climate change

Climate change is global, but the effects are not evenly shared between regions. (Harrington et al., 2016; Stern Review, 2006; World Bank, 2009), the victims of extreme climate events that are the most affected. Climate According to the 2016 World Risks Index, developing countries are generally more vulnerable to climate change than developed countries (Kreft et al., 2016). Poor countries are most vulnerable to the most vulnerable hot and climatic effects (Harry & Morad, 2013; Morton, 2007), many of whom are already living in rural areas because they are more vulnerable to climate change than rich countries. In addition, the economies of these countries are drought-tolerant and vulnerable agriculture, (Leiserowitz, 2007; Ludwig et al., 2007). It is important that developing countries have a low ability to adapt to the adverse effects of changing climate, generally at a lower level than rich countries. They do not have enough access to technology to help human and financial resources and adaptation. (Harry & Morad, 2013; Leiserowitz, 2007; Ludwig et al., 2007; Morton, 2007).

In developing countries, small farmers are considered to be the most vulnerable to the effects of climate change, especially in drought (Burnham, 2014; Lappe 2011; Morton, 2007; Truelove et al., 2015). Agricultural production is intensive and does not depend on access to modern technological equipment and global markets. In addition, agricultural land is often marginal environments that are exposed to climate change and the precariousness of land ownership (Morton, 2007). Climate change can exacerbate existing deficits and reduce the ability of small farmers to produce water and gain access to water and generate income. Furthermore, it is estimated that the regional weather, such as monsoon rains, will also fall by 70% in the late 21th and early 22nd centuries, while the precipitation in Southeast Asia is expected to be delayed until 15 days before the weather gets warmer and humid climate (Loo et al., 2015). Some areas will be buried, while others will suffer drought that damages plants and livestock. Millions of farmers will have to migrate temporarily or permanently and will increase hunger. Along with ocean acidification and global population growth, people will also experience water shortages for consumption and use. Rice production will also decrease. The International Rice Research Institute showed that the dry season increased by at least 1 °C (RGC, 2013) at night temperature, reducing rice yield by 10%. Many farmers will live in difficult access to basic needs such as water and food since rice farming and water access is essential.

2.7 Obligations and responses to climate change risks

It is important that you act urgently as climate change is so large that it can worsen existing weaknesses. Addressing the risks of climate change requires strong commitments from all countries and international co-operation (Fankhauser & Stern, 2016). However, developing countries like Libya (based on equality of people struggling with climate change) (under-developed and developing countries struggling with climate change) have been forced to appeal for climate justice in developing countries, because there is not enough capacity and funding to combat climate change and developed countries and developing countries (Mary Robinson Foundation-Climate Justice, 2011). Climate-prospective, rich countries say they have a special responsibility because they are the world's biggest producers of

greenhouse gases. These countries have the obligation to support at a certain level the transfer of knowledge and technology to reduce greenhouse gas emissions and to increase the capacities of such developing countries to mitigate and adapt to changing financial resources. Responses to climate change include two main approaches: mitigation and adaptation. Reduction and adaptation require both effective implementation because there is not enough choice for treatment of the adverse effects of changing climate (IPCC, 2014).

Adaptation includes leadership of farmers at the farm and farm level while being regularly addressed in response to the administrative strategy in agriculture. Then the adaptation of agriculture, as well as the modifications (such as variability and extraordinary events), are made and strengthened, as indicated by different types of farms and regions. The economic climate, political and institutional conditions that climate change experiences and climate change have become a management preference. Many possible agricultural adaptation options have been proposed, either from measures that could be taken to mitigate potential adverse effects or from practices. These include a wide range of structures (technical, financial, administrative), scales (global, regional, local) and members (governments, industry, farmers). The practices were influenced by intrigue events (organic, economic, social etc.) and the chronological scale. Many of these techniques actually refer only to potential adaptation measures instead of measures taken (Smit and Wandel, 2006).

2.7.1 Climate change mitigation

Mitigation of climate change means reducing the intensity of greenhouse gas emissions to the environment (IPCC, 2014). It is necessary to take action for mitigation at international level, especially for countries with the largest producers of greenhouse gases. The United Nations Framework Convention on Climate Change (COP 21), the 21st Conference of the Parties' Conference, marked a significant improvement in global cooperation, less than 2 °C (Climate Center and Energy Solutions, 2015). This would require the release of all of these gases (such as fossil fuels) or atmospheres (for example, for the oceans and forests), which

would require an increase in the storage of these gases. People, especially those from developing countries, will face similar catastrophes and will not act (Kreft et al., 2016). Every country should now have a policy plan to mitigate climate change.

It is also important to note that people should change their behavior and lifestyles in order to reduce greenhouse gas emissions. Addressing climate change requires governments and people to share this responsibility together. Government policies, programs, and international agreements are important not only for greenhouse gas emissions and climate change reasons but also for reducing billions of decisions every day, such as the activation of driving cars and lights of this type (Leiserowitz, 2007; Spence et al., 2011).

2.7.2 Climate change adaptation

Adaptation strategies for adaptation of people in a changing climate are now expected for the future climate (Cohen et al., 1998; IPCC, 2014). International and national policies have increasingly focused on adaptation measures in the last decade (Harmer & Rahman 2014; Measham et al., 2011), Reducing the likelihood of sustainable development and poverty reduction (Harmaling et al., 2010, Roberts, 2013) was not successful and the United Nations Environment Program (UNEP), has long been working on Climate Change (2007) (IPCC, 2001). It is important to note that these countries suffer from devastating socio-economic damages (Wheeler, 2011). They have low capacity to adapt and even under the moderate increase in global temperature setting to reduce their emissions, they are vulnerable to the effects of climate change (Truelove et al., 2015). Adaptive capacity is related to socio-economic development but is not evenly distributed among communities (IPCC, 2007). Different countries have different ways and resources to deal with the adverse effects of climate change. Countries that are richer and financially financed have more opportunities to make changes, but countries with fewer sources of income need to invent unique ways to combat the adverse effects of climate change. Climate change initiatives began to count on a variety of projects: how to manage more ecstasy disasters and associated risks, how to cope with coastal protection and seascape violations, how to better manage land and forests, how to tackle water

availability, ways to tire rubber product varieties, how to plan energy and public infrastructures to reduce to protect.

Effective solutions to address climate change at every level require strong policy and implementation efforts from both the individual and the government. Internationally, for example, adaptation financing schemes such as the Least Developed Countries Fund and the Adaptation Fund are widely available Measham et al., (2011), developed under the UNFCCC and/or the Kyoto Protocol to mitigate the adverse effects of climate change.

At the national level, many governments have policy and acceptance adaptation plans and integrated climate change issues into broader development plans (IPCC, 2014). Many developing countries have established a national framework for harmonizing their adaptation needs, known as the Intelligence National Action Adaptation Department (INAPA) (Measham et al., 2011) such as information and climate change predictions, spreading the creation of adaptation protocols to climate change, and adaptation initiatives as a measure of organizational adaptation and projects (Measham et al., 2011).

Historically, policy and adaptation schemes usually come from hopes with limited participation by people at the grassroots level down (Measham and et al., 2011; Van Aalst and others, 2008). Van Aalst et al., (2008) argues that it is important to include the local community in adaptation plans for adaptation to climate change, especially to update the approaches from the top to the bottom for adaptation to climate change. Many countries have recently focused on adaptation strategies at the local level (Measham et al., 2011), which has recently been added, because people depend on the geographical area and live in different forms with the effects of climate change. Geographical Variability Effects of Climate Change Depending on biophysical and social conditions, an approach that analyzes security vulnerability and adaptation at the local or national level (Measham et al., 2011). Small communities are often equipped to cope with these problems, which are vital to strengthen the resistance of communities and ecosystems against the climate-setting climate (based on community-based settings, most vulnerable to the effects

of climate change (Reid et al., 2009). Struggling with change has a great global priority. A strong policy and effort is needed by individuals and governments at all levels to solve the problem effectively. It is important that an effective solution to climate change requires shared responsibilites among resources.

2.8 Public awareness of climate change

Effective reduction of climate change requires that individuals and governments work together. Why is it important to understand how public climate change is perceived and to what extent and how it affects greenhouse gas emissions and how it adapts to changing climate conditions? For example, although global warming was discovered in 1827 by a French scientist, Jean-Baptiste Fourier (Leiserowitz, 2007), the world had the hottest climate of the 19th century until 1988. Europe and Japan did not have begin climate change, and mitigation and adaptation (Leiserowitz, 2007). For this reason, the public on climate change has vital preventive measures for the implementation of climate change policy (Burnham, 2014; Wei et al., 2014).

Public awareness on the subject of climate change is based on the socio-political context in which policy makers operate and affect political, economic and social action to meet specific risks (Leiserowitz, 2007). Examination of the public consciousness also adds to the changes in the environment. The World Bank (2009) found out that climate change was viewed as a more serious problem, although people in underdeveloped Countries did not have a good understanding and awareness of climate change. Leiserowitz (2007) thinks that people living in wealthy countries are not interested in climate change, because it is a geographically remote threat that does not harm directly the family. People in less-developed countries, therefore, expressed stronger support for responsive policy and programmes than those in developed nations (World Bank, 2009).

2.9 Perception of climate change risks

Risk perception explains how risky people evaluate a situation. Williams & Noyes, (2007); Slovic (1987) notes that the risk perception is complex. Scientists evaluate a risk situation according to the risk or risk analysis and the way people

think, depending on the more subjective judgments. Risk types also affect how people affect their anxiety about risk (Whitmarsh, 2008). When they identify the risks as risk, they make an assessment of how often the event has occurred and how serious and controllable it is. Slovic (2000), Lujal et al. (2014) found out that people also perceive risks based on subjective personality, knowledge, experience, attitude and sex. However, direct climate change experience is associated with climate change (Lujala et al., 2014; Wachinger et al., 2013). People are worried about the threats of climate change, for example the risk of climate change. People's perception of the threats to climate change varies between individuals and geographical areas (Taylor et al., 2014). Northern UK citizens, for example, could have lived warmer in the winter and warmer in the winter than in the south east, explaining differences in perceptions among citizens of the same country to change the local climate (Palutikof et al., 2004).

Risk perception is different from a wide variety of factors, including a person's personality, geographic location, and direct interaction on climate change. As a result, studies on risk awareness must add factors at the local level. An increasing literature decides that risk perception is an important factor affecting the behavior of individuals and communities and that decisions are taken in response (Siegrist et al., 2005; Slovic, 2000; Williams & Noyes, 2007). The study was conducted to determine the impact of climate change (Spence et al., 2011). The study showed that those who are experiencing a high level of behavioral change want to reduce carbon dioxide emissions during their daily lives. This is an example of how risk perception affected behavior change in response to climate change.

However, several studies have shown that the relationship between risk perception and behavioral response/behavioral changes is ambiguous (Harmer & Rahman 2014, Lujala et al., 2014; Whitmarsh, 2008). A comparative study explores the perceived risk perception and translation of flood and air pollution victims between complex perception and behavior change (Whitmarsh, 2008). Whitmarsh (2008) found out that people who suffer from air pollution are more likely to worry about the problem and act as the reaction. However, flood victims did not show any compliance. In response to hazards, some may take mitigation measures, others may

overlook hazards (Balcom, 2015; Wachinger et al., 2013). Some studies have shown that there is a lot of information about the risk that people will get. An in-depth understanding of citizens' perceptions, perceptions and reactions to extreme climate events should support the development of state policy (Yu et al., 2013). Such information is also important for development consultants, such as climate change programs and grassroots communities involved in adaptation and mitigation programs (Wei et al., 2014). Given that risk perceptions differ between individuals and regions, support for adaptation policies should be conducted differently depending on where you are at (Taylor et al., 2014). Geographical diversity and direct exposure to climates can give different responses to climate change adaptation policies. For this reason, it is valuable to discover how communities understand and share the climate risk and react to climate change.

Research on farmers' risk perceptions and strategies to combat climate change in developing countries are largely aware of the threats to climate change from farmers in underdeveloped countries (Bryan et al., 2009; Jianjun et al., 2015; Senaratne & Scarborough, 2011; Udmale et al., 2014)، for instance, farmers in Yongqiao District in China (Jianjun et al., 2015) and Maharashtra state in India (Udmale et al., 2014). Life effects and agricultural production were at significant risk for these areas due to extreme weather events, mainly drought. As a result, they are adapting to reduce the impact of drought. The study by Udmale (2014) in India differentiated Indian farmers' preparation plans and adaptation responses to alleviate drought. To prepare for the droughts, rather than selling harvested grain, the vast majority of farmers stored it for family consumption. The income tax is deducted from the farm income.

Adaptation measures included changing planting dates, using crop varieties requiring little water, collecting and saving water, and changing crop and irrigation techniques. The study found out that more than 50% of the farmers changed their crop log and used the seeds to withstand drought. However, very few farmers have used crop varieties that consume less water in response to drought conditions. In addition, very few farmers changed the way they used irrigated crops, such as using a sprayer. Only a few farmers in the survey had irrigation tools that allowed them to

sow the crops in time because the monsoon rainfall pattern had changed. That is why farmers have a lot of money to invest in their farms. These factors explain the reasons behind the low absorption of alternative irrigation systems.

The study conducted in Yongqiao province (Jianjun et al., 2015) found out that similar adaptation strategies were implemented by farmers. Common choices included the use of crop management techniques, improved land use and management, diversification of agricultural inputs and increased exploitation off-farm activities. However, Jianjun et al., (2015) found out that some farmers saw temporary and permanent migration as adjustment strategies. The study stated that farmers decided to use adjustment measures based on education, experience, size of farms, household income and climate change perceptions. In summary, the perception of risk of climate change is complex and varies between individuals and countries of origin and geographical regions. Many of them affect how risk perception reacts and supports people's adaptation and mitigation policies. In order to effectively solve the climate change problem, it is important to understand how the public perceives the risk. For this reason, some studies on risk awareness in developing countries are discussed in the next section.

The study explores farmers' perceptions of global change events as a whole and in particular climate variability. Primary data were collected using observation and research, supplemented group and individual interviews. The study showed that 80% of the farmers felt different symptoms and effects of climate variability in the eighty percent. The study reveals that gender, age, income and education levels are decisive factors for farmers' perceptions of events and climate variability impacts on crop and livestock production. The perceptions of farmers of temperature change relate to the analysis of meteorological data. However, their perceptions were found to be disagreements with meteorological precipitation trends (Yayeh & Leal, 2017).

Survey data collected from farmers have been analyzed to find answers to relevant research questions ‘‘Do farmers help adaptation and mitigation measures?’’ The results show that farmers who are concerned about the impact of climate change on agriculture and who are associated with human activities are

more positive about adaptive and mitigating management strategies (Arbuckle et al., 2013)، field observations and openness in the villages to understand the impact of climate on agricultural practices in poor regions. In the summer, with the participation of residents of rural communities, polls on semi-structured issues were conducted to study the effects and role of recent climate and environmental changes. Individual understanding of the practice of land management in individual and communal areas of life support interaction with these concepts. The results are complemented by secondary agricultural, economic and climatic advantages in research areas. Participants suggested that land conversion programs improve the sustainability of potential livelihoods, pasture livestock and environmental quality. Nevertheless, the availability of water is increasingly considered a limitation of agriculture and human health in areas where these water resources are particularly consumed. The positive effects of government land administration schemes have been distributed in unstable villages, as well as related to missing information and transferred to it in the process of transferring information between regions, which often leads to marginalized families and/or communities (Sjögersten et al., 2013).

The study showed that the expected risks of grain losses in the long run are usually higher than in the short run. Climate change beliefs are an important factor explaining short-term and long-term differences in risk perception، those who believe in climate change, future product losses (such as plant insufficiency, farming experience, numeracy, interactions with other producers and farm characteristics) (Menapace et al., 2015).

A qualitative approach has been adopted to establish the relationship between climate dynamics and sensitivity levels. The collection of domain data consists of observations of local association boards and of semi-structured interviews with local participants. While both communities are very influential in climate events, climate change perceptions are significantly different. The difference in perception is often a different context in climate. In order to understand the dynamics of the adaptation strategy, motivational issues will be stimulants, which are the agents of reflexes about the conditions of sensitivity to climate change and the reflection of extreme conditions (Bonatti et al., 2016).

Understanding the adaptive capacities of landowners is important for assessing the future possibilities of preserving biodiversity in private agricultural landscapes. The study encourages environmental agencies to intensify climate change and rangeland management through informed government agencies (NGOs) and farm groups and to engage low-potential land managers through formalized guidance programs (Raymond et al., 2015). A study on understanding how farmers perceive the risks of climate change and how it affects their willingness to adopt adaptation methods. This study examines the perceptual relationship between climate change events and farmers' perceptions, adaptation and de facto behavior of climate change, and their relationship to the premises at the farm level. It has been observed that the risk of climate change is increased by increasing awareness of climate change (eg, water stress and extreme weather events). Awareness of extreme weather events is an important factor in adaptive behavior. (ie, the amount of farm and land management, as well as the ownership of the existence of a successor to E. acquisition), and the availability of information from social and agricultural networks (Li et al., 2017).

2.10 Theories of risk

The risk theory provides a framework for researchers to understand the answers to risks (Roeser et al., 2013). Risk perception studies, behavioral and behavioral changes are complex and are addressed in psychology rather than in developmental studies. However, it is useful to examine some of the approaches to risk theories (Social Amplification Theory and Rational Choice Theory), as they describe a range of influencing factors that are relevant to this research.

Knowledge Theory (KT) indicates that individuals perceive their risks based on knowledge and risk awareness (Wildavsky & Dake, 1990). People are at risk as a danger. Different people perceive the same risks differently. Some people may be at greater risk than others. The Social Assistance Theory (SAT) assumes that people's perception of risk is influenced by factors such as SMEs and organizational structures (Zaki, 2011). He argues that people may be aware of the dangers of social media, of newspapers or of television programs. This affects assessments of

whether climate change is a real threat to them. Organizational structures also affect people's perception of risks. Organizations such as social status, cultural identity and education have the potential to determine how people see danger (Renn et al., 1992). Rational Choice Theory (RCT) has had an impact on the social science research on human behavior for many years (Zaki, 2011). The RCT examines how individuals react to danger. The theory states that people react to danger through a combination of emotions, attitudes and motivations. In other words, individual responses to stimuli are different. The theory assumes that people are judging a wide range of solutions and that the solution is better for them (Zaki, 2011, p.Scott (2000) assume that the RCT will make choices because individuals cannot get what they want.

CHAPTER III
METHODS

The chapter gives details of methods used in data collection, application of the data tools, and data analysis which is carried out to define the attitude and risk perception about climate change in farming communities in Tripoli, Libya.

3.1 Research Model

This study mainly aimed at getting the attitude and risk perception of climate change in farming communities in Tripoli, Libya. This study is based on field study carried out in Tripoli, Libya in 2017. The method applied in this study to make it more reliable is quantitative method by use of research questionnaires adopted from Amber et al., (2017) and from sources like articles, textbooks, and studies on the subject and internet source.

3.2 Participants and sample

The study is a cross-sectional one among 300 farmers dwelling in the Tripoli district of Libya. This study concentrated on the adult population. An eligible criteria used in this study include (i) the farmer being above 18 years (ii) a permanent resident in the study area and (iii) the respondent's willingness to be obliged to the study protocols and complete the study.

Every farmer was be given an organized questionnaire obtained from Amber et al., (2017). The questionnaire focused on gender, age, education, farmers' concern about potential problems for their operation, farmers' attitudes toward changing weather and adaptation and perceived risks and beliefs in anthropogenic climate change (See detailed questionnaire).

Figure 2
Demographic distribution of the study

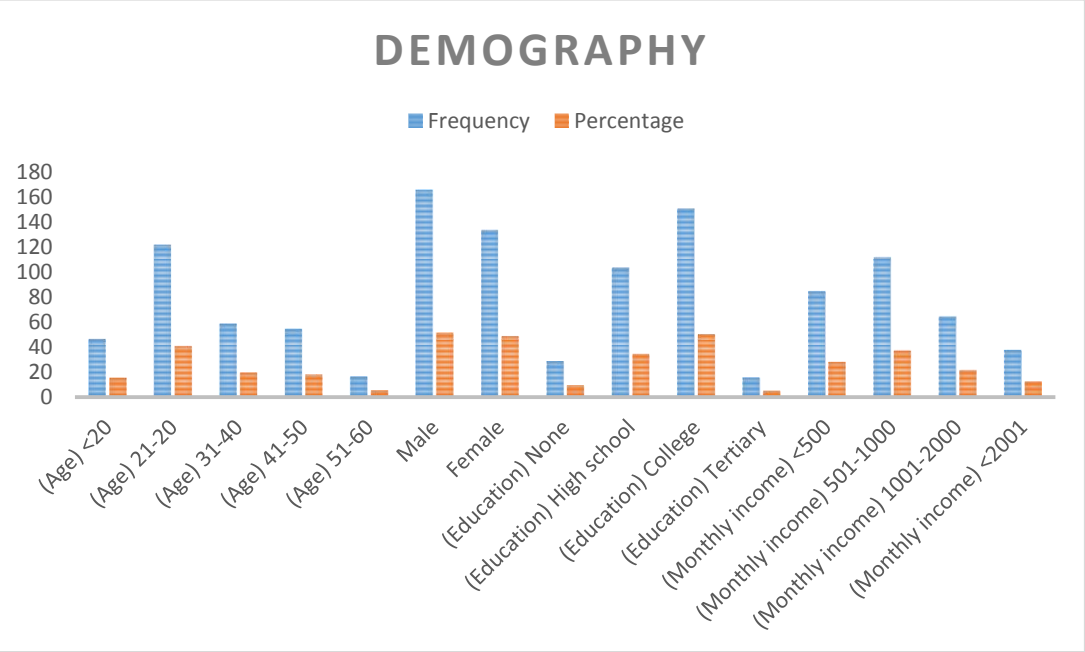

Table 1.
Demographic distribution (n = 300).

Age	**Frequency**	**Percentage**
<20	47	15.7
21-20	122	40.7
31-40	59	19.7
41-50	55	18.3
51-60	17	5.7
Gender	**Frequency**	**Percentage**
Male	166	51.25
Female	134	48.75
Educational level	**Frequency**	**Percentage**
None	29	9.7
High school	104	34.7
College	151	50.3
Tertiary	16	5.3
Monthly income	**Frequency**	**Percentage**
<500	85	28.3
501-1000	112	37.3
1001-2000	65	21.7
<2001	38	12.7

Table 1 and Figure 2 show the demographic of the farmers. 47 (15.7%), 122 (40.7%), 59 (19.7%), and 17 (5.7%) were less than 20 years, 122 (40.7%) between 21 - 30 years, 59 (19.7%) were between 41 - 50 years، and 17(5.7%) were between 51-60 years. Also, 166 (51.25%) of the famers were males whiles 134 (48.75%) were female. This signifies gender were fairly distributed. In addition, 104 (34.7%) of the farmers attended high school، 151 (50.3%) college while 16 (5.3%)، attended tertiary and only 29 (9.7%) of the farmers did not attend school. For monthly income, 85 (28.3%) of the farmers received monthly income of less 500$، 112 (37.3%) received between 5001-1000$، 65 (21.7%) received 1001-2001$ and 38 (12.7%) received more than 2000 monthly.

3.3 Data Gathering Tools

In this study the data collection tools were Personal Information, Environmental Perceptions, Knowledge and Behavior Scale Test and Information test.

3.4 Scoring Scale Classification of the Substance

The risk perception and attitude of farmers regarding climate change were revealed according to the interpretation based on the survey questions.

3.5 Data Analysis

The attitude and risk perception about climate change in farming communities were determined statistically by means of t-test, ANOVA and descriptive statistics. Data were analyzed using the statistical software SPSS 20.0. No laboratory or medical tests were conducted.

3.6 Research Ethics

For the research to be reliable, valid and scientific research process ethics were considered. The people who participated in the studies were given direct questions. The researchers actually demonstrated an objective attitude during the research by demonstrating a good work behavior in order not to influence the study.

3.7 Reliability

Table 2.

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Attitude	11.2290	1.544	.714	.727
Perceived risk	11.2594	1.281	.643	.771
Perceived belief	11.4106	1.455	.597	.782
Potential Problems	12.3360	1.845	.685	.771

Table 2 indicates the summary of the total reliability test. The reliability of the construct was examined using Cronbach's alpha. The construct reliability should exceed 0.7 to fall within acceptable level. (Fraenkel, Wallen 2000). The reliability of the construct of this study ranges from .727 to 0.782 which suggests excellent internal consistency.

CHAPTER IV
RESULTS AND DISCUSSION

This chapter explains the results in details from the statistical analysis carried out on respondents answers to the questionnaire and then discusses according to the outcome of the analysis.

4.1 Do perceived risks affect the attitude of farmers towards climate change

Table3.
Farmers' attitudes toward changing weather and adaptation

Item	Statement	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
11	Individual adaptation attitude: Changing my practices to cope with increasing climate variability is important for the long-term success of my farm	2 (0.7%)	2 (0.7%)	88 (29.3%)	159 (53.0%)	48 (16.3%)
12	Libyan adaptation attitude: It is important for farmers to adapt to climate change to ensure the long-term success of Libya agriculture	2 (0.7%)	2 (0.7%)	55 (18.3%)	108 (36.0%)	133 (44.3%)
13	Noticing more variable weather on farm: In the past 5 years, I have noticed more variable/unusual weather on my farm	4 (1.3%)	0 (0.0%)	14 (4.7%)	119 (39.7%)	103 54.3%)

In Table 3, 207 (69.0%) of the farmers agreed on item 1 that changing practices to cope with increasing climate variability is important for the long-term success of farm while 92 (30.7%), of them disagreed and were uncertain. This suggested that practices to cope with increasing climate variability is important for the long-term success of their farm. Also, most farmers 241 (80.3%) indicate that it

was important for them to adapt Libyan adaptation attitude (item 2). only 59 (19.7%) disagreed and were uncertain. Lastly, 222 (74.0%) indicated that in the past 5 years, they have noticed more variable/unusual weather on my farm (item 3). Only, 18 (6.0%) did not agree and uncertain. The finding shows that the farmers' attitudes are better toward changing weather and adaptation.

Table4.
Perceived risk in anthropogenic climate change

Item	Statement	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
14	Climate change is not a big issue because human ingenuity will enable us to adapt to changes	3 (1.0%)	1 (0.1%)	39 (13.0%)	103 (54.3%)	94 (31.3%)
15	Changes in weather patterns are hurting my farm operation	2 (0.7%)	2 (0.7%)	51 (17.0%)	111 (37.0%)	134 (44.7%)
16	My farm operation will likely be harmed by climate change	2 (0.7%)	2 (0.7%)	80 (26.7%)	116 (38.7%)	100 (33.3%)

Table 4 displayed information about the perceived risk in anthropogenic climate change. 197 (65.7%) of the farmers agreed that climate change was not a big issue because human ingenuity would enable us to adapt to changes (item 4) while 43(14.3%), of them disagreed and were uncertain. In addition, 245 (81.7%) of the farmers agreed that changes in weather patterns were hurting their farm operation (item 5). Only 55 (18.3%), of them disagreed. Furthermore, 216 (72.0%) of the farmers agreed that farm operation would likely be harmed by climate change (item 6)، while 84 (28.0%) disagreed and uncertain.

Table 5.
Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Perceived risk & attitude	300	.590	.000

Paired Samples Correlations were employed to assessed whether perceived risks affect on the attitude of farmers towards climate change. In Table 5, there is a correlation between farmers' perceived risk and attitude towards climate change. Therefore, the farmers' perceived risks affect the attitude of farmers towards climate change.

4.2 Does farmers' attitude towards changing weather affect their perceived risk and belief?

Table6.
Belief in anthropogenic climate change

Item	Statement	Strongly disagree	Disagree	Uncertain	Agree	Strongly agree
17	In the past 5 years, I have noticed more variable/unusual weather on my farm	3 (1.0%)	1 (0.3%)	125 (41.7%)	137 (45.7%)	34 (11.3%)
18	In the past 5 years, I have noticed more variable/unusual weather across the Libya	4 (1.3%)	0 (0.0%)	62 (20.7%)	131 (43.7%)	103 (34.3%)
19	Extreme weather events in recent years have affected my long-term management goals	4 (1.3%)	0 (0.0%)	49 (16.3%)	112 (37.3%)	135 (45.0%)

In Table 6, 171 (57.0%) of the farmers agreed that in the past 5 years, they noticed more variable/unusual weather on their farm (item 8)، while 129 (43. 0%),

of them disagreed and were uncertain. Also, 234 (78.0%) of the farmers agreed that in the past 5 years, they noticed more variable/unusual weather across Libya (item 9)، while 66 (22. 0%), of them disagreed and were uncertain. Lastly, 234 (78.0%) of the farmers agreed that in the past 5 years, they noticed more variable/unusual weather across Libya (item 9)، while 66 (22. 0%), of them disagreed and were uncertain. Also, most farmers 247 (82.3%) indicated that the extreme weather events in recent years affected their long-term management goals (item 10). Only 53 (17.7%) disagreed and were uncertain.

Table7.
Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.694[a]	.481	.478	.32965	.481	137.820	2	297	.000	1.309

a. Predictors: (Constant), perceived risk and belief
b. Dependent Variable: attitude

Table 7 displays the standard regression model summary and Table 9 illustrates the Analysis of Variance (ANOVA) test of statistical significance of regression model. From the ANOVA (Table 9), F = 137.820 and p =.000 (< .05) indicates that the test was statistically significant. Therefore, linear combination of independent factors significantly relate to the perceived belief, and risk

Table8.
ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	29.954	2	14.977	137.820	.000[b]
	Residual	32.276	297	.109		
	Total	62.230	299			

a. Dependent Variable: attitude
b. Predictors: (Constant), perceive belief, perceived risk

The standard regression model summary (Table 8) indicates the value of the regression coefficient (R =.694). This suggests how well all independent factors combined related with the dependent factor (perceived risk and belief). Moreover, the Adjusted R^2 = .412 shows that all the attitude contributed 47.8% of the variances in the dependent factor perceived risk and belief.

Table 9.

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
(Constant)	1.599	.157		10.189	.000	1.290	1.908					
Perceived risk 1	.297	.035	.401	8.532	.000	.228	.365	.590	.444	.357	.789	1.268
Perceived belief	.338	.039	.411	8.726	.000	.262	.414	.595	.452	.365	.789	1.268

a. Dependent Variable: attitude

From Table 9, Factor 1 (perceived risk) was statistically significant (B = .401, t = 8.532; p = .000 < .05) and Factor 2 (belief) was also statistically significant (B = .411, t = 8.726; p = .000 < .05). Therefore, farmers' attitude towards changing weather affects their perceived risk and belief.

4.3 Does gender affect farmers' concern about potential problems of their operation?

Table10.

Farmers' concern about potential problems for their operation

Item	Problem/Threat	Not concerned	Slightly concerned	Concerned	Very concerned
1	Increased flooding	2 (0.7%)	6 (20.3 %)	129 (43%)	108 (36.0%)
2	Longer dry periods and drought	2 (0.7%)	53 (17.7%)	107 (35.7%)	138 (46.0 %)

3	Increased weed pressure	8 (2.7%)	40 (13.3%)	170 (58.7%)	82 (27.3%)
4	Increased insect pressure	2 (0.7%)	117 (39.0%)	172 (57.3%)	11 (3.7%)
5	Higher incidence of crop disease	2 (0.7%)	2 (0.7%)	115 (38.3%)	181 (60.3%)
6	More frequent extreme rains	3 (1.0%)	65 (21.7%)	131 (43.7%)	101 (33.7%)
7	Increases in saturated soils and ponded water	1 (0.3%)	65 (21.7%)	131 (43.7%)	103 (4.0%)
8	Increased heat stress on crops	2 (0.7%)	50 (16.7%)	124 (41.3%)	124 (41.3%)
9	Increased loss of nutrients into waterways	3 (1.0%)	95 (31.7%)	122 (40.7%)	80 (26.7%)
10	Increased soil erosion	3 (1.0%)	60 (20.0%)	118 (39.3%)	119 (39.7%)

Table 10 displayed the information about Farmers' concern about potential problems for their operation. 237 (79.0%) were concerned about increased flooding (Item 11) whiles 9 (26.7%) were not or were slightly concerned. Also, 245 (81.7%) of the farmers were concerned about longer dry periods and drought (item 12). Only 9 (18.3%) were not concerned. For increase weed pressure (Item 13), 252 (84%) of the farmers were concerned only 48 (16.0%) were not concerned.

Item 14، of 237 (79.0%) were concerned with higher incidence of crop disease (Item 15) while 9 (1.3%) were not or slightly concerned. In addition, 232 (77.3%) of the farmers were concerned about more frequent extreme rains (item 16). Only 68 (22.7%) were not concerned. For increases in saturated soils and ponded water (Item 17), 234 (78.0%) of the farmers were concerned whilst 66 (22.0%) were not concerned. For increase insert pressure (Item 18), 248 (82.7.0%) were concerned with increased heat stress on crops، while 52 (17.3%) did not were or slightly concerned.

Furthermore, 202 (67.3%) of the farmers were concerned about increased loss of nutrients into waterways (item 19). Only 98 (32.7%) were not concerned. For increased soil erosion (Item 20), 237 (79.0%) of the farmers were concerned whilst 63 (21.0%) were not concerned.

Table 11.
Independent Samples Test for gender and potential problems

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Potential problems	Equal variances assumed	.006	.939	.333	298	.739	.01267	.03804	-.06220	.08754
	Equal variances not assumed			.332	283.022	.740	.01267	.03810	-.06234	.08767

The independent sample t-test was used to test the hypothesis at a $p = 0.05$. The results are provided in Table 11. The t-test results, however, showed that there was no statistically significant difference ($t(298) = .333$, $p = .939 > 0.05$) between a male and female farmer's concern about potential problems of their operation. Therefore, gender of farmers affects their concern about potential problems of their operation?

4.4 Is there a difference between gender attitude and risk perception of climate change?

Table12.
Independent Samples Test for gender and attitude

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
attitude	Equal variances assumed	2.677	.103	-.489	298	.625	-.02593	.05305	-.13033	.07847
	Equal variances not assumed			-.501	297.953	.617	-.02593	.05179	-.12786	.07600

The independent sample t-test was employed to investigate the hypothesis at p = 0.05. The results are provided in Table 12. The t-test results, however, revealed that there was no statistically significant difference (t (298) =- .489, p = .103 > 0.05) between a male and female farmer's attitude perception of climate change. Therefore, there is a difference between male and female attitude perception of climate change.

Table13.
Independent Samples Test

		Levene's Test for Equality of Variances		**t-test for Equality of Means**						
		F	Sig.	t	df	Sig. (2-tailed)	Mea Differe	Std. Erı Differer	95% Confidence Interval of the Difference	
									Lower	Upper
Perceived risk	Equal variances assumed	.047	.828	-.050	298	.960	-.00363	.07184	-.13776	.14501

	Equal variances not assumed	-.051	293.057	.959	-.00363	-.07119 .14374 -.13649

Furthermore, the t-test results shown in Table 13, presented that there was a statistically significant difference (t (298) =- .050, p = .047 > 0.05) between a male and female farmer's risk perception of climate change.

4.5 Does education level make any difference in the attitude and risk perception of climate change?

Table14.

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	What is your education level	2.5133	300	.74274	.04288
	Attitude	4.1827	300	.45621	.02634
Pair 2	What is your education level	2.5133	300	.74274	.04288
	Perceived risk	4.1522	300	.61760	.03566

Table15.

*Paired Samples Correlation*s

		N	Correlation	Sig.
Pair 1	What is your education level & attitude	300	-.037	.525
Pair 2	What is your education level & perceived risk	300	-.096	.098

Pearson correlation was used to check whether there is relationship between education level attitude and risk perception of climate change. From Table 15, there is no correction or relationship between farmers' attitude and risk perception of climate change. Therefore, there is no difference in the education level in the attitude and risk perception about climate change.

4.6 Does farmers' age affect their perceived risk and belief towards climate change?

Table16.
Correlations for farmers' age

		Age Group	Perceived risk	Perceived belief
Age Group	Pearson Correlation	1	-.002	.026
	Sig. (2-tailed)		.978	.657
	N	300	300	300
Perceived risk	Pearson Correlation	-.002	1	.460**
	Sig. (2-tailed)	.978		.000
	N	300	300	300
Perceived belief	Pearson Correlation	.026	.460**	1
	Sig. (2-tailed)	.657	.000	
	N	300	300	300

Pearson Correlation was employed to assess whether farmers' age affected their perceived risk and belief towards climate change or not. The Table above, shows no correlation between the variables. Therefore, there is no significant (p = .978, >0.05: .657, >0.05) relationship between farmers' age and perceived risk and belief towards climate change.

4.7 Does farmers' monthly income affect their concern about potential problems in their operation?

Table 17.
Correlations for monthly income

		What is your monthly income?	Potential problems
What is your monthly income?	Pearson Correlation	1	.200**
	Sig. (2-tailed)		.000
	N	300	300
Potential problems	Pearson Correlation	.200**	1
	Sig. (2-tailed)	.000	
	N	300	300

Pearson Correlation was employed to assess whether farmers' monthly income affect their concern about potential problems for their operation or not. The Table above, shows a correlation between the two variables. Therefore, there is a

significant ($p = .000$, >0.05) relationship between farmers' monthly income and potential problems for their operation.

CHAPTER V
CONCLUSION AND RECOMMENDATION

This chapter summarizes the result of the study from the perspective of the respondent outcome of the research according to statistical evaluation on attitude and risk perception about climate change in farming communities in Tripoli, Libya.

5.1. Conclusion

The adaptation of individual farmers shows that they change their practices to cope with increasing weather and climatic variability in order to have a long term success of their farm and in the success of Libyan agricultural sector. They have to adapt the changes in weather patterns damages to farm operation.This is similar to the study of (Fishbein and Ajzen, 2010) which states that farmers' climate change beliefs significantly predicted adaptation attitudes, which significantly predicted adaptation behaviors. There is on correlation between farmers' perceived risk and attitude towards climate change which indicates that farmers perceived risk affects attitude of farmers towards climate change.

In the past 5 years there were more variable and unusual weather conditions on farms across Libya. These extreme weather conditions have affected long-term management goals. Farmers' attitude towards changing weather is statistically significant to perceived risk and belief, therefore farmers attitude towards changing weather affects their perceived risk and belief. According to Amber et al., (2017) the extent of extraordinary climatic weather conditions in impacting adaptation attitudes and practices, and the potential for crop protection to decrease incentives for or postpone more significant changes to farm tasks are only two promising avenues. Adaptation to climate variability and change because it affects the ways in which people perceive and respond to adaptation opportunities. The processes of adaptation to climate variability represents farmers' efforts to balance the dynamic interactions between these multiple facets of life.

The farmers are concerned about increased flooding, longer dry periods and drought as indicated by Udmale et al., (2014) that life effects and agricultural production were at significant risk for these areas due to extreme weather events,

mainly drought. Increased weed and insect pressure, higher incidence of crop diseases, frequent extreme rain, saturated soil and pond water, heat stress on crops, loss of nutrients into waterways and soil erosion in this result correspond with the study of David et al., (2008) which concluded that many crops will have yield losses associated with increased frequency of high temperature stress, inadequate winter chill period for optimum fruiting in spring, increased pressure from marginally over-wintering and/or invasive weeds, insects, or disease, or other factors.. There is no statistically significant difference between male and female farmers affecting their concern about potential problems of their operation.

There is no statistically significant difference between male and female farmers' attitude and perceptions which is similar to the study of Kisuazi et al., (2012) which pointed out that male and female farmers' perceptions of climate change did not differ significantly on all the parameters except on frequency of droughts with women more likely to perceive increased drought frequency compared to men but rather in our present study there is a statistically significant difference between male and female farmers risk perception of climate change. Kisuazi et al., (2012), further recommended that climate change response interventions need to engage both men and women so as to get a holistic understanding of community perceptions.

There is no correlation or relationship between farmers' attitude and risk perception of climate with regards to education level. Therefore, There is no difference in the education level in the attitude and risk perception of climate change. A higher level of education may slightly result in a greater awareness of climate change as a real issue of global and immediate concern. Thus، increasing the likelihood that changes in farming practices are attributed to the impact of climate change. However, the odds of increasing likelihood of the perception levels is not statistically significant which might be attributed to the observation that more educated ones are the younger ones. Smallholders who are more educated are more likely to be able to interpret and apply climate information to their lives making them aware of local climate change or variability which becomes crystallized into a perception of climate change. The impact of education and access to weather

information (i.e. a higher level of education is associated with a greater probability of perception of climate change) is common among smallholder farmers across African farming systems (Mustapha et al. 2012; Ndambiri et al. 2012; Amdu et al. 2013).

There is no significant (p = .978, >0.05: .657, >0.05) relationship between farmers' age and perceived risk and belief towards climate change. There is a significant (p = .000, >0.05) relationship between farmers' monthly income and potential problems in their operation.

5.2. Recommendation

Due to variability in climate change in the region the following recommendation will be viable in adapting to some strategies that will be helping in this condition and also improve agricultural yield.

- Modification of farming practices
- Modifying crop types and varieties
- Resource management and diversification
- Farmers should be educated more on variability caused by climate change
- There should be policies and programs put in place to support adaptation like reforestation, intercropping, conservation farming and water management.
- Farmers should prepare for droughts rather than selling harvested grain
- Adaptation measures including changing planting dates, using crop varieties requiring little water, collecting and saving water, and changing crop and irrigation techniques.
- There should be local and national training on causes of climate change and how to adapt to its changes.
- Further studies should be carried out on awareness climate change effect on agricultural yield.

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Appendix-1

QUESTIONNAIRE

Dear respondents

The objective of the questionnaire is to collect information about **Attitude and Risk Perception of Climate Changes in Farming Communities in Tripoli, Libya.** The information you provide will be valuable for academic purpose of Near East University, Turkish Republic of north Cyprus TRNC. Therefore, your genuine, honest, and prompt response will be a valuable input for the quality and successful completion of the research. The information you will give will be used only for academic purpose and will be kept confidential.

I. Demographic Data

i. Gender: Male ☐ Female ☐

ii. Place of birth: …….

iii. Age: < 20 ☐ 21-30 ☐ 31-40 ☐ 41- 50 ☐ 51 -60 ☐ >60

v. Level of Education

High school ☐ College ☐ University ☐ No education ☐

vii. What is your monthly income? (Dollars $)

Less than 500 ☐ 501-1,000 ☐ 1,001-2,000 ☐ 2,001 and above

II. Farmers' concern about potential problems for their operation.

	Problem/Threat	Not concerned	Slightly concerned	Concerned	Very concerned
1	Increased flooding				
2	Longer dry periods and drought				
3	Increased weed pressure				
4	Increased insect pressure				
5	Higher incidence of crop disease				
6	More frequent extreme rains				
7	Increases in saturated soils and ponded water				
8	Increased heat stress on crops				
9	Increased loss of nutrients into waterways				
10	Increased soil erosion				

III. Farmers' attitudes toward changing weather and adaptation.

	Statement	Strongly disagree	Disagre	Uncertain	Agree	Strongly agree
11	Individual adaptation attitude: Changing my practices to cope with increasing climate variability is important for the long-term success of my farm					
12	Libyan adaptation attitude: It is important for farmers to adapt to climate change to ensure the long-term success of Libya agriculture					
13	Noticing more variable weather on farm: In the past 5 years, I have noticed more variable/unusual weather on my farm					

IV. Perceived risk and belief in anthropogenic climate change.

	Risk Perception	**Strongly**	**Disagre**	**Uncertain**	**Agree**	**Strongly agree**
14	Climate change is not a big issue because human ingenuity will enable us to adapt to changes					
15	Changes in weather patterns are hurting my farm operation					
16	My farm operation will likely be harmed by climate change					
17	In the past 5 years, I have noticed more variable/unusual weather on my farm					
18	In the past 5 years, I have noticed more variable/unusual weather across the Libya					
19	Extreme weather events in recent years have affected my long-term management goals					

Curriculum Vitae

My name is Hesham MABROK AYOUZ. I was born in 14/6/1978 in Tripoli / Libya. In 1995, I started high school and completed in 1998, and began to study at the Higher and Intermediate Institute of Agricultural Technology of Ghiran /Tripoli. I have been awarded the Higher Diploma in the Agricultural Science Technology, Specializing in Agricultural Mechanics .Department Agricultural Mechanics with the general grade (BA. Excellent) and an average (88.87%). For spring semester for the academic year 2004. I have appointed as a teaching assistant 2004. I have been nominated to study abroad for a master's degree by the Admiration of the Higher and Intermediate of Agriculture Technology of Ghiran / Tripoli. I studied the English language in the United Kingdom (UK) and afterword I had the opportunity to travel to the Republic of Northern Cyprus to get a good education in this country. My master began (2016) in the field of management science and environmental education.

Thesis

ORIJINALLIK RAPORU

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Yayın

Alıntıları çıkart Kapat

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