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FARMERS ATTITUDE TOWARD SUSTAINABLE AGRICULTURE IN WEST TRIPOLI OF LIBYA

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ABSTRACT

FARMERS ATTITUDE TOWARD SUSTAINABLE AGRICULTURE IN WEST TRIPOLI OF LIBYA

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The fundamental aim of this study was to evaluate Libyan farmers' attitudes toward sustainable agriculture in West Tripoli of Libya. The thesis focused on how farmers' attitudes towards sustainable agriculture vary according to the rating of socio-economic problems, environmental problems, contributing factors to environmental problems, natural resources utilization and environmental protection, environmental degradation, measures taken to combat environmental problems, steps taken to control weeds, production process and improvement, problems being experienced during production, agricultural production and influencing factors; it goes further to explain how demographic characteristics determine attitudes of farmers toward natural resources, environmental protection and environmental degradation.

However, the research revealed a wide range of variation and significant values among farmers expressing their views toward sustainable farming in relation to the aforementioned variables being identified as testable parameters in this empirical study. In fact, the result as indicated by "The Mann-Whitney U and Kruskal Wallis Tests" that age among other demographic factors was so crucial in influencing the attitudes of sustainable farmers toward the management, health and safety challenges confronting environmental resources as a result of the impacts of their farming activities. The research was quantitatively, theoretically and practically evaluated using the direct responses that was derived from 180 Libyan farmers through the use of structured questionnaires and administered on one on one basis.

All the information that was collected from the respondents in the study area were assessed through the aid of Statistical Package for Social Science (SPSS); these depicted various inferential values and as well supported by pie and bar charts in percentage ratings that represents different views of farmers regarding some socio-economic and environmental issues affecting alternative agricultural practices in Libya.

On the basis of the findings and after analytically appraised attitudes of farmers toward sustainable agriculture; it is crucial at this point to raise suggestions that will improve farming activities toward sustainability in order to transform agronomy with sole objectives of securing permanence, maintaining food supply for the entire human populace globally; safeguarding environmental safety, health and stability; and to create more awareness among farmers about the methods, environmental implications and socio-economic benefits of sustainable agriculture.

Keywords: Farmers, Attitudes, Sustainable Agriculture, Socio-economic, Environmental Problems.

ÖZET

LIBYA'NIN BATISI TRIPOLI'DEKİ ÇİFTÇİLERİN SÜRDÜRÜLEBİLİR TARIMA YÖNELİK TUTUMLARI

Mustafa MOHAMED ABOLGASM ANAKUA

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Bu çalışmanın temel amacı, Libya'nın Batısı Tripoli'deki çiftçilerin sürdürülebilir tarıma yönelik tutumlarını değerlendirmektir. Bu tez çiftçilerin sürdürülebilir tarım konusundaki tutumlarının sosyo-ekonomik sorunların derecesine, çevresel sorunlara, çevresel sorunlara katkıda bulunan faktörlere, doğal kaynakların kullanımına ve çevreyi korumaya, çevresel bozulmaya, çevre sorunlarıyla mücadeleye yönelik alınan önlemlere, yabancı otların kontrol altına alınmasına, üretim süreci ve iyileştirmesine, üretim sırasında yaşanan sorunlara, tarımsal üretim ve etkileyen faktörler ile demografik özelliklerin çiftçilerin doğal kaynaklara, çevresel korumaya ve çevresel bozulmaya karşı tutumlarını nasıl belirlediğini açıklamaya odaklanmıştır.

Deneysel olarak yürütülen bu çalışma, çiftçilerin sürdürülebilir tarımla ilgili görüşlerini, yukarıda bahsedilen değişkenler ile ilgili olarak çeşitli değişkenler açısından ortaya koymuştur. Çiftçilik faaliyetlerinin etkilerinin bir sonucu olarak, demografik faktörler arasında yer alan yaş, sürdürülebilir çiftçilerin, çevre kaynakları ile mücadele eden yönetim, sağlık ve güvenlik sorunlarına karşı tutumlarını etkilemede çok önemli olduğu Mann-Whitney U ve Kruskal Wallis Testleri" ile bulunmuştur. Nicel olarak gerçekleştirilen bu çalışmada, 180 Libyalı çiftçiye yapılandırılmış olarak hazırlanan anketler uygulanmıştır.

Çalışma kapsamında katılımcılardan toplanan tüm bilgiler, Sosyal Bilimler için İstatistik Paketi (SPSS) yardımı ile analiz edildi ve Libya'daki alternatif tarım uygulamalarını etkileyen bazı sosyo-ekonomik ve çevresel konularla ilgili olarak çiftçilerin farklı görüşleri, çeşitli çıkarımsal değerler ile tasvir edilip ve aynı zamanda bu değerler pasta ve çubuk grafikler ile desteklendi.

Bulgulara ve çiftçilerin sürdürülebilir tarıma karşı tutumlarının analiz sonuçlarına göre; tarımın kalıcılığın sağlanmasına yönelik hedeflerle dönüştürülmesi, tüm dünyadaki insan nüfusunun gıda tedarikinin sürdürülmesi için tarım faaliyetlerinin

sürdürülebilirliğe yönelik iyileştirilmesi için öneriler getirilmesi hayati önem taşımaktadır. Bu doğrıultuda araştırma kapsamında, çevre güvenliği, sağlık ve istikrarın korunması ve sürdürülebilir tarımın yöntemleri, çevresel etkileri ve sosyo-ekonomik faydaları hakkında çiftçiler arasında daha fazla farkındalık yaratılması gibi etkinliklerin yapılması önerilmektdir.

Anahtar Kelimeler: Çiftçiler, Tutumlar, Sürdürülebilir Tarım, Sosyo-ekonomik, Çevre Sorunları.

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ABBREVIATIONS

ANOVA: Analysis of Variance

FAO: The Food and Agriculture Organization

NRC: National Research Council

PRC: People Republic of China

SARE: Sustainable Agriculture Research and Education

SPSS: Statistical Package For the Social Sciences

USA: United States of America

USEPA: United States Environmental Protection Agency

WB: World Bank

N: Number

%: Percentage

TERMINOLOGY

FARM: It is both land and water parts of the biosphere like the terrestrial and water environment where food, raw materials, power are generated for human consumption and other uses (Baylis et al., 2008).

AGRICULTURAL SUSTAINABILITY: It is the capacity to catch up with the state demands in terms of food production in such means that does not have any adverse effects on the immediate environment and people well-being. In this case, people, food security, health, jobs, state affairs and environment are duly put into consideration and as well sustained continually (NRC, 2010).

AGRICULTURE: It is one of the primary activities that involves formal and informal structures that produces, repackages and supplied food both crops and livestock and other nature endowments for human consumption (NRC, 1989).

ENVIRONMENTAL DEGRADATION: It is ecological damages that are caused as a result of human activities which adversely have serious effects on the soil, water and air features; these in turn affect farm produces, people health and totally disrupt environmental integrity (USEPA 2006).

*INTEGRATED PESTS MANAGEMENT**:*** It is a system that comprises of various supporting or interchanging methods such as traditional, physical machinery, organism and substance management techniques to prevent pests from spreading without any damage to the farm produces and the environment (Isaac et al., 2009).

MIXED FARMING: It involves the production of livestock and crops in the farmland for mutual benefits of both the crops, animals and soil (NRC, 2010).

ORGANIC FARMING: It is the type of farming system that works on regenerated materials, soil and water preservation in order to improve the ecological features while involving on farming activities. It makes use of farm remains, practice sequential cropping system, control pests and enrich the soil through non-artificial methods, uses environmentally friendly hi-tech equipment and non-use of industrial farming materials (Guthman, 2004).

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CHAPTER I

INTRODUCTION

Sustainable agriculture is a combined method of farming both livestock and crops with a define operational technic in a particular location for a wider range of time in order to meet up with man and industrial consumption, improving ecological value and ecological endowments that serves as a foundation for farming commercialization. Sustainable agriculture utilize effectively irreplaceable natural endowments in such a way that makes agricultural activities to be sustainable, regulate and balance ecosystems. Agricultural activities are commercially sustainable all-round the year and improve agricultural livelihoods of people across the globe (Parr et al., 1992). The meaning and concept of sustainable agriculture varies with location, method of operation and state or area across the world where it is being practiced. Sustainable agriculture may sometime refer to as non-conventional agriculture, natural agriculture, renewable agriculture and biological agriculture. It may be cumbersome and deceiving in trying to identify sustainable agricultural system. Some farmers may be adding more to their production efforts which at long run could make all the operations in the farm site to be unviable (Kotile, 1998).

There is an absence of standardized pre-requisites that could be used to categorize agriculturalists on the part of sustainable agriculture or artificial agriculture. These pre-requisites could be based on size or dimension of farmland, revenue generation on the basis of the land size, and knowledge about agricultural programs and farmers' relation with agricultural associations around them (Young's et al. 1992). Most sustainable farmers usually involve in tilling of their farmland, plant leguminous plants and practice interchanging of plant sequentially in order to enrich the soil fertility, to regulate growth of unwanted plants, to reduce and check the outbreak of pests and diseases (Hanson et al. 1996).

Presently, all nations across the globe are deeply concerned about the negative consequences of modern conventional agricultural practices and developments on

nature, ecological endowments and viability of soil environment for continuous use. Consistent damaging of soil endowments, wearing of soil materials, environmental contamination of all kinds (water, land and air), over usage of fertilizer materials, mismanagement of water endowments, reduction of earth water sources and devastation of ecosystems and its bio-diversities through the use of harmful substances in our modern system of farming. These are minor among major issues that are being championed and agitated by farm operators, people, civil activists, farming expatriates and nature specialists. Regardless of the devastating consequences all across different areas of the earth, conventional farming has reformed our modern world financially, commercially and societally which include the advanced and third world nations. Further consequences could be seen as high rate of unemployment, empowerment of more female adults than male adults, high rate of division of labors among employees and remote settlements are gaining more power politically (Sadati et al. 2010).

In addition, conventional farming operations are very essential in vast majority nations of third world (like Libya and the rest of the nations in Africa, Asia and South America) because it adds value to their financial and commercial status. Thus, viability in agrarian industry are crucial matters that require urgency in order to eradicate suffering among the masses, maintain adequate food supply for the frequent rising in the numbers of people and secure reliable revenue source. To maintain nature, finance, commerce and civil affairs continuously, every farm operator should abide with sustainable methods of farming like efficiently making use of agricultural enhancer substances (fertilizers, pesticides and insecticides), unified pest control, efficient artificial water control and maintain adequate well-being of both crops and livestock among chemical producers and users. Farm operators' attitude to chemical application are much more vital (Lee 2005; Bhutto et al. 2007). Contamination of soil is majorly triggered by inefficient usage of agricultural implements, absence of advanced methods of generating water into the farmland artificially, destruction of natural forests by lumbering activities and inefficient land-use systems (Aktas, 2001). Attitudes are views or knowledge based concepts which could be genuine or not depending on the

knowledge of critical thinking, knowledge about feelings and knowledge about previous actions of people (Allen et al. 2005). Therefore, the needs for sustainable agriculture systems are pertinent for human well-being, maintaining environmental safety and quality, efficient usage of environmental resources and as well as to combat the dreadful climate change.

1.1. Background of the Study

According to the World Bank growth determinants or indices, open land for farming activities in Libya were analyzed and estimated to be approximately 9 percent in the year 2014. The statistical graph below showes how agricultural land is used Output were declining drastically with significant values of 8.78, 8.74, 8.74, 8.74, 8.74, 8.74, 8.74, 8.72, 8.72, 8.73, 8.73 to 8.72 in the year 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013 and 2014 respectively. These variations in farm production as depicted above are mainly determined by the availability of suitable farmland and other farm inputs – which include modern farming implements, chemical for soil enrichment, availability of improved crop varieties, efficient water supply for irrigation farming, domestic and global market demands (World Bank: Trading Economics 27th March 2018).

Figure 1.

Agriculture Production in Libya from 2004 to 2014(World Bank, 2018).

Libya shares her boundaries with the Sahara desert that covers approximately ninety five percent of the total landmass at the southern part while the northern part is extensively shared with the Mediterranean Sea. Libya is exceptional among other neighboring countries that have harsh weather conditions with vast barren land of low agricultural potentials. Libya is known to be an agrarian society that generate sustainable income both for the governments and the people before the advent of petroleum exploitation – which reduces agricultural output from thirty percent to below five percent that signified a remarkable decline of agrarian sector with rising of the output of petroleum industry to over fifty five percent of the overall internal production output. For instance, according to the IMF in the year 2005, agricultural sector experienced the following varies declining growth of 10.3, 8.1, 7.5, 5.3 to 4.3 in the years 1999, 2000, 2001, 2002 and 2003 respectively, while the Petroleum industry had a steady higher rising growth of 28.4, 39.8, 39.2, 52.8 to 61.2 in the years 1999, 2000, 2001, 2002 and 2003 accordingly (FAO Aquastat database, 2005; FAO, 2005).

However, the farming rich areas of Libya are Jabal al Akhdar, in the Eastern part of Banghazi and Fezzan, Al-Jafara plain in Tripolitania, Oases of Kufrah and Sarir and the mountainous desert region located in the southern part of Libya. Food and cash crops production extended to three hundred and fifty five thousand hectares of land, thirteen million three hundred thousand hectare of land are the portion allocated for livestock production and forest resources stretched to approximately five hundred and forty seven thousand hectares' of land. Irrigation farming are widely practiced due to the long period of drought and glasshouse farming system is gaining momentum in Libya from coverage of one thousand hectares of land to two thousand five hundred hectares' in the year 1991 and 2009 respectively. Glasshouse farming systems are commonly practiced in Jabal al Akhdar in the Eastern part of Banghazi known for potatoes, tomatoes and cucumber production (Maggio et al. 2010; Park, 2016). Grain farming is restricted to barley, maize and wheat; other crops farming include dates, olive, orange, onion, potatoes, tomatoes and watermelon (Coleman-Jensen et al. 2014).

Desert encroachment, harsh climatic conditions couple with long period of drought and pollution from the petroleum industry are major problems confronting farming operations in Libya (Gebril et al., 2012). Most essentially, uncontrollable overgrazing and deforestation are the main root cause of desert encroachment. Many steps have been taken to alleviate erosion particularly on land which entails flood control and safeguarding high topography for the growing of trees, creating barriers against wind storms, sequential cropping system and various initiatives designed to enrich and protect soil fertility (Saad et al., 2011). Also, the water shortage, poor soil fertility and harsh weather circumstances triggered crop pests and diseases; people and civil authorities have little understanding and simply lack the capacities to control such menace (Abagandur et al., 2017).

The attitudes of farm operators toward the role of viable agricultural practice varies from one farm operator to another. It could be determined by demographic factors (like gender, age, educational background, population size, income and social status and nationality), social and commercial settings of a nation, national priority of a nation and knowledge about the attitude of farm operators of a nation toward the environment and various agricultural practices (Tatlıdil et al., 2009). As this thesis focused on farm operators' attitude toward sustainable agriculture, it is therefore very necessary to analyze critically how farmers' attitude varies in ranking of socio-economic issues, environmental problems, factors influencing environmental problems, the use of natural resources and environmental protection, steps taken to combat environment problems, environmental degradation, steps taken to control weeds, agricultural production process, problems encountered during agricultural production process and factors influencing agricultural production process within the context of sustainable agricultural practices in West Tripoli region of Libya.

1.2. Problem Statement

Farming activities have been growing tremendously from subsistence systems to modern agricultural systems without any restriction because of the demand for food consumption from the rising explosion of human population all across the world. More

pressure have been casts on limited soil fertility and ecosystems that are experiencing degradation due to frequent application of chemical zed substances and one cropping systems. The long engaging conventional agricultural systems have increased food output capacity very greatly with serious consequences on financial systems and ecosystems. Instances on environmental burdens are washing away of land particles, pollution of internal and external earth water, shortage of underground water, extinction of nature endowed bio-diversities both plants and animals, fluctuation of global price index and damage of traditional remote settlements and food healthiness cannot be totally guaranteed. Because of these ante incidences, there are serious clamoring amongst agriculturalists and general public for organic or biological farming operations. These methods of farming are profit and mass production oriented. It manages natural endowments more efficiently, safeguard nature and improve the general well-being of people. The application and viability of this sustainable agricultural practice – is what prompts the researcher to investigate farmers' attitude toward sustainable agriculture in West Tripoli area of Libya.

1.2.1. Sub problem

I. How do Farmers' attitudes toward sustainable agriculture vary according to the ranking of the socio-economic problems?

II. How do farmers' attitudes toward sustainable agriculture vary according to the ranking of the environmental problems?

III. How do farmers' attitudes toward sustainable agriculture vary according to the order of important factors that are contributing to environmental problems?

IV. How do farmers' attitudes toward sustainable agriculture vary according to the order of important measures taken against environmental problems?

V. How do farmers' attitudes toward sustainable agriculture vary according to the order of important steps taken to control weeds?

VI. How do farmers' attitudes toward sustainable agriculture vary according the production process and improvement?

VII. How do farmers' attitudes toward sustainable agriculture vary according to the problems being experienced during production?

VIII. How do farmers' attitudes toward sustainable agriculture vary according to the agricultural production and influencing factors?

IX. How do farmers' attitudes regarding the use of natural resources and environmental protection differ according to the demographic characteristics?

X. How do farmers' attitudes regarding environmental degradation differ according to the demographic characteristics?

1.3. Objective of Research

Several research works have concluded with proving facts that the practice of sustainable farming are mostly determined by financial and market forces, environmental conditions, edaphic or soil conditions and farm operators view, knowledge and practice (Comer et al., 1999).

In summary, the fundamental objective of this research is to evaluate farmers' attitude toward sustainable agriculture in West Tripoli region of Libya according to gender, age, educational level, income level, population size, socio-economic problems ranking, environmental problems ranking, ranking of the factors that contributed to environmental problems, use of natural resources and environmental protection, environmental degradation ranking, ranking of steps taken to combat environmental problems, ranking of steps taken to control weeds, production process and improvement, problems being experienced during production, agricultural production and influencing factors.

1.4. The Significance of the Research

Regardless of the financial and non-related financial challenges of conventional farming systems, many farm operators, both local and commercial, still find it difficult to be grafted into sustainable or organic farming systems and their attitudes differ from the types of crops being cultivated and geographical location often presents a lot of considerations. Many research works on organic farming have been so limited and un-collaborated, because of the main matters relating to agricultural sustainability remained unaddressed holistically without frameworks and strategies for implementation. Although, there are data on how organic or sustainable farming could be carried out, few studies have been done in revealing the view or approach and impetus that could encourage agriculturalists in taking steps to implement sustainable farming. In fact, there is no any obstacle for immediate implementation but profit viability of sustainable farming is a serious factor deeply considered by most farm owners. Others are lack of technical facts and method of spread such facts to farm owners for full implementation of sustainable farming. Even previous research works have been too academic and technical for farmers to understand especially from their local approach. Thus, farm operators must be comprehended vividly according to their local approach to sustainable farming, a better evaluation of the approach and conducts of farm operators according to their demographic profiles. Socio-economic and environmental conditions would assist policy makers positively affecting their actions on implementation of sustainable farming (Comer et al., 1999).

1.5. Assumption

I. Farmers' attitude toward sustainable agriculture differ significantly according to the ranking of socio-economic problems.

II. Farmers' attitude toward sustainable agriculture differ significantly according to the ranking of environmental problems.

III. Farmers' attitudes toward sustainable agriculture differ significantly according to the important factors that are contributing to environmental problems.

IV. Farmers' attitudes toward sustainable agriculture differ significantly according to the order of important measures taken against environmental problems.

V. Farmers' attitudes toward sustainable agriculture differ significantly according to the order important steps taken to control weeds.

VI. Farmers' attitudes toward sustainable agriculture differ significantly according to the production process and improvement.

VII. Farmers' attitudes toward sustainable agriculture differ significantly according to the problems being experienced during production.

VIII. Farmers' attitudes toward sustainable agriculture vary according to the agricultural production and influencing factors.

IX. Farmers' attitudes' regarding the use of natural resources and environmental protection differ significantly according to the demographic characteristics.

X. Farmers' attitudes regarding environmental degradation differ significantly according to the demographic characteristics.

1.6. Limitations

The study was restricted accordingly as follows:

1. Primary data was empirically sourced in relation to farmers' attitude toward sustainable agriculture in West Tripoli area of Libya. The survey was carried out among farmers in West Tripoli, who turned up in great numbers while farmers in other agrarian areas in Libya were not covered.

2. Distribution of questionnaires were only limited or controlled within the catchment of West Tripoli on one and face to face interviews according to the leading questions in the research instrument.

3. Distribution and coordination of the questionnaires toward the targeted goal of the research was very tasking with capital, time and insecurity challenges that dominated the area. Notwithstanding, these challenges were not too cumbersome to overcome because Libya is gradually regaining its security and peaceful atmosphere.

4. On methodological basis, this research was only restricted to quantitative method of collecting data through well-structured leading questions according to the goals and scope of the research.

5. Sample structure was clearly defined with 180 farmers that were randomly selected, but these do not represent the exact numbers of farmers in West Tripoli region of Libya. The physical setting of the sampled area was very rural indeed with sparse settlements and farmland coupled with grazing land.

6. The information that was collected from various farmers was not restricted to any gender, profession, age and social status. In fact, the researcher tried as much as possible not be biased demographically. Every sampled respondents were equally represented.

1.7. Definition of Terms

1. Attitudes: Attitudes are mood or approaches to action or practice which could be positive or negative to people, society, public, formal organization and activity (Bergevoet et al., 2004).

2. Climate Change: It is also known as global warming which con not increase in temperature of the globe or abnormal changes in weather conditions which results in extreme temperature, windstorm, rising in sea level, torrential rainfall and severe floods (Wezel et al., 2009).

3. Conventional Farming: Conventional farming could be otherwise be regarded as commercial farming which involve application of chemical enhancers or boosters and other modern farming implements in achieving high productivity. (Wezel et al., 2009).

4. Cover Crops: They are crops that subdued the growth of unwanted plants and it helps to reduce washing away of top soil, enrich the soil, prevent outbreak of pests and disease and as well add nitrogen to the rich. It could also be regarded as leguminous plants or any free land grasses or plants (Demi, 2014).

5. Crop Rotation: It is the planting of crops in orderly patters that varies with planting periods or interchanging varieties of crops for one another in a routine pattern (Fry, 2012).

6. Deforestation: It is gross cutting of forest plants without replacement which may result in total extinction or destruction of vegetation covers (Perry & Hart, 2008).

7. Desertification: It is the advancement or encroachment of desert into areas that are not familiar with desert condition due to the negative actions of man like deforestation, poor systems of farming and overgrazing (Dregne, 2002).

8. Drought: It is the period of insufficient water due to low amount of rainfall or complete seizing of rain water (Cooley, 2006).

9. Farmers: Are people who major operation entails animal and crop production (Leeuwis, 2013).

10. Sustainable Agriculture: It can be referred to alternative agriculture, biological farming and ecological farming that require no artificial inducers or materials like fertilizers, genetically modified crops and chemicals for pests, diseases and insects control (Gomiero et al., 2013).

CHAPTER II
RELEVANT LITERATURE REVIEW

2.1. Global Agricultural Crises

Many farmers across the globe are faced with related problems of meeting the increasing demand for food consumption by the entire human populace. By the year 2050 the entire human figures will definitely cross to 9 Billion according to the statistical estimation (FAO, 2009). Also coupled with the monthly food consumption and the demand for food balance for human health and growth is on the high side (FAO, 2011). Environmental endowments will in doubt experience a serious degradation or destruction and shortages which may results in famine and inflation. Availability of adequate water and land for agricultural activities are getting shrink due to urbanization and overpopulation crises (FAO, 2012). In addition to the existing problems are the extinction of natural habitat for plants and animals, edaphic problem and reduction in value of water for human safety and health. The global climatic alteration also increases the tempo of the environmental crises and adds more difficulties to world agricultural production (Backlund, 2009). Probably the entire farmers in the world may achieve viability in farming production, but the issues on income, social and financial disparity in the societies must be attended to holistically, if not, over four hundred million human population may not have access to food (FAO, 2009).

2.1.1. The Need to Expand World Agricultural Output

As earlier indicated, the rising numbers of human statistic, capital per head due to high costs of living and high expectation for food balance for healthy development of people both physically and mentally, likewise the growing needs of agro-allied companies, quest for renewable energy (biofuel) especially from agricultural productions and unanticipated water problem that affect the world due to climate change. These aforementioned problems add more burdens for agricultural production and push more for higher agricultural output. Thus, the world grain output from agricultural sector should rise up to several billion of loads yearly while surplus

domesticated animal produce of about two million load should be projected for the year 2050 (FAO, 2011).

The rising global demand for agricultural plant productions which are used for generating biomass as alternative to countdown or reduce the use of fossil fuel has overstressed the production capacity of the farming sector and as well triggered the prices of staple food for household consumers. For instance, the diversion of grain crops like maize and soybean by energy producing companies for biomass production have accelerated the market value and the consumption rate of such grain crops. The grain consumption and utilization data in USA revealed that about twenty three percent of the overall maize production were being used for the manufacturing of biomass energy. The implication of these could be seen in high rate of inflation on all agricultural grain related crops and the adverse effects on the immediate environment is causing a serious public agitation (National Research Council, 2010).

2.1.2. Environmental Endowments under Threats

The land use pattern globally is drastically changing competitively with more threats and water accessibility is becoming so dare particularly to the farming sector. On geographical basis and allocation, water endowments are not equally allocated worldwide considering both the surface water and the ground water. There are so many nations across the world that battle seriously with inadequate water supply whereas some nations have water endowments so surplus. It is an undisputable fact that farming sector utilize close to seventy percent of water worldwide while in the year 2050, forty percent is estimated to be apportioned for crops farming activities (FAO, 2012). The artificial water generating system for farming purpose in third world nations is growing at the rate of ten percent so as combat dare of agricultural produces. Shortage of water resources would persist to be a fundamental problem for farming sector and the need for market supremacy from other segments of the global economy on the rise. The moment the consumption rate hike up due to the growing need from consumers, the cost of water resources generation for irrigation farming would hike up as well. Thus, farmers would be required to manage efficiently the limited water resources through the reprocessing of

used water or by introducing low water requirement farming system (National Research Council, 2010).

The pattern of land utilization is another vital aspect of environmental endowments under threat which hinders farming activities at local, state, national, regional and global levels. All the vegetation resources have been cleared away for the sake of farming activities. Vegetation resources like trees, shrubs and wildlife which generate financial and environmental supports will probably be degraded or altered the moment they are allocated for agricultural purposes (FAO, 2011). The only reserved world vegetation forests are commonly found in the tropical regions of Africa and South America (FAO, 2009). Nations facing rapid expansion of urban areas and over congestion of people are nations known to be limited by water endowments and land mass (FAO, 2011).

Every nation must be alerted and prepared for the nearest future, farming activities becouse limited land and water resources shall severely encounter a terrible challenge with the uprising of urbanization across the world. Exceeding urbanization coupled with high rate of industrial activities and hospitality industry would eventually lead to water shortage and dare of farmland to farmers globally (FAO, 2011). Urbanization crisis in USA has taken most nourished land that is suitable for farming activities (National Research Council, 2010). In fact, urbanization is seriously competing with the land so suitable for highly marketable agricultural products in many regions in USA. Thus, it was statistically projected that approximately eighty six percent of farm productions grown in those regions are facing the risks of urbanization (National Research Council, 2010).

2.1.3. Annihilation of Environmental Endowments

All across the world, environmental endowments are not only being threatened but they are facing serious damage, destruction and even extinction (FAO, 2009). The land resources are badly being damaged or ruined with the soil facing uncertainty of losing structure, nutrient and profile to sustain wildlife and plants (Miller & Brewer,

2005). The value of soil could be damaged structurally, compositionally either organic or inorganic and loss of living organisms. Structural damaging of soil involves removal of soil either by water or wind, lessening of soil particles, water percolation and action of desert encroachment, compositionally by the rate of salt concentration, diminishing of soil vital components and pollution from various usage of agricultural chemicals. Loss of living organism involves destruction of both plant and animal communities (National Research Council, 2010). Loss of landscape leads to destruction of ecological values and termination of socio-cultural, economic and environmental impacts that are related to ecological settings. Over twenty five of suitable land resources that are conducive for farming activities are seriously damaged and equally loss their primary values (FAO, 2012). Most soil has gradually diminished all over different farming or agricultural zones in the world, the third world and first world countries (FAO, 2001).

In addition, the world is currently facing water value problems because so many sources of water have been polluted due to over application fertilizers, pesticides, insecticides and herbicides. These chemical substances, by time, penetrate into rivers, lakes, sea and earth water (FAO, 2011). Existence of most living organisms of plants, animals and microorganisms in their natural distribution ecosystems are being threatened by massive destruction of forest resources, contamination and alteration forest environment for another land use (FAO, 2009). Thus, an estimation of about seventy five percent of ecological resources that are viable grounds for farm production have been terminated by human actions, natural recycling forces that help to sustain the existing ecological systems and its endowments have been altered completely in the areas of fertilization, breaking down of dead remains of degradable materials, prey and epidemic control and sustainability of ecological functions. All kinds of common grain products like corn, rice, barley and most tuber crops were estimated at sixty percent of the total world agricultural crops production (FAO, 2013). Protecting these agricultural products and its diverse varieties from extinction are very vital for continuous production. These keep farm producers and crop scientists on a sustainable propagation that are ecologically friendly (National Research Council, 2010).

2.1.4. Weed Control and Sustainability

Managing unwanted plants on farmland are seriously proven to be tough on the part of organic/biological and industrial/commercial farm operators. In fact, the main challenge facing organic farm operators are the struggle on how to get rid of weeds from farm land. It is crucial in farm administration; these unwanted plants called weeds struggle with farm products for space, sunlight, water, air and at the same time diminish farm harvests (Dollisso, 2002; Jamtgaard, K. 1995).

Weeds cause great economic and quality damage to farm products; for instance, estimated rate of about five percent to ten percent are mostly accounted for the damage caused by weeds to soybean provided they are well managed while more thirty five to one hundred percent are likely to be damaged by weeds if they are efficiently managed. The global growing rate of urbanization is alarming and the demand for foodstuff is getting higher because of the rising in the number of human. The task is for the farm operators to be ready to take charge of these growing needs that may arise from food consumption. Thus, the task for efficient weed management in farmland is crucial in order to achieve maximum productivity in agricultural output without necessarily relying on harmful substances that are threatening the sustainability of the ecosystems (Aldrich & Kramer, 1997).

So many questions may be raised, like “Can farm operators manage to actualize getting rid of weeds efficiently?”. Getting rid of weeds from farmland could be done traditionally, scientifically using biology based knowledge, mechanically and chemically. All these means could be combined which essence is to reduce the growth of weeds and boost crops productivity with limited efforts and costs. The vital parts of combined weeds control comprise of redefine pattern of cultivation, sequential planting of crops for mutual advantage and soil benefit, giving more space for wanted crops to occupy, retaining and replacement of soil nutrient naturally (Swanton & Wiese, 1991).

Another method of combined pest control method needs more support of knowledge and guidance from agricultural specialists, but most farm operators are more conscious of the cost and profit implications; while the ecological and people health

implications could be well assessed, but most emphasis is on the financial implications (Antle & Wagenet, 1995). This method demands the use of chemicals, for the management of pests and insects should be supervised and restricted because of the adverse effects on the immediate environment. The usage must be regulated, ecologically, nature of the farming environment must be assessed before any usage of pest control materials and application of the dosage of the pest regulated materials must be considered as well. The advantage and aftermath threats should be assessed by specialists before adopting the techniques (Swanton & Wiese, 1991). The research work that was conducted in Lowa (USA), revealed approximately ninety percent of farm operators from commercial and organic/biological farming sector apply minimum of one or two techniques of weeds management by changing the pattern of tilling and sequential cropping system (Bultena et al. 1990).

The present agricultural programs globally have ever been in support of commercial agriculture for mass production and as well aiding the use of herbicide substances in getting rid of weed from farmland (Bird et al. 1995). It was later projected that in the upcoming ten to twenty years to come, the chemically based weed management shall be minimized due the adverse effects on the people and ecological systems. The awareness would be so much that the traditional and ecological weed management would be more relevant and commonly adopted by farmers across the world (Forcella & Bumside 1994). The natural weed management would find it difficult to take chemically based weed management because of the asserted reasons below:

- Chemically based weed management would constantly be relevant to issue out fast remedy for weed predicament. Thus, the latest improved ones would be wisely used in combination to get rid of weed very fast and safely.
- The combination of local and physical weeds management would be supplementary for upcoming age. The application would be supported by the understanding of the ecological characters of the weed in the farming environment.
- Improved crop varieties would take over the mechanical weed management technique.

- Newly discovered live foreign organisms would be introduced to manage pests, diseases and weed collaboratively. First, it must be tried environmentally through careful evaluation of the ecological settings of the farmland (Forcella & Bumside 1994).

2.1.5. Climatic Alteration versus Global Warming

In most time the terms climate change and global warming are used interchangeably because both explain changes that happen within the content of weather conditions. Climate change is more general in explaining the sudden changes that happen to all elemental factors regarding climate, while global warming is more specific about temperature rising of the earth and atmosphere. Climate change changes the distribution volumes of rainfall, raises the rate of carbon dioxide emissions and the degree of temperature which in turn have serious adverse effects on farm output and environmental endowments source (Backlund et al. 2008). The estimation of the impacts of global warming depends on location, physical settings and human factors that are prevailing in a particular region. For instance, advanced nations located in north part of the earth are known as the highest emitters of carbons. The third world nations then suffered the consequences (like shortage of rainfall, rising of the sea levels, extreme temperature, excessive waterlog due to torrential rainfall and acid rain) towards the southern part of the earth. These adverse environmental consequences reduce production levels of farming activities and as well cause severe food instability (FAO, 2009).

2.1.6. Variability of the World Foodstuff Production

The most toughing issue confronting the entire earth today is the unstable foodstuff production particularly among the third world nations that have not been able to achieve neither high production level through conventional farming (due to poor research and low technological know-how) or attain sustainable agricultural practices and protection of bio-diversities from human encroachment. Although, the population of human that suffered from foodstuff shortage reduced statistically from one billion to eight hundred and seventy million in the year 1990 and 2012 respectively (FAO, 2012). From the inception of the financial melt-down in the year 2008, the statistics of people

who have no access to adequate foodstuff is increasing drastically (FAO, 2009). True solutions to food crisis will only be solved by finding solutions to the origin of human impoverishment (Lappe et al., 1998). Also, FAO revealed that peradventure the world foodstuff output ascend to seventy percent. The estimated rate of four hundred million human population will not be able to access food adequately unless the issues of social and financial disparity are fundamentally resolved (FAO, 2009). Basic economic issues must be redefined, such as uneven allocation of resources particularly land resources and capital per head need to be tackled and propound lasting solutions (Lappe et al., 1998). There are some societal challenges that are supporting foodstuff instability such as inadequate transport services, civil crisis, social discrimination, unregulated government policies, low economic performance and no access to reliable loan facilities (National Research Council, 2010). Social disparities across every nation are the main cause of foodstuff variability that is affecting the globe (Lappe et al., 1998).

2.2. Concept of Controlled Manner versus Farmers Attitude towards Sustainable Agriculture

The concept of controlled manners in human actually generated from the field of societal psychology which regards personal motive exhibited a certain manner or action is a main force in the operation of manner. Motive is considered as a main encouraging force that affect manner/conduct. This relies so much on principles that connect particular manners to specific views which lie on conceived societal force that influence operation/action. Motives in human are likely to impact human actions/manners in such a way that the individual has a capacity to rule on his/her manner/action (Ajzen, 1991). This concept is very applicable to understudy farm operators' manner in relation to some noticeable response – which could be very vital for the formulation of programs that will enhance farming and agro-allied sectors (Kautonen et al., 2013), provided that the goal is to enhance viable administration of environmental endowments that promote the practice of viability amongst farm operators (Matthews, 2013).

This concept is an applicable ideological study that gives insight of better knowledge of farm operators' views and enthusiasms. With such knowledge about farm operators, their manners/actions could easily be impacted positively (Fielding et al., 2008). Fostering organic farming among non-governmental farm operators will demand a deeper knowledge of the way manner/action variation could be impacted or controlled. A thorough application of the concept of controlled manners or actions will help to raise fundamental issues on farm operators', in relation to ecological viability, manners or actions that may eventually result to whether they will agree or not on environmental friendly operations (Yazdanpanah et al., 2014). The purpose of every persons views, societal impacts and influence regarding their actions should be tested and analyzed to be able to have the full knowledge of things that motivate farm operators either to agree or disagree with friendly environmental actions in all their farming engagements. After an empirical study was conducted among farm operators, it was revealed that farm operators are constructively ready as well motivated to implement friendly ecologically systems in terms of their views and actions toward sustainable agriculture (Fielding et al., 2008; Wauters et al., 2010). It was contended that agriculturalists' action could not be subjected to any optional influence (Sharifzadeh et al., 2012). Farm operators' view and actions could outwardly be affected by so many interest groups and co-investors like farm operators' association, agro-allied companies, governments and international communities. Thus, the following recommendations below were offered on the basis of the studies:

Constructive views will remarkably determine farm operators' motive rewards implementation of organic farming systems.

- Dictated rules/standards will remarkably determine farm operators' motive towards implementation of organic farming systems.
- The concept of controlled manner/action will remarkably determine farm operators' motive towards implementation of organic farming systems.

However, it is also sensible to presume that farm operators who have more knowledge about the ecosystem and portray good ethical obligations regarding ecological actions may determine their high level of constructive views to the implementation of organic farming systems (Beedell & Rehman, 2000; Corbett, 2002; Fielding et al., 2008). Thus, assessment of ethical responsibilities refer to people's awareness or view of ethical accuracy or inaccuracy in exhibiting of a particular action (Ajzen, 1991). These assumptions below were then included to the speculated recommendation stated above:

- Ethical responsibilities will remarkably influence farm operators' views regarding organic farming systems.

Many research works proposed that previous actions could be very vital to determine prospect action (Armitage and Conner, 2001). Also previous works on environmental administration operations involve actions that demand money and long moment of period to be actualized. This may possibly affect the motives of the coming prospect. On such basis, this assumption was asserted below:

- Farm operators who acquire natural endowed place as farmland will be willing to preserve forest resources both at the present and up coming days.

Finally, other related research works raised fundamental issues that pertains to organization of farming operations such as the demographic profiles, type of land ownership and harvest per tonnes of farm operators which were rated in percentage. The essence of this assessment, is to know the impact of ethical motives on farm operators in relation to sustainable farming systems (Kautonen et al., 2013).

2.3. The Application of Sustainability in Farming Sector

Working towards safeguarding the environment, commerce and the societal expectations are the main focus of sustainability in farming activities which in turn maintain stability in foodstuff supply and consumption across all nations of the world. Being able to match up with growing need of foodstuff both domestically and industrially are the fundamental ideas behind sustainability in the farming industry (National Research Council, 2010). The idea of farming viability is a crucial matter that is versatile and hard to be structured into clear terms of meaning. Farm operators all over the world adopt different methods to promote viability in farming operations and thereby channel it into collective aims and responsibilities. The collective aims and responsibilities are clearly stated as keeper of country environmental resources (like water, terrestrial and breeze resources for wide period advantage, standardized livelihood for farm operators, folks and neighbors). The farm output aimed to meet the necessities of people in terms of foodstuff, animal care, raw materials and promote biomass energy consumption. Other wider aims are preservation and conservation of soil fertility, preserving and making water resources very sustainable, preserving atmospheric air standard and different species and varieties of natural endowments of all living things (National Research Council, 2010). All farm operators all over the globe utilize the like of these new ideas and diverse methods of operation to accomplish these viability aims as stated above (Sustainable Agriculture Research and Education [SARE], 2012).

2.4. The Techniques of Sustainable Farming

Sustainable farming varies from one nation and geographical location to another. There are so many methods being used in sustainable farming among non-commercialize farmers in third world nations using traditional means of enriching the soil and conserving the ecosystem (Denney, 2013). Viable farming operations include a well-designed and articulated farming and minimized land cultivation method. If it is well applied, it could be highly resourceful and ecological friendly. Some of the commonly known methods are mixed agriculture, sequential cropping method,

leguminous planting method, water conservation method, effective pest control method, effective soil conservation method, dung waste method and using of plant residues method. Thus, the farm operators make use of many methods to boost commercial advantage without tampering with the ecosystem by no barrier marketing with the end users, centralized selling center for farm produces, collective investment initiatives for agriculture and common commercial center add values to agricultural products. Also, being dynamic and exploring diverse methods in viable agricultural operations positioned farm operators to be protected and the revenue generation increased as well. This will safeguard farm operators from price instability and at the same time refining agricultural goods through farmers initiative to increase revenue and give rooms for many varieties of agriculturally based goods (National Research Council, 2010).

Practicing sustainable farming will not only increase farm operators financially but will, on the other way round, preserve the natural resources both biotic and abiotic of the environment where they are operating. Using these natural means of farming could save a lot of costs than demanding for agriculture supporting materials such as pesticides, insecticides, herbicides and fertilizers. Sustainable farming operation makes society socially viable in terms of equality and occupation protection for agriculture working force for due allowances and as well securing the environment of the farmland. Environmentally well behaved farmers will have access to credit facilities. It opens up more ground for hospitality industry with more eco-sites for tourists, farm operators would be more enlightened with rich diet foodstuff, creating the environment for cheaper and healthy accessible foodstuff for the growing human population (National Research Council, 2010).

2.5. Chinese Attitude toward Biological Farming: A Lesson to Farmers across the World

Depending on the way it is being termed whether alternative farming or organic farming or sustainable faring or ecological farming or biological farming; all the terms are still regarded as sustainable farming. The advent of viable growth and alternative farming was to address the challenges confronting the industrialized nations

because of their artificial attitudes to commercial advancement and civilization. This era worked on transformation philosophy, standard and global belief in addressing the existing interactions concerning human and environment. The improved features of tertiary institutions of learning in first world nations have experienced much for the past 30 years coupled with their diverse gifts of nature, higher agricultural output and therefore diversified to improve all their activities. Contrarily to what it is obtainable in advanced nations of the world, the Chinese people do not have the enablement environment to accomplish viable advancement. The literacy level among the remote settlers in China is very low. The latest innovation in viable advancement in relation to farming was extremely hard for native farmers to cope with due to traditions and norms of the Chinese society. This idea of environmental viability was not easy for the native farmers to adopt and practice. The Chinese people could not emulate the concepts and methods of the Europeans and Americans in executing alternative or ecological farming. The farmers only work on the methods that are applicable to their immediate environment. Many native farmers were not familiar with the concepts of ecosystem and viable environmental advancement, but they were executing this concept unknowingly among many remote farmers like keeping of poultry farm at the upper of piggery and fish farms according to the traditions that are being passed from one era to another. The practice have serious health consequences, followed by the traditional way of generating biomass gas which later serves as source of inspiration for advanced technicians in China towards the creation of renewable gas generation station, these reduces the use of petroleum energy by native farm operators who gained more supports from them (Xu, 2004).

An agronomist Dr. King really rated the native renewable farming system of the Chinese people. They used native means of converting agricultural remains to enrich soil, practicing traditional mixed farming to both benefit of plant, animal and the land itself; using different patterns of tilling on high topographical land to manage the crops and land advantageously. These produces a vibrant ecosystem that keeps the natural movement of food and molecules for persistent renewability and high productivity for

every farmer (Gongfu, 1989; Ruddle, & Christensen,1993). Application of this Chinese sustainable farming that involved the exchange of substances that are of mutual benefits are seen working in the areas of environmental technology (such as remote power production on biomass, edaphic and water management, afforestation and cover plant recovery, surface water channelization to prevent denudation of soil), technology incorporation of plant tillage, livestock production, fish farming and technology for converting discarded agricultural remains into useful materials. Chinese people have extended this sustainable way of farming to so many regions across the People Republic of China (PRC), especially to the areas where people are experiencing topographical challenge, loss of soil nutrients due to massive erosion and loss of forest cover. Thus, forests have been recovered through the use of biomass fuel which in turn expand the statistics of piggery farmers and fish farmers coupled with increased revenue generation, more financial gains, positive environmental and societal impacts, more knowledge gain, low capital require, require high working force at low cost rate and creation of environmental friendly people. The public authorities of China uses the opportunity to reward farmers who comply environmentally to sustainable farming by giving them loan incentive at low interest rates, engineering supports and advisory supports from agricultural experts. Statistical figures of farmers that practice sustainable farming has grown from one hundred and one to two thousand four hundred and fifty across the regions of China (Qianji, 1988).

2.5.1. Evaluation of Chinese Sustainable Farming and Global/Western Sustainable Farming.

Chinese nation is environmentally rich with diverse gifts of nature, rich valuable traditions and nature knowledge of natural phenomenon, capitally viable, high productivity in terms of agricultural production, highly rated capital per head, high purchasing power and highly enterprising, while the advanced Western and even the developing nations have a lot to do for the idea of alternative farming to be widely adopted by the farmers in general. Chinese farmers are highly ranking compared to these nations in sustainable farming. It is just that China is limited due to high illiteracy rate

that dominate the farming sector (Xu, 2004). These evaluations are expatiated as follows:

- The public authorities made a crucial impact of consultation and supervision among the native Chinese farm operators through the spreading of the idea of alternative farming, while their Western counterpart public authorities were not making any directives influence and collaboration with potential farmers. It is self-decision that matters on the part of the Western farmers whether to adopt alternative farming or not (Xu, 2004).
- Most power generating means among native Chinese farmers are sourced from the remains of agricultural product usually called biofuel, while the Western farmers' sourced power from conventional means for their farming operations like nuclear, hydroelectric and fossil fuel (Brown & Brown, 2013).
- On the basis of statistical survey on Chinese farmers, their population was approximately two hundred and fifty million which could be so tough to migrate to the cities compared to the mass movement of people that happened in Western nations from villages to cities during the industrial revolution seeking for well-paid jobs (Swaminathan, 2002).
- There are varies ecological, societal, financial, commercial and traditional viable environments across large span of areas in Chinese Republic compared to the advanced nations of the west. Several methods are combined together to achieve ecological farming in China than using a specific technique like the western people do (Altieri & Merrick 1987).
- The practice of organic farming in China is at a large measure while in Western world the practice is done at a small dimension because method gives more priority to the environment and its resources. Thus minimizing farm resources utilization, makes it more financially and commercially sustainable, producing more agricultural output with no environmental negative consequences. It explained further that organic farming must be power producing and reliable, output must be large at every span of land use, it must be able to modify itself into diverse areas of production and services, make use of little span of land, financially at advantage, landscape beauty

must be maintained and it must be morally acknowledged. Practically, Chinese organic farming is not fundamentally characterized with small farming materials, dependable with power and dependable for viability in resources usage. This practice spread to so many Chinese provinces (Kiley-Worthington, 1993).

In addition, both the Chinese and Western sustainable or ecological farming shared several things in common which involve changing the direction of farming from industrial farming to sustainable farming in order to solve power generating problems by diverting into biomass power source, boost foodstuff production due to the increasing numbers of people and safeguard the damaging ecosystems. Both share the idea of environmental concern, growing effects of human on the environment, moral consideration for the ecosystems; collaborating finance, commerce and public obligations into sustainable farming. Both advocate for justice on the part of human to the environment, enhancement of village settlement with adequate infrastructures and eradicating impoverishment among the people by achieving food security and wealth creation (Wu&Flynn, 1995).

2.6. The Agrarian Economy in Libya

The public authority in charge of farming activities in Libya gives serious attention and focus on the advancement of agrarian economy. Land owners who are not into the business of farming are motivated to give out their land to potential farmers; more incentives are given to farmers who operate in villages so as to discourage the movement of working force from villages to cities. It was a well accomplished program that have boosts agricultural productivity in Libya (Allan et al., 1973). Then the output in agrarian economy picked up a bit significantly higher with the collaboration of non-Libyan farmers that migrated from other countries of the world into Libya (Cervantes-Godoy & Dewbre, 2010). Thus, farming economy now transformed into the main primary activities of Libyan economy according to the growth programs given more upper hands to the financing of water schemes through damming of the water sources in the region of Al Kufrah and Sarir (Pallas, 1980). Libyan public authority also opened access of repayable financial incentives to ten thousand farmers at zero interest rates for

the agrarian financial institutions. In the year 1984, this encouraged approximately twenty percent of working class of Libyans to be actively involved in farming activities. With regards to these incentives, Libya remained static to be depending on the importation of grain crops from other countries of the world. The farming output only makes little impact to their domestic production and income. On the statistical mean level, close to seventy percent of Libyan foodstuff consumption comes from overseas from the origin of Libya till date (Salem, 1992).

Without any doubt, the Libya agrarian economy could have been experiencing steady growth and even make impact socio-economically if not because of the harsh unstable weather situations, poor state of the soil and the challenges that are involved in getting water artificially into the farmland. Available good farming lands are only concentrated to the west region towards the seaside of Libya. Cereal crops are commonly planted while the animal rearing are restricted to the eastern part of south Libya. Crop production is limited by scanty rain and long period of drought and desert encroachment. But notwithstanding for the past three decades, the growth of Libyan agrarian economy has picked up massive irrigation farming, use of chemicals for pest and diseases control and fertilizers enriching and getting rid of the poor state of Libyan soil. Consumers' consumption rate due to the rising population has created a commercial opportunity for potential farmers in Libya (Alghariani, 1994).

2.6.1. Crops farming in Libya

Considering human statistic figures in Libya, which was estimated to be above six million inhabitants with seventy thousand people that are fully engaged in agricultural practice while one hundred thousand people are partially engaged. The available land for animal rearing covered fifteen million hectares, one million eight hundred thousand hectares allocated for staple crops products (for such crops are cereal in nature) and three hundred thousand hectares for stable farm produces like citrus fruits and other tree crops (dates and olives). About two hundred and forty hectares of land are apportioned for vegetable products which are mostly carried out through artificial means of passing water into the farmland (Lowder et al., 2014). Although, the farming

authority of Libya crated a goal for agricultural product before Libyan farmers with robust incentives, these impacts have not significantly boost the production and trading capacity of the agrarian industry despite the wide prospects internationally for the food and cash crops. Even farm products trading prospects abound among the nations surrounding Libya (Heemskerk & Koopmanschap, 2012).

2.6.2. Livestock Farming in Libya

Livestock farming in Libya are mostly dominated by poultry birds and other domesticated animals that are purposely source for eggs, meat and animal milk products respectively. According to the information that was gathered in the year 2010 in respect of livestock farming capacity in Libya, the estimated figures are stated as follows: seventy one thousand for camels, two hundred ten thousand for cows, one million nine hundred thousand for domesticated goats, five million one hundred thousand for sheep's and twenty four million eight hundred thousand for poultry birds. The livestock industry were able to hit up with domestic demand and consumption, but not to the rising demand of international market due to poor pasture land that limits livestock feeding and breeding capacity. Thus the farmers mostly depend on the importation of livestock meals. This industry was often faced with poor management on the part of the government, farmers and marketing links that are connecting to the final consumers. The fishing segment as a subsidiary of livestock industry experienced a tremendous growth to the extent of expanding its market internationally in early 1980s due to the backing of the public authority before the emergent of the Libya oil boom. These resulted in loss of exportation to the bordering Mediterranean nations and the Asian nations as well (Heemskerk & Koopmanschap, 2012).

2.6.3. The Evaluation of Problems and Prospects of Sustainable Farming in Libya

The consequences of socio-economic problems, environmental degradation, water shortage in the like of long drought, desert encroachment and over irrigation farming that results in high concentration of salt in the soil and soil nutrient deficiency in Libyan agrarian sector may probably not be comprehended by non-Libyans except they

take a field trip visitation to sample the opinions of the farmers that are facing the hardship. These farmers are desperately looking for remedies to solve the aforementioned problems restricting their farming activities, most especially water scarcity through adopting of viable and consistent water supply to the farmland like the water project obtainable in Egypt, Turkey, Tunisia and Syria. All the techniques adopted by these nations were able to manage all their water sources both surface and underground more efficiently than it could ever be imagined (El-Habbasha et al., 2015; Acar et al., 2014; Thabet et al.2013; Hussein & Yakoub, 2011). The use of water retention substances can as well keep the soil highly moisturized at all times and at the same time help to solve scarcity of water that is affecting farming activities (Cisar et al., 2000). These water retention substances are similar to the one used in transforming the sandy nature of soil in Egypt. It enhanced the soil structure, constituents and as well boost the production capacity of grain crops (Mohamed & Magdi, 2005). In Libya, loss of soil nutrients and structure are serious crucial matters affecting plant production capacity. Leaving plant remains after harvest in the farmland are vital strategies that could help control soil diminishing effect by different actions of denudation either water or wind. The use of leguminous plants could help to control this menace like it is being practiced among farmers in Spain, so Libyan farmers are incorporating such practice into their farming system (Turmel et al., 2015; Ruiz-Colmenero et al., 2013).

However, many farm operators in Africa do not have access to satellite data in except some countries like Libya which implements a well reliable and specific farming technique and production in relation to soil conditions and adaptable farming policies for the present and thereafter (Bora et al., 2012; Geipel et al., 2015). It was revealed by the research carried out in USA that assuming we have exactly ten percent of farm operators adopting specified or correct farming technique, such farm operators would be able to minimize two thousand loads and one thousand eight hundred and ninety three loads of chemicals that are usually used on insects, soil and weed accordingly (Park, 2016). Many current studies embarked on by the Ministry of Agriculture were targeted towards the improvement of agrarian economy in Libya. Precisely in the year 2012, the public authority of Libya collaborated with foreign institutes for farming study to do findings

on how to farm on dry land – these were initiated with many prospects that will lunch Libya towards sustainable agriculture; especially on the issue of farm water administration and grains farming. Libyan authorities were financially supported with approximately seventy one million dollars from Food and Agriculture Organization in order to develop Libyan agrarian economy on vital aspects of crops farming, administration of the application of chemicals on farmland, improvement of crop varieties and efficient coordination of environmental endowments towards increment on crops farming. But, the advent of political instability and insecurity, the activities of FAO had experienced a serious countdown while the administration works were being coordinated from the outlets in Tunisia and Egypt. This eventually affected different categories of farm operations in Libya both the government, individual farmers and subsistence farmers (Combaz, 2014).

2.7. The strategic Position of Farming Expatriates toward Sustainable Farming.

Alternative or organic farming focused on potential farmers are ready to be encouraged to use agricultural inputs efficiently such as pesticides, fertilizers, insecticides, fungicides and herbicides. It also involved in the prevention of the pollution of water sources, rearing of domesticated animals in the most efficient way, natural enrichment of soil and storing of crop seeds in the most secured facility for any eventuality in the nearest future. Many challenges may arise due to lack of coordinated efforts and policies among farmers on the use of agricultural inputs. The positive outcome of alternative farming may not really rely so much on reinforcement, abilities and understanding of every farm operators, likewise the way farm operators practice and get information relating to organic farming. Training of farm operators is very essential in achieving the best in organic farming especially through the support of tertiary institution lecturers and expatriates from agricultural research institutes. But academic communities have not been able to meet up the targeted expectations regarding sustainability and agriculture, such as lack of concern in individual improvement and teaching on the act of sustainable know how. Learners were unable to acquire the expected knowledge in the administration of sustainability studies. The technological

acts of alternative or organic agriculture should clamor more on the dimension and techniques that will assist farm operators to evaluate the conditions regarding their operations in the areas of animal dung assessment, mapping of familiar pests in the farming areas and the assessment of the organic and chemistry contents of the soil. Thus, the act of acquiring knowledge about alternative farming entails serious reformation on the basic aims, techniques, concepts, understanding of threats, working force framework, assessment of abilities and demonstration of efficiency in agricultural practices. There are 4 educational channels that are basically rooted in understanding of farming and ecological rules (Röling, 1993): these include the following:

- Sustainable farm operators should be sensitive to the situations around them, take note of all events surrounding their farming operations, mount facility for farmland survey and supervise the methods of operation thoroughly.
- Sustainable farm operators should be more aware of the state, origin and production sequence of any farm produces predator in their surroundings, knowledge on how to prevent, knowledge about basic environmental rules or concepts, knowledge about soil contents and mode of formation.
- Sustainable farm operators should possess every necessary ability in the areas of farm surveillance, supervision, minimizing farm waste through finding means of decomposing them, efficient use of farm chemicals and threats evaluation.
- Sustainable farm operators must not only administer on farming operations but also be actively involved in cooperative responsibility of taking care of environmental endowments.

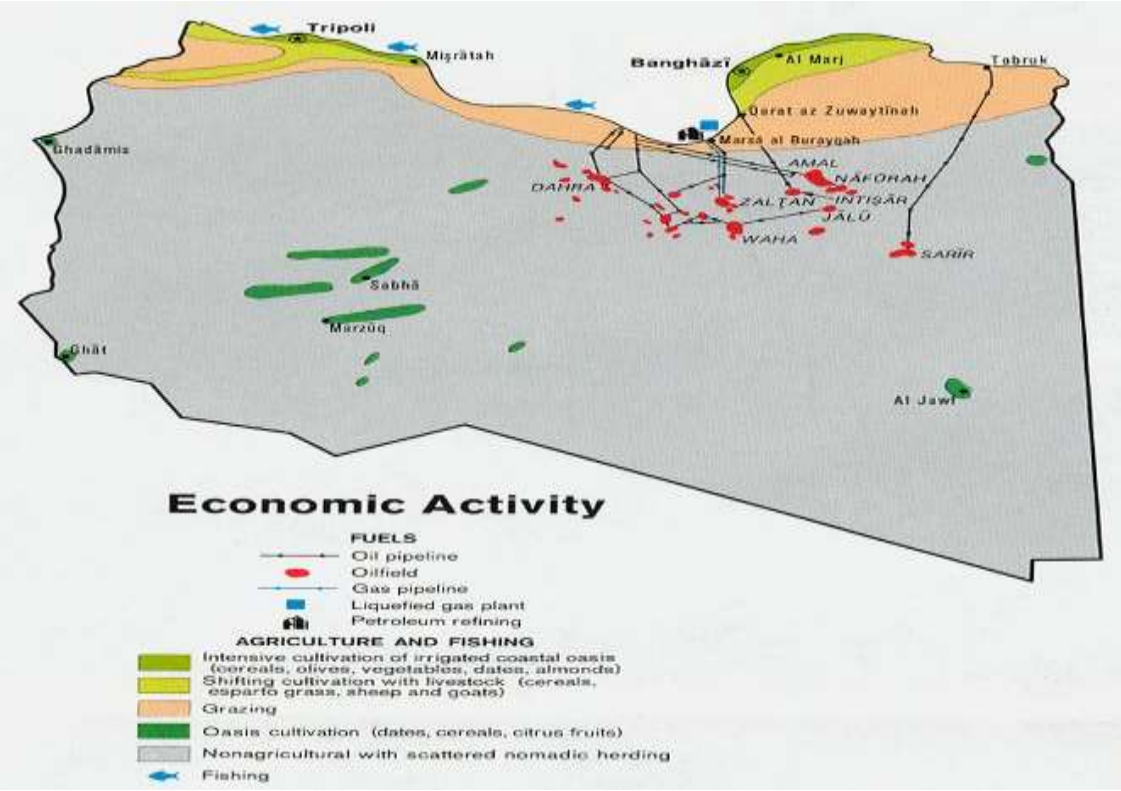
CHAPTER III

RESEARCH METHODOLOGY

3.1. The Population and Characteristics of the Study Area

This research was basically framed toward quantitative analysis. The research mainly focused on farmers in the West part of Tripoli – which is predominately mixed land use for residence, public administration, commercial and farmland for farmers who rely mostly on accessible irrigation water, favorable Mediterranean climate, geophysical state of the landscape, soil condition and market opportunity makes it so conducive for high concentration of farming activities. The population size of the farmers that include subsistence farmers, commercial farmers and government owned farm operators have been estimated to be about fifteen thousand and nineteen farmers that covers forest, crops and livestock production (Ayub et al., 2016). Their farming operations are limited to production of grain crops (wheat, barley and corns), vegetable crops (onion, tomatoes, peppers, cucumbers, potatoes and watermelons), tree crops (like olives, oranges and dates) and domesticated animals rearing (such as sheep, goats, cows and poultry birds), fish and dairy production (See details in Figure 2 below showing Agricultural and fishing activity areas in Libya with focus on Tripoli Region). The mode of farmers' selection was based on random sampling technique and they were numbered accordingly as the questionnaires being distributed to the respondents on one to one and face to face basis. A total of 180 questionnaires were administered putting into consideration the broad view of the entire population that included farmers, non-farmers and residents were estimated approximately to one fifty seven thousand seven hundred and forty seven according to the periodic head count of the year 2012(Ayub et al., 2016). This action was justified by the view of Krejcie and Morgan in the year 1970. It should be noted that targeted farmers were first sampled out and numbered according to the concluded sample size before the questionnaires were finally administered to the respondents.

Figure 2.
Showing Agricultural and Fishing Activity Areas in Libya with Focus on Tripoli Region (Sourced from Google image of Libya Economy and Agriculture).



3.2. Research Tool

This study was specifically aimed to analyze farmers' attitude towards sustainable agriculture in west Tripoli, located in Libya and dated to the year 2018. The farmers were seriously motivated to think on the basis of their experiences and as well eager to express their various perceptions regarding farming activities and the environmental circumstances surrounding them. The research tool comprises of eleven sectional leading questions that are well simplified and organized to determine farmers' attitude in relation to the research topic depending on demographic factors, ranking of socio-economic challenges, environmental problems, factors that contributed to environmental problems, natural resources and environmental protection, environmental degradation, measures taken against environmental problems, measures taken to control weeds, production process and improvement, problems encountered during production,

agricultural production and influencing factors. On the basis of these, Libyan farmers in west Tripoli signified their attitudes to ranking and acceptance through Seven-points of Likert scale (1 = strongly agree to 7 = strongly disagree) or “always”, “often”, “sometime”, “rarely” and “never” or ranges from first source to second source and “yes” or “no” responses. Each section of the questionnaires varied from six to sixteen assertions in which every farmer responded. The assertions were formulated to represent various views toward sustainable farming in reference to the research work of (Agbaje et al., 2001).

However, for the dependability and originality of this research work, as it was earlier specified, a quantitative research technique that involved the use of questionnaire, field surveys, one to one interview, interaction with the targeted respondents and on-line search of research materials were practically utilized and consulted accordingly. An in-depth cross analysis search of both previous and current related works of this study was carried out with comprehensive comparison to prove the empirical value of the facts with the on-going work on farmers’ attitude toward sustainable agriculture (Özkök et al., 2009; Karasar et al., 1999).

3.3. Data Collection

The gathering of data through the aid of questionnaires was carried out at the end of the first quarter of the year 2018. A pre-survey of the research field was previously carried out to alert or prepare the farmers ahead of days the questionnaires were administered and the farmers accepted to be interviewed on one to one with the leading of the research tool for data collection. Precisely one hundred eighty questionnaires were administered to 180 farmers and in return one hundred percent of responses were generated from the farmers. It was really interesting because the farmers cooperated and participated fully for the period of two weeks that the interview was scheduled. All the pre-requisites for omission coordination check were duly observed despite the fact that it was unfounded in this research work. The technique supported that empirical information collated from few targeted farmers can as well be used to generalize the opinions of non-participated farmers (Lindner et al., 2001).

3.4. Data Analysis

Both the referential and descriptive data analysis were carried out through the application of SPSS software which was marked at critical upper value of 0.05. The results of this statistical analysis depicted various significant values on how farmers' attitude toward sustainable agriculture could be determined by demographic factors, socio-economic situations, environmental problems, factors that triggers environmental problems, natural resources and environmental protection, environmental degradation, measures taken to control environmental problems, steps taken to control weeds, production process and improvement, problems experienced during production, agricultural production and influencing factors. All these were revealed by one –way analysis of variance (ANOVA) and post-hoc Dunn's pairwise differences evaluation whether variation occurred among these asserted variables in relation to farmers' attitude toward sustainable agriculture in west Tripoli of Libya.

3.5. Ethical Aspect of Research

All the ethical rules and regulations were duly observed and complied with. The information collected regarding the respondents were kept confidentially and undisclosed for any public identification and the data collected was specifically used for the purpose of this research which was basically for academic reasons.

CHAPTER IV
FINDING AND ANALYSIS

At this stage of thesis, the findings and analysis were derived according to the sub-problems formulated statement basically on the area of study as details on the statistical tables and comments below:

4.1. Presentation and Analysis of Findings on the basis of Research Problem Assertions

The evaluation of the significance of the problem assertions depends on the respondents' response in relation to their attitudes toward sustainable agriculture in Libya. Thus, the findings are well elaborated as follows:

4.1.1. The First Sub-Problem

The first sub-problem stipulated that "How do farmers' attitudes toward sustainable agriculture vary according to the ranking of the socio-economic problems?". According to the statistical data being revealed in Table 1 and Figure 3; 55 percent of the Libyan farmers expressed significantly education as one of the fundamental problem facing Libyan society and other socio-economic problems followed concurrently in ranking as health care 21.1 percent, unemployment 8.3 percent, transportation 6.1 percent, environment 5.6 percent and economic inflation 3.9 percent correspondently. The major societal problem in Libya that crucially influences the farmers' attitude toward sustainable agriculture is education. In most developing nations like Libya, farming supports every part of the society financially and commercially. Sustainable farming basically solves matters relating to impoverishment, unemployment, foodstuff scarcity, low capital per head of the general populace and triggers other areas of the society towards growth and development (Lee, 2005; Bhutto & Bazmi, 2007). It is pertinent to bear in mind that diverse learning activities and strategies involve full information of farmers' attitudes in relation to alternative farming, basically, learning and exposure indirectly or directly have serious effects on peoples' perceptions, ideas and views regardless of their societal problems (Petrzelka & Malia, 1996).

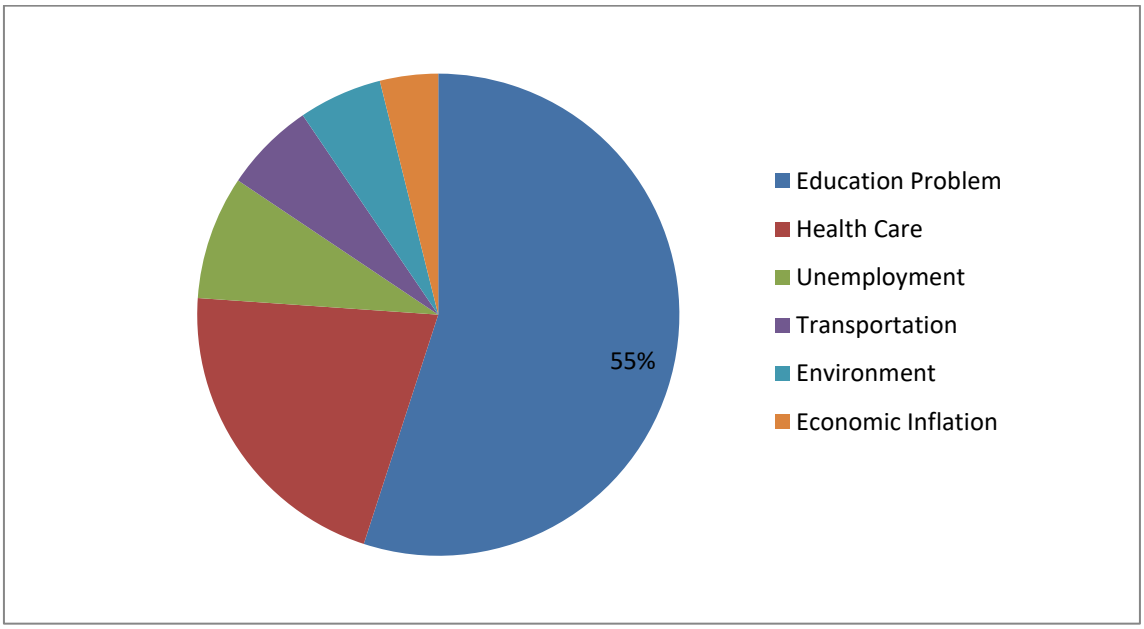
Table 1.

The results of descriptive analysis of farmers' attitudes toward sustainable agriculture as it vary according to socio-economic problems.

Problems	Unemployment	Education	Transportation	Environment	Healtcare	Economic Inflation
1st rank	15	99	11	10	38	7
	%8.3	%55	%6.1	%5.6	%21.1	%3.9
2st rank	18	52	6	11	87	6
	%10	%28.9	%3.3	%6.1	%48.3	%3.3
3st rank	60	15	11	49	22	23
	%33.3	%8.3	%6.1	%27.2	%12.2	%12.8
4st rank	25	7	28	33	15	72
	%13.9	%3.9	%15.6	%18.3	%8.3	%40
5st rank	29	6	47	57	11	30
	%16.1	%3.3	%26.1	%31.7	%6.1	%16.7
6st rank	33	1	77	20	27	42
	%18.3	%0.6	%42.8	%11.1	%3.9	%23.3
Total	180	180	180	180	180	180
	%100	%100	%100	%100	%100	%100

Figure 3.

Ranking of sosio-economic problems among farmers in relation to sustainable agriculture in Libya.



4.1.2. The Second Sub-Problem

The second sub-problem postulated that “How do farmers’ attitudes toward sustainable agriculture vary according to the ranking of the environmental problems?”. The farmers indicated the basis of the results in Table 2 and Figure 4 relating to environmental problems affecting sustainable agricultural practices in Libya. Large number of farmers rated deforestation (37%) higher than any other environmental problems such as air pollution 17.8%, water pollution 14.4%, random urbanization 8.9%, soil contamination 7.2%, global warming 6.1%, noise pollution 2.2% and species control 1.1%. Taking a critical look at the source of these environmental problems, soil contamination in any given environment is fundamentally originated from the persistent utilization of contemporary agricultural implement, inefficient application of substances to induced soil fertility, control pests and insects, poor way of farming through artificial water systems, indiscriminate trees, poor way of managing pastoral land, expansion of cities and industrial activities (Aktas, 2001).

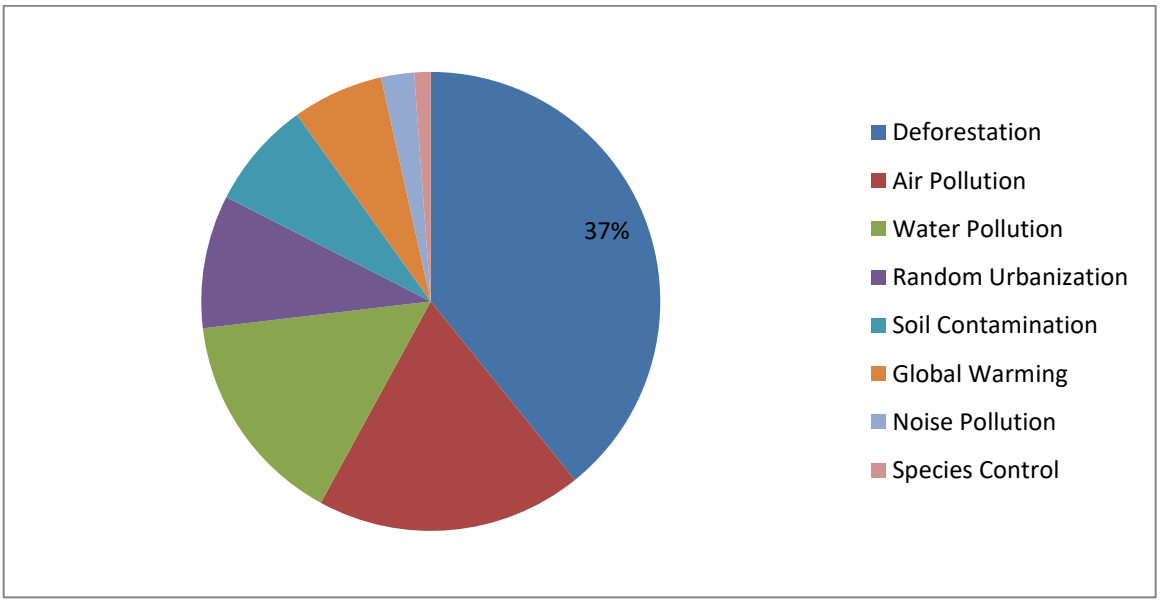
Table 2.

The results of descriptive analysis of farmers' attitudes toward sustainable agriculture as according to the order of importance of environmental problems in Libya.

Statements	**Noise Pollution**	**Air Pollution.**	**Water Pollution.**	**Soil Contamination**	**Deforestation**	**Solid Waste.**	**Random Urbanization.**	**Global Warming.**	**Species Control**
		2	6	3	7		6	1	
1st rank	2.2	17.8	14.4	7.2	37.2	5	8.9	6.1	1.1
		5	3	9	8	9	1		
2st rank	3.9	25	23.9	10.6	15.6	10.6	6.1	3.9	0.6
	0	1	0	8	8	2	1		
3st rank	5.6	17.2	27.8	15.6	10	6.7	11.7	5	0.6
4st rank	1	6	8	7	8	6	1		
	6.1	14.4	15.6	31.7	10	8.9	6.1	5	2.2
5st rank	4	4	5	2	3	1	2	5	
	7.8	13.3	8.3	17.8	7.2	17.2	17.8	8.3	2.8
	7	1	2	7	3	2	4	2	
6st rank	9.4	6.1	6.7	9.4	7.2	28.9	18.9	12.2	1.1
	6				11	5	2	1	4
7st rank	20	3.3	1.1	1.7	6.1	13.9	17.8	28.3	7.8
	1					0	5	1	6
8st rank	28.3	2.8	1.1	5	3.9	5.6	10	22.8	20
	0							5	15
9st rank	16.7	0	1.1	1.1	2.8	3.3	2.8	8.3	63.9
	80	80	80	80	80	80	80	80	80
Total	100	100	100	100	100	100	100	100	100

Figure 4.

The order of importance of environmental problems among farmers in relation to sustainable agriculture.



However, with regards to the man induced and nature related problems stipulated above; alternative farming has been positioned to utilize small resources at renewable and high productivity advantage (Sadati & Sadati, 2010). Presently, the global community is troubled so much about the negative consequences of farming advancement on ecosystem, ecological endowments and future effects of renewability on soil properties (Leeuwis, 2004; Al-Subaiee & Thomson, 2005).

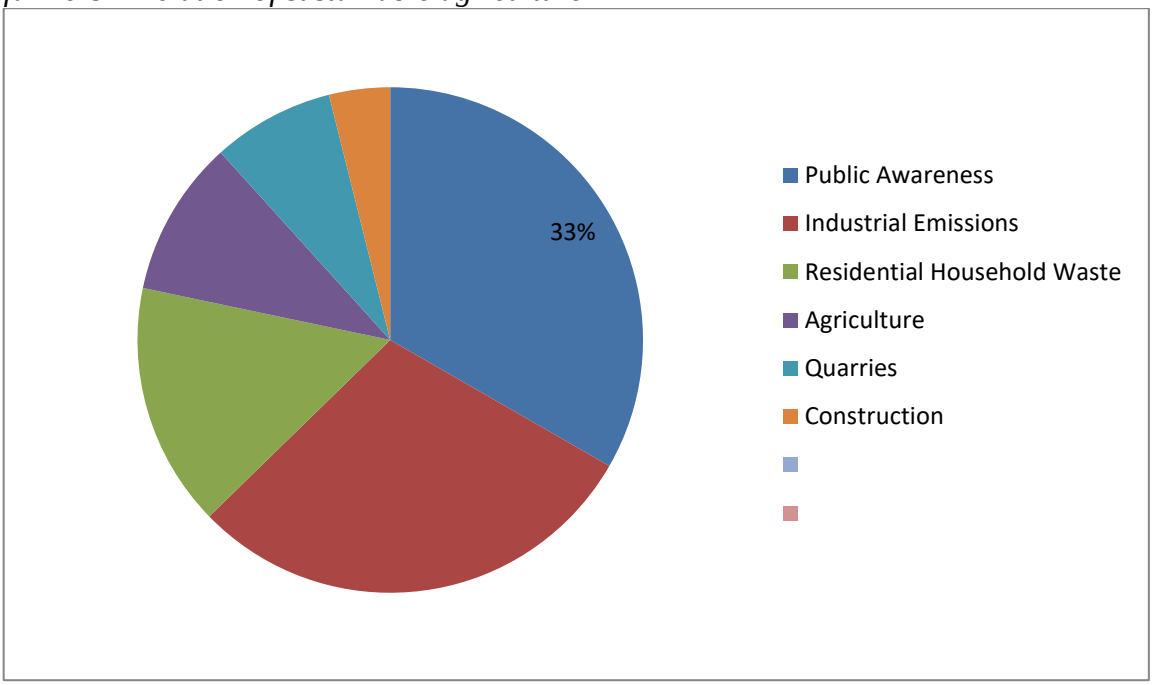
4.1.3. The Third Sub-Problem

Table 3.

The results of descriptive analysis of farmers' attitudes toward sustainable agriculture as according to the order of important factors that are contributing to the environmental problems in Libya.

Statements	Industrial Emissions "Factories & Power plants"	Residential "Household Waste"	Agriculture "Fertilizers, Pesticides"	Constructions	Quarries	Public Awareness
1st rank	53	28	18	7	14	60
	29.4%	6%.	10%	3.9%	7.8%	33.3%
2st rank	30	25	62	23	14	27
	16.7%	13.9%	34,4%	12.8%	7.8%	15%
3st rank	44	36	35	14	14	37
	24.4%	20%	%19.4	%7.8	%7.8	20.6%
4st rank	25	52	35	25	16	27
	13.9%	28.9%	19.4%	13.9%	8.9%	%15
5st rank	12	25	16	63	50	14
	6.7%	13.9%	8.9%	35.0%	27.8%	7.8%
6st rank	16	14	14	48	72	15
	8.9%	7.8%	7.8%	26.7%	40%	8.3%
Total	180	180	180	180	180	180
	100%	100%	100%	100%	100%	100%

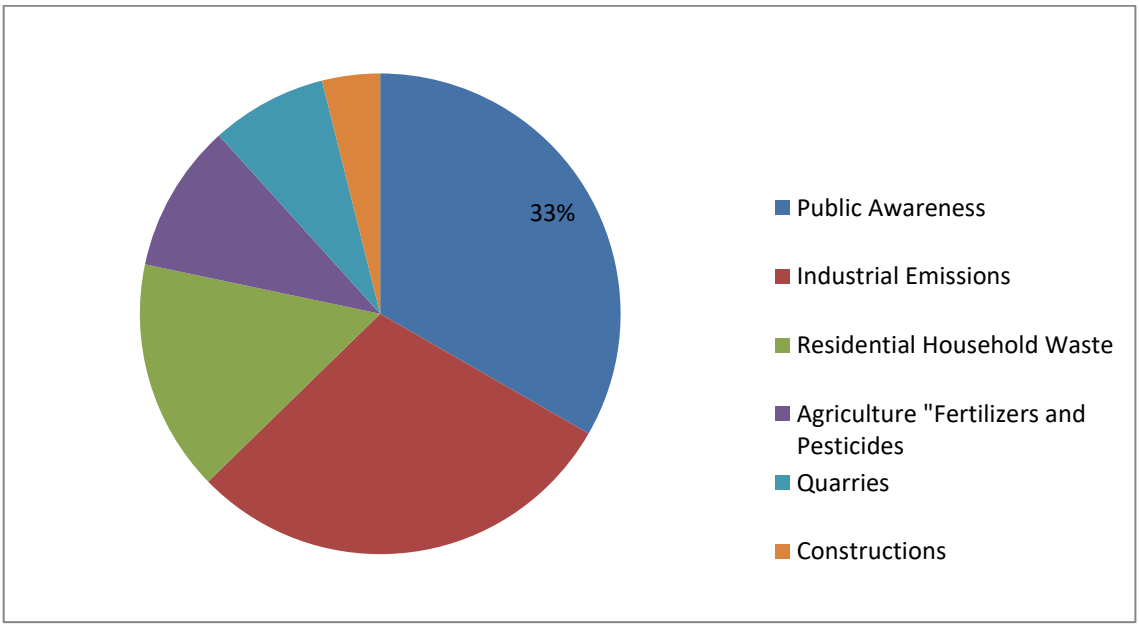
Figure 5.
The order of importance of factors that contributed to environmental problems among farmers in relation of sustainable agriculture



The third sub-problem focused on "How do farmers' attitudes toward sustainable agriculture vary according to the order important factors that are contributing to the environmental problems?". The information collected inference in Table 3 and Figure 5, vividly revealed how farmers expressed different views farmers awareness 33.3% were remarkably acknowledged the most among other factors like industrial emissions (factories and power or plants) 29.4%, residential household waste 15.6%, agriculture (fertilizers and pesticides) 10%, quarries 7.8% and construction 3.9%.

Figure 6.

The order of >important factors that are contributing to the environmental problems among farmers in relation to sustainable agriculture.



Because of the growing numbers of man across the world, the urgency of meeting up with foodstuff supply for domestic and industrial purposes, advancement in agricultural strategies and the industrial farming are adopting more sophisticated method to boost production capacity. All these are transformed into frequent use of substances that induce and protect farm production which in turn have serious adverse effects on biosphere, particularly all forms of contamination that occurred within the ecosystem, exhaustion of environmental possessions (like water, vegetation, soil, wildlife, atmospheric gases), human migration and activities in form of waste disposal, construction, mining and industrialization (CCE 1998, Marta-Costa 2001, Costa and Poeta 2003). Also, the majority of the farmers followed the direction that public awareness is the main contributing factor to environmental problem. Thus through adequate public awareness, farmers could be collaborated into the ideologies and strategies of alternative farming by reinforcing learning activities that will impact their understanding, views and approach towards obligation to take care of nature while farming (Hungerford & Volk, 1990).

4.1.4. The Fourth Sub-Problem

The fourth sub-problem is "How do farmers' attitudes toward sustainable agriculture vary according to the order of important measures taken against environmental problems?. The obtained data are given in Table 4 and Figure 6 accordingly.

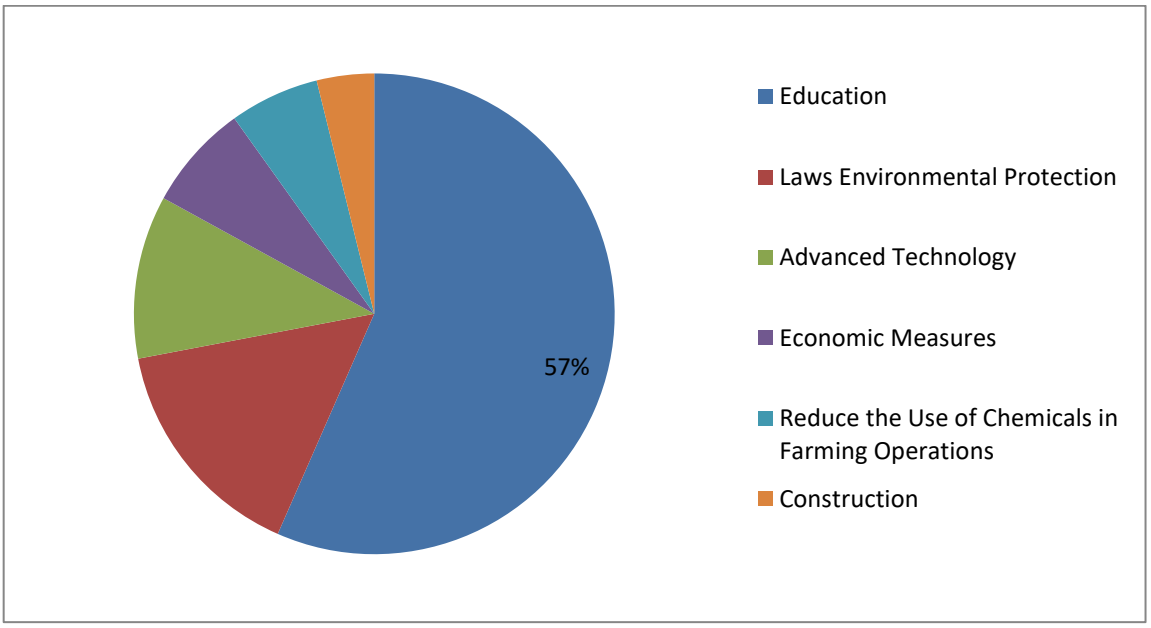
Table 4.

The results of descriptive analysis on the order of important measures taken against environmental problems in Libya.

Statements	**Advanced Technology**	**Education**	**Laws for the protection of natural resources and protection of the environment.**	**The use of recycled raw materials in industry**	**Economic measures (sanctions, incentives, taxes)**	**Reduce the use of chemicals in farming operations such as fertilizer, soil nutrients, toxins and anti-pest.**
1st rank	20	103	28	5	13	11
	11.1%	57.2%	15.6%	2.8%	7.2%	6.1%
	35	27	87	9	16	7
2nd rank	19.4%	15%	48.3%	5%	8.9%	3.9%
	21	22	28	24	71	13
3rd rank	11.7%	12.2%	15.6%	13.3%	39.4%	7.2%
	49	11	26	16	39	39
4th rank	27.2%	6.1%	14.4%	8.9%	21.7%	21.7%
	39	9	9	45	20	58
5th rank	21.7%	5%	5%	25%	11.1%	32.2%
	16	8	2	81	21	52
6th rank	8.9%	4.4%	1.1%	45%	11.7%	28.9%
	180	180	180	180	180	180
Total	100%	100%	%100	100%	100%	100%

Figure 7.

The order of important measures taken against environmental problems among farmers in relation to sustainable agriculture.



According to Table 4and Figure 5 above, Libyan farmers responded the most to education (57.20%) as the first factor among other measures taken against environmental problems in Libya; the results of other measures include Laws for the protection of natural resources and protection of the environment 15.60%, advanced Technology 11.10%, economic measures 7.20% and reduce the use of chemicals in farming operations 6.10%. The implication of the results showed a great for the knowledge and teaching of ecological matters among farmers toward alternative farming in terms of the laws, influence of agricultural technology on environment and the use and the environmental impacts of agro input substances. These showed laxity on the part of education failing to inculcate ecological knowledge into farmers learning experience (Jabbour, 2010). It significantly implies that education has more vital roles to play among Libyan farmers in reshaping their attitudes toward sustainable agriculture and collectively alleviate environmental problems.

4.1.5. The Fifth Sub-Problem

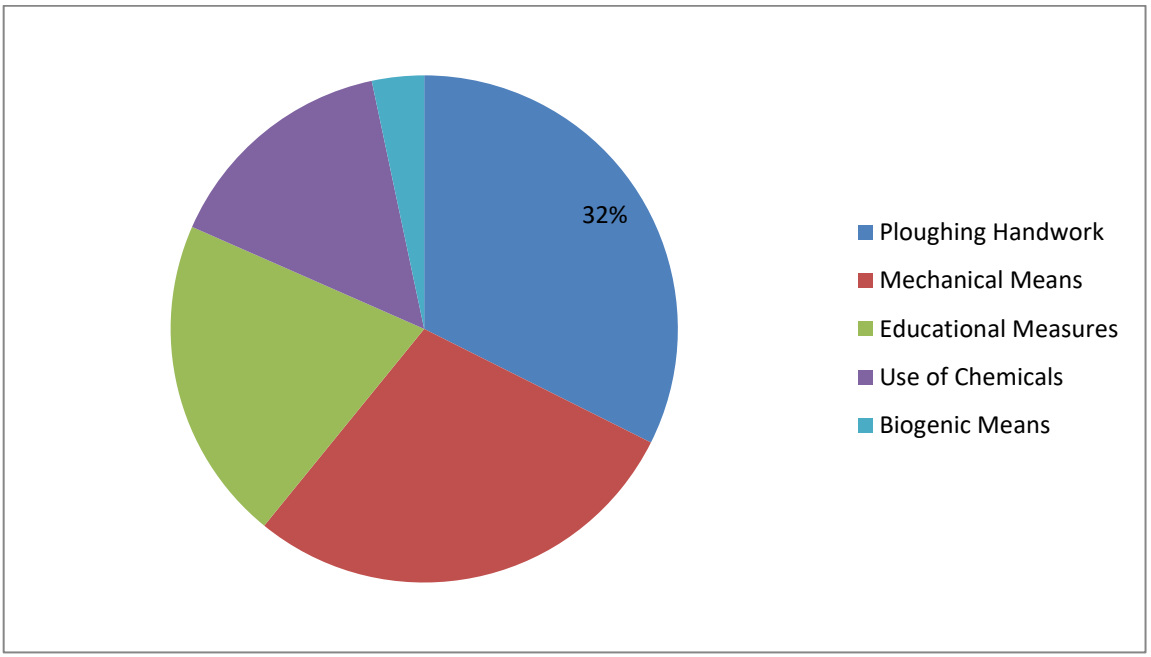
The fifth sub-problem is "How do farmers' attitudes toward sustainable agriculture vary according to the order of important steps taken to control weeds? The details of the data are exclusively given in Table 5 and Figure 7 below.

Table 5.
The results of descriptive analysis on the order of important steps taken to control weed in agricultural fields in Libya

Statements	**Mechanical means (mowing, plowing)**	**Plowing handwork**	**Biogenic means (insects, sheep, and poultry)**	**Chemicals such as herbicides means**	**Educational measures for preventing the spread of pesticides in the area cultivated for farmers (the use of advanced irrigation, fertilization).**
1st rank	**51**	58	6	27	37
	28.3%	32.2%	3.3%	15%	20.6%
2nd rank	74	46	13	26	21
	41.1%	25.6%	7.2%	14.4%	11.7%
3rd rank	33	39	34	51	23
	18.3%	21.7%	18.9%	28.3%	12.8%
4th rank	15	23	48	25	69
	8.3%	12.8%	26.7%	13.9%	38.3%
5th rank	7	14	79	51	30
	3.9%	7.8%	43.9%	28.3%	16.7%
Total	180	180	180	180	180
	100%	100%	100%	100%	100%

Figure 8.

The order of important steps taken to control weed among farmers in relation to sustainable agriculture in Libya.



As indicated in Table 5 and Figure 7, the Libyan farmers responded differently to the various means or methods of weed control, but the most commonly used method is Plowing handwork (32.2%) which happens to be the most effective solution to weed control in agricultural fields in Libya. While the rest of the farmers indicated other practices of weed control that includes mechanical means 28.3%, educational measures 20.6%, chemical means 15% and biogenic 3.3%. Several research works revealed that a lot of farm operators often find it difficult to manage unwanted plants in their farmland. Weed management techniques vary from manual means to traditional, biogenic and nature generated substances (Aldrich & Kremer, 1997; Forcella & Burnside, 1994). On the basis of the statistical data being collected the majority of the farmers in the study area used ploughing handwork to get rid of weed in their farmland. This particular technique often helps to preserve the soil composition, structure, moisture content and properties. It also increases productivity of farm product, it protects soil from diminishing, preserves ecological system and its endowments (Dastgheib & Goh, 1999). Farmers also responded positively to teaching and learning means of weed management,

possibly through agricultural field workers which directly promote sustainable farming in Libya.

4.1.6. The Sixth Sub-Problem

The sixth sub-problem is "How do farmers' attitudes toward sustainable agriculture vary according to the production process and improvement? "And the obtained data are given in Table 6 and Figure 8 which depicted various opinions of Libyan farmers toward sustainable agriculture on the basis of production process and improvement.

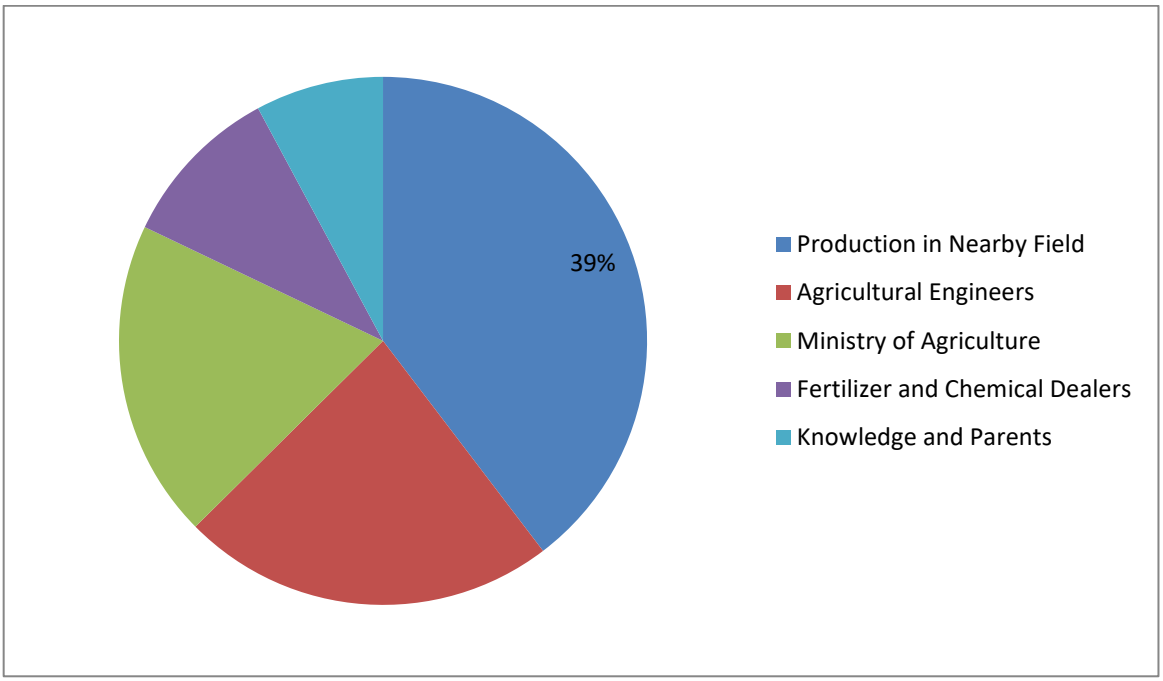
Table 6.

The results of descriptive analysis of farmers attitudes toward sustainable agriculture as it vary according to the production process and improvement in Libya

Statements	**Producers in nearby fields**	**Fertilizer and chemicals dealers**	**Ministry of Agriculture**	**Agricultural engineers**	**Knowledge and Parents**
1st source	**71**	18	35	41	14
	39.4%	10%	19.4%	22.8%	7.8%
2nd source	51	46	24	38	22
	28.3%	25.6%	13.3%	21.1%	12.2%
3rd source	32	37	44	20	45
	17.8%	20.6%	24.4%	11.1%	25%
4th source	19	34	18	58	50
	10.6%	18.9%	10%	32.2%	27.8%
5th source	7	45	59	23	49
	3.9%	25.5%	32.8%	12.8%	27.2%
Total	180	180	180	180	180
	100%	100%	100%	100%	100%

Figure 9.

Farmers attitudes toward sustainable Agriculture as vary according to production Process and improvement in Libya.



Considering the interpretation in Table 6 and Figure 8 as shown above, Libyan farmers communicated the most to the Producer in nearby (39.40%) field, when they experienced a challenge during production and needed immediate support. Other sources of support and enhancement in form of incentives that guarantee high productivity comes from Agricultural engineers (22.80%), The Ministry of Agriculture 19.40%, Fertilizers and Chemical dealers 10% and Knowledge and Parents 7.80%. Thus, these categories of people and organizations influence farm operators' action and attitudes on the platform of what kind of plants and livestock to nurture, what to do in order to get rid of farm weed and nuisances, what method to be adopted on farmland during cultivation with regards to the farm implements, how to acquire such farm implement and how to employ the right working forces. These implies that the use and influence of suitable agricultural agents could transform constructively alternative farming and as well as the ecological setting (Hassanein, 2000).

4.1.7. The Seventh Sub-Problem

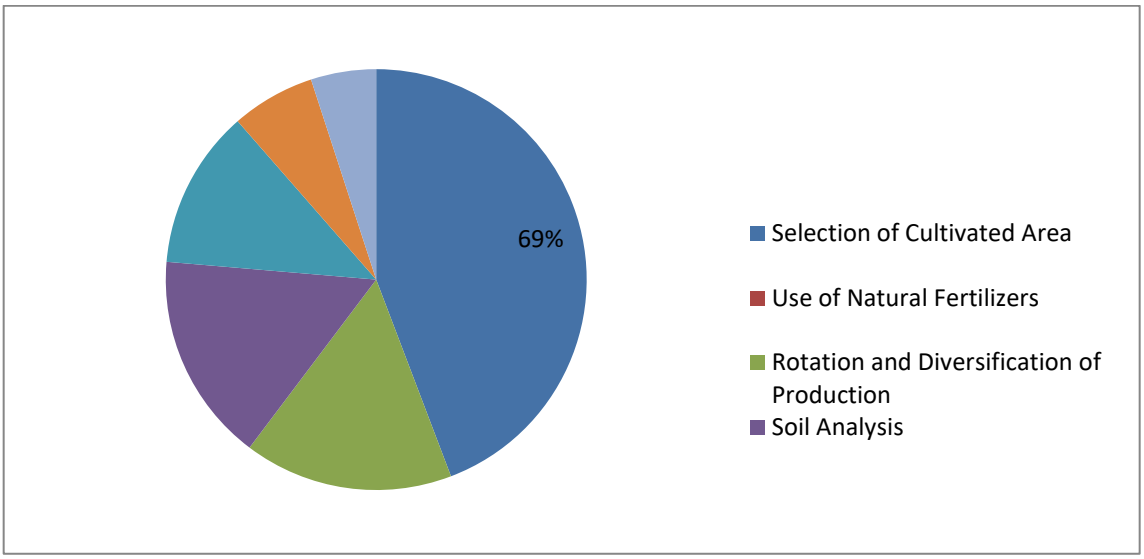
The seventh sub-problem focused on, "How do farmers' attitudes toward sustainable agriculture vary according to the problems being experienced during production?". The results of the analysis of the data collected during the course of study are well elaborated in Table 7 and Figure 9 below.

Table 7.
The results of descriptive analysis with respect to the problems being experienced by farmers during production in Libya.

Statements	ALWAYS		OFTEN		SOMETİMES		RARLLEY		NEVER	
Agricultural crops Packaging	5	19.4	9	21.7	0	33.3	1	22.8		2.8
Rotation and diversification of production in the field	5	25	2	23.3	4	35.6	8	15.6		0.6
The use of chemicals in the agricultural process	4	7.8	1	28.3	7	37.2	1	17.2	7	9.4
The use of natural fertilizers and animal waste	0	38.9	8	43.3	7	15.0		2.8		
Selection of appropriate varieties of cultivated area	23	68.8	2	23.3		3.3		2.8		2.2
Soil analysis	6	25.6	2	12.2	5	25	2	28.9	5	8.3
Leaf analysis	9	10.6	7	9.4	6	25.6	4	35.6	4	18.9

Figure 10.

Farmers attitudes toward sustainable agriculture as it vary according to the problems being experienced during production in Libya.



According to the data analysis in Table 7 and Figure 9, Libyan farmers responded with high significant value to the Selection of appropriate varieties of cultivated area (68.8%) as always with respect to the problems being experienced during production, followed by the Use of Natural fertilizers and Animal wastes 38%, Rotation and diversification of production in the field 25%, Soil Analysis 25%, Agricultural crops Packaging 19%, Leaf Analysis 10% and the use of Chemicals in the Agricultural Process 7.5%. All these are appropriate applications used in addressing and promoting sustainable farming in Libya. There is the need for farmers to reform their attitudes toward environmentally friendly farming operation such as sequential cropping system in collaboration with animal production because of its financial, commercial, ecological and general well-being advantages (Kotile & Martin, 2000).

4.1.8. The Eighth Sub-Problem

The eighth sub-problem is “How do farmers’ attitudes toward sustainable agriculture vary according to agricultural production and influencing factors?”. The obtained data are given in Table 10 accordingly with details.

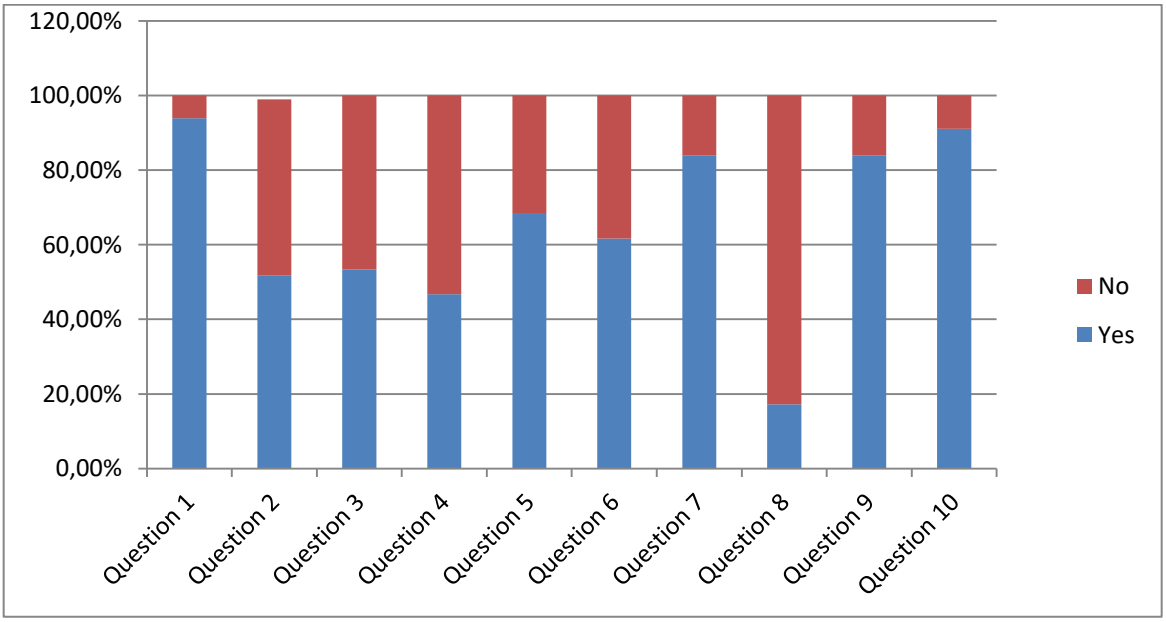
Table 8.

The results of descriptive analysis with farmers' attitudes towards agricultural production and influencing factors

Statements	Yes		No	
Q1.Do you think farmer like to enlarge the crop planting area?	69	93.9	1	6.1
Q2. If the price of agricultural means of production rises in future, are do you think farmer like to increase Agricultural investment?	3	51.7	7	47.3
Q3. If the grain price declines in future, do you think it is encouraging for the farmers to increase agricultural investment?	6	53.3	4	46.7
Q4. Do you know about sustainable agriculture?	4	46.7	6	53.3
Q5. In your opinion, is the rural environment getting better?	23	68.3	7	31.7
Q6. Do farmers increase farmland is economy efficiency?	11	61.7	9	38.3
Q7. Do you think the rural environment important in the farmer's life?	51	83.9	9	16.1
Q8. Do you think the farmer considers environment consequences during agricultural production?	1	17.2	49	82.8
Q9. Do you think the reasons of environmental degradation have impact on farmer performance?	51	83.9	9	16.1
Q10. Is environmental quality important to grain production in terms of food safety?	64	91.1	6	8.9

Figure 11.

Farmers' attitudes toward sustainable agriculture as it vary with agricultural production and influencing factors in Libya.



According to the statistical report displayed in Table 8 and Figure 10, the farmers responded as “Yes” (93.9%) and “No” (6.1%) on what they thought about the need to enlarge the crop planting area of their farmland in relation to agricultural production and influencing factors respectively. As for the evaluation of farmers’ reaction to agricultural means of production either to increase farm investment or not 51.7% said “Yes” and 47.3% said “No”. The farmers’ response to reduce grain production in speculation for future price fluctuation were indicated with “Yes” 53.3% and “No” 46.7%. Their level of awareness about sustainable agriculture were rated 46.7% “Yes” and 53.3% “No”. Their opinion about rural environment getting better were acknowledged with “Yes” 68.3% and “No” 31.7%. Their opinion about whether farmland is economically efficient or not were recorded with “Yes” 61.7% and “No” 38.3%. Their opinion on whether environmental degradation could affect farm operation were rated “Yes” 83.9% and “No” 16.1%. Their opinion about environmental consequences of their farm production were also rated “Yes” 17.2% and “No” 82.8%. The assessment on how farmers value rural environment were indicated with “Yes” 83.9% , “No” 16.1% and farmers evaluation of environmental quality varies with 91.1% “Yes” and “No” of 8.9%. Many challenges stemmed from the advancement of various farming activities which are having serious negative ecological effects and farm works are becoming highly tasking due to ignorance of farmers about sustainable farming, poor knowledge of environmental value, poor application of farm devices and substances, indiscriminate release of discarded materials from domesticated animals, increasing demand for foodstuff for domestic consumption and industrial uses, people demand for natural farm produces and total well-being (Rahman et al., 1999).

4.1.9. The Ninth Sub-Problem

The ninth sub problem centered on “How do farmers’ attitudes regarding the use of natural resources and environmental protection differ according to the demographic characteristics?. The normality distribution (N>50) Kolmogorov-Smimof is considered vividly according to the normality test for the scores obtained in Table 9 below.

Table 9.
The Normality Test

	Kolmogorov-Smirnov		
	Test Istatistics	**Sd**	**p**
Points regarding the use of natural resources and conservation of the environment	**,76**	**180**	**,013**

As illustrated in Table 9, it was decided that the Mann-Whitney U and Kruskal Wallis tests would be appropriate for non-parametric techniques due to the non-availability of the normality condition the data are given in Table 10.

Table 10.
The Mann-Whitney U and Kruskal Wallis tests.

Demographic Data	**Category**	**Mean Runk**	**Sum of Runks**	**Z/df**	**A. Sig.**
Gender	Female	87,32	3318,0	-,425	**,671**
	Male	91,35	12972,0		
Level of Education	High school	87,89		3	**,894**
	College	93,14			
	University	91,63			
	No Education	82,13			
Monthly Income	At most 200	85,02		4	**,181**
	201 – 400	72,27			
	401 – 600	92,88			
	601 – 1,000	98,47			
	1,001 and above	100,58			
The population	Less than 2000	84,50		3	**,386**
	Between 2000 – 5000	76,57			
	Between 5001 – 30000	95,95			
	More than 30000	93,29			
Age	At most 20	76,83		3	**,444**
	21-30	68,96			
	31-40	70,53			
	41-50	81,92			

According to the statistical data in Table 10, the attitudes of Libyan farmers toward sustainable agriculture in relation to the usage of natural resources and environmental protection do not differ significantly according to all their demographic characteristics. Previous research that was conducted among farm operators revealed remarkable differences in attitudes toward farming and environmental endowment because of their diverse sociological, ethnical, traditional and demographical backgrounds. These showed how farm operators understood environment and its endowment on the basis of how they could be utilized and organized sustainably. Thus, farm operators have different views about the environment and therefore view agriculture from different that may not necessarily be from commercial point (Petrzelka et al., 1996).

4.1.10. The Tenth Sub-Problem

The tenth sub problem is "How do farmers' attitudes regarding environmental degradation differ according to the demographic characteristics?" for normality distribution (N> 50) Kolmogorov-Smirnof was carefully observed and evaluated according to the normality test for the scores obtained in Table 11 as given below.

Table 11.
The Normality Test

	Kolmogorov-Smirnov		
	Test Istatistics	Sd	P
Points about regarding environmental degradation will lead to serious consequences globally	,119	180	**,000***

As seen in Table 11, it was decided that the Mann-Whitney U and Kruskal Wallis tests would be appropriate for non-parametric techniques due to the non-availability of the normality condition. The data are given in Table 12.

Table 12.
The Mann-Whitney U and Kruskal Wallis tests

Demographic Data	Category	Mean Runk	Sum of Runks	Z/df	A. Sig.
Gender	Female	83,33	3318,0	-,959	**,338**
	Male	92,42	13123,50		
Level of Education	High school	90,50		3	**,769**
	College	91,07			
	University	92,92			
	No Education	75,54			
Monthly Income	At most 200	82,93		4	**,199**
	201 – 400	73,27			
	401 – 600	93,66			
	601 – 1,000	97,94			
	1,001 and above	100,73			
The Population	Less than 2000	75,37		3	**,406**
	Between 2000 – 5000	83,63			
	Between 5001 –30000	89,15			
	More than 30000	94,95			
Age	At most 20	73,50		3	**,046**
	21-30	55,54			
	31-40	72,87			
	41-50	84,78			

In reference to the statistical data in Table 12, the attitudes of Libyan farmers toward sustainable agriculture in relation to environmental degradation do not differ significantly according to all their demographic characteristics excluding the age factor. This shows how significant age factor could be in creating different views about environmental degradation among various sustainable farmers in Libya. Thus, the opinions of the Libyan farmers about environmental degradation still maintained a wide

range of similarity according to their gender differences, educational background, and income level and population size. Except on age factor those farmers indicated diverse opinions regarding the subject of context. Fundamentally, there is a strong link between ecological degradation force and views of farm operators that should be highly valued. It signified that farm operators who seriously encounter ecological degradation will have more passionate views about renewable matters in relation to sustainable agriculture (Rahman & Mikuni, 1999).

CHAPTER V

CONCLUSION AND RECOMMENDATION

All the findings that are entailed during the course of this thesis without any deviation from aims and scope of study are hereby subjected to any additional contributions, suggestions, criticisms, more empirical evidences and contentions as it is expected in this chapter.

5.1. Conclusion

Every farmer, both at private and government levels, regardless of the scale of production should have positive attitudes that will trigger the reformation of our agrarian sector across every nation of the world. To achieve success in regenerating agricultural activities requires a mind of collaborative obligation that will safeguard the environment and the posterity of human race. It is only with persistent appraisal of every individual, particularly the farm operators, with regards to their views, perception, knowledge and beliefs that can make us actualize a stable ecological quality and renewability towards agriculture worldwide (Petrzelka et al., 1996).

The major aim and postulated purpose of this study was realized after successfully revealing how Libyan farmers' attitudes toward sustainable agriculture varies' significantly according to the ranking of the socio-economic problems, environmental problems, important factors that contributing to environmental problems, important measures taken against environmental problems, important steps taken to control weed, production process and improvement, problems being experienced during production, agricultural production and influencing factors, how to use natural resources and environmental protection differs based on demographic characteristics and how environmental degradation differs based on demographic characteristics. All these variables, after being carefully studied, collected from different respondents on one to one basis as structured in the research questionnaire and analyzed to reveal how attitudes of Libyan farmers vary towards sustainable agriculture. The results depicted variation, acceptance and impact of alternative farming operations, how attitudes could be

influenced through adequate awareness and in return regain ecological stability and further expand alternative farming activities across agricultural zones in Libya. Thus, any agrarian sector must be workable with nature regardless of the advancement of science and hi-tech devices. Alternative farming is quite supportive with high yield, high commercial values, societally and environmentally friendly, food security is well guaranteed, environmental renewability and agricultural development objectives are collaborated without any interference, management of power generation and utilization for farming purpose done sustainably, nature are well protected and as well accommodate the advancement of environmentally friendly hi-tech equipment (Flores & Nascimento, 1994).

However, on the basis of the results displayed in Table 1 to 10 and Figure 3 to 10, it was revealed that Libyan farmers were able to independently express their opinions vividly on different perspectives regarding socio-economic problems, environmental problems, various challenges being encountered during farm production and how they were able to express these issues demographically. Particularly the age, and human and environmental factors significantly influenced attitudes of farmers toward sustainable agricultural practices in Libya. It is thus anticipated or projected that the attitudes of the recent farmers in West Tripoli would serve as a reference and positively impact sustainable agriculture in other parts of Libya that are agriculturally sustainable.

Finally, after critically examining the attitudes of farmers toward sustainable agriculture, it is pertinent, at this point to work and advance farming activities toward sustainable attitudes in order to revolutionize agriculture with sole objectives of securing continuity for agricultural practices, ensuring foodstuff accessibility for the entire human populace globally, fortifying environmental safety, health and stability, and to create more awareness among farmers about the methods, environmental impacts and socio-economic advantages of sustainable agriculture.

5.2. Recommendation

These are the suggested ideas that are derived from observation and assessment of findings during the course of this study – which could be used to propose solutions and as well use to formulate policies towards the development of sustainable agriculture in Libya – as simply enumerated below:

- Creating awareness through necessary and adequate training and practical workshop or practical training on the farm that can easily be adopted and workable in Libya environment.
- Through the creation of cooperative organization and network that easily pass information and idea about the most efficient sustainable agricultural practices.
- Government, private and environmental expatriates should lay more emphasis and reinforce the awareness through sociable networks among farmers particularly on the advantages of sustainable farming.
- Farmers should be properly educated on the environmental and socio-economic benefits of the crops and livestock they are producing. This will really motivate the farmers and protect the market of their farm produces.
- Government and private sectors should collaborate under the act of corporate social responsibility to motivate farmers with incentives toward sustainable agricultural practices.
- Farmers should be encouraged with easy workable facility that will support the regenerating of organic wastes into fertilizers which will help to restore soil fertility and its compositions.
- Pests, insects and weed should be mostly controlled through biological, physical and traditional means without the use of chemical materials.
- Producers of pesticides, insecticides and herbicides should remove and modify the harmful chemical components of their products into an environmentally compliance and friendly one that can guarantee environmental and human safety and health.

- Government and cooperating organizations should promote agricultural studies toward sustainable agriculture and pass the information as new discovery to farmers for immediate adoption.
- Government should consistently formulate policies and periodic programs that will encourage farmers to practice the culture of sustainable farming, so as to achieve nature driven, healthy and food secured society.
- Government and private sectors should support sustainable farmers with loan facility that will enhance their production capacity and reinforce their attitudes constructively towards sustainable farming.

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Appendix-1

Personal Information Form and Questionary

Dear Farmers,

Thank you for your participation. This survey is related to a scientific study. As a result, you will not be given any grades, Therefore; please do not write your name. Please read the questions carefully and answer them sincerely.

Best Regards:

Mustafa MOHAMED ABOLGASM ANAKUA

Master student

Appendix-2

FARMERS ATTITUDE SURVEY QUESTIONS

Demographic Data

I. Gender: Male [ ] Female [ ]

II. Age: at most 20 [ ] 21-30 [ ] 31-40 [ ] 41-50 [ ] > 51 [ ].

III. Level of Education.

High school [ ] College [ ] University [ ] No education [ ]

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

At most 200 [ ] 201 – 400 [ ] 401 – 600 [ ] 601 – 1,000 [ ] 1,001 and above [ ].

VI. The population of the area you live.

Less than 2000 [ ] between 2000 – 5000 [ ] between 5001 –30000 [ ] More than 30000 [ ].

Libya as a developing country suffers serious problems in different sectors; in line with this rank the following from the most important (1) to the least important (6) by giving numbers from 1 to 6.

Statements	**RANK**
Noise Pollution	
Air Pollution.	
Water Pollution.	
Soil Contamination	
Deforestation.	
Solid Waste.	
Random Urbanization.	
Global Warming.	
Species Control	

Rank the following factors which contribute to the environmental problems from the most important (1) to the least important (6) by giving numbers from 1 to 6.

Statements	**RANK**
Industrial Emissions “Factories & Power plants”	
Residential “Household Waste”.	
Agriculture “Fertilizers, Pesticides”.	

Constructions	
Quarries.	
Public Awareness.	

Specify to what extent you agree or disagree with the following statements regarding the use of natural resources and protection of environment.

No	Statements	STRONGLY AGREE	AGREE	Neutral	DISAGREE	STRONGLY DISAGREE
1	Natural resource is a common property, so it can be privatized and used alone, without considering the interests of others.					
2	Natural resource is a common property for all mankind, so it must be used to benefit all who live near that resource.					
3	Natural resources is a public property and no one is entitled to encroach on it for the purpose of agricultural reclamation.					
4	Mankind has the right to make changes in the environment and its natural resources to meet the needs of humanity.					
5	Human intervention always leads to disastrous results on environment and consequently on our lively hood.					
6	People usually tend to over exploit their environment and exhaust it of its natural resources					
7	Nature has enough natural resources to satisfy the needs of all humanity					
8	Forces of nature including environmental balance is strong enough to deal with the effects of industrial pollution.					

9	getting economic benefits from natural sources must be a priority so that the protection of natural resources in second place					
10	In some countries and regions, economic situation and social problems are valued more than environmental issues; therefore priority should be given to resolve those issues of concern first.					
11	One of the goals of sustainable development should be the monitoring and balancing of resource use to preserve the needs of current and future generations.					
12	Exploitation and preservation of natural resources is not exclusive to just one generation without the other, it is concerning of all humanity.					
13	Plants and animals have the right to coexist alongside with humans.					
14	It's exaggerated when it talking about environmental issues and natural resources is exaggeration.					
15	All generations, even the modern ones should learn how to deal with issues related to the environment.					
16	If everything continues as it is today, dealing with environmental issues, humanity will have no escape, facing major ecological disasters.					

Specify to what extent you agree or disagree with the following statements regarding environmental degradation will lead to serious consequences globally.

No	**Statements**	**STRONGLY AGREE**	**AGREE**	**Neutral**	**DISAGREE**	**STRONGLY DISAGREE**
1	Increase of global warming which will lead to climate change.					
2	Will increase poverty and hunger.					
3	Will lead to a decline in oil production.					

4	Will pollute the sources of fresh drinking water "Water will be expensive"					
5	Good agricultural practices will gain importance to help reduce environmental degradation.					
6	Desertification will accelerate.					
7	Natural resource will shrink especially drinkable water causing disagreement and armed conflict to erupt over resource control.					
8	Will lead to the melting of glaciers, inundating many coastal areas around the world.					

The following measures can be taken against environmental problems, rank in order of importance (1: most important, 6: least significant).

No	**Statements**	**RANK**
1	Advanced Technology.	
2	Education.	
3	Laws for the protection of natural resources and protection of the environment.	
4	The use of recycled raw materials in industry	
5	Economic measures (sanctions, incentives, taxes)	
6	Reduce the use of chemicals in farming operations such as fertilizer, soil nutrients, toxins and anti-pest.	

In your opinion, what are the best solutions to deal with weed in agricultural fields? Rank in order of importance (1: most important, 5: least important)

No	Statements	RANK
1	Mechanical means (mowing, plowing).	
2	Plowing handwork	

3	Biogenic means (insects, sheep, and poultry).	
4	Chemicals such as herbicides means	
5	Educational measures for preventing the spread of pesticides in the area cultivated for farmers (the use of advanced irrigation, fertilization).	

In your opinion with respect to the production process and improvement, how can they be used for the following applications?

No	**Statements**	**ALWAYS**	**OFTEN**	**SOMETİME**	**RARLLEY**	**NEVER**
1	Agricultural crops Packaging					
2	Rotation and diversification of production in the field					
3	The use of chemicals in the agricultural process					
4	The use of natural fertilizers and animal waste					
5	Selection of appropriate varieties of cultivated area					
6	Soil analysis					
7	Leaf analysis					

In your opinion when the farmers experience a problem during production where can they request assistance (Ehabeddin & Serife, 2015).

No	Statements	1ST SOURCE	2ND SOURCE	3RD SOURCE	4TH SOURCE	5TH SOURCE
1	Producers in nearby fields					
2	Fertilizer and chemicals dealers					
3	Ministry of Agriculture					
4	Agricultural engineers					
5	Knowledge and Parents					

Respondents' attitudes towards agricultural production and influencing factors. Ma et al., 2009).

No	Statements	Yes	No
1	Do you think farmer like to enlarge the crop planting area?		
2	If the price of agricultural means of production rises in the future, do you think farmers will increase agricultural investment?		
3	If the grain price declines in future, do you think it is encouraging for the farmers to increase agricultural investment?		
4	Do you know about sustainable agriculture?		

5	In your opinion, is the rural environment getting better?		
6	Do farmers increase farmland economy efficiency?		
7	Do you think the rural environment is importantal in the farmer's life?		
8	Do you think the farmer considers environment consequences during your agricultural production?		
9	Do you think the reasons of environmental degradation have an impact on farmer performance?		
10	Is environmental quality important to grain production in terms of food safety?		

Curriculum Vitae

My name is Mustafa MOHAMED ABOLGASM ANAKUA. I was born on October 22, 1975 in the city of Alajielat in Libya. I started primary school when I was six and finished high school at the age of 18. Then I went to study at Higher Institute of Water Affairs in Alajielat. In studied in the Department of Desalination and got a Higher Diploma. Then I started to work in Agricultural sector in 2001 until 2004. Then I moved to the Housing, Utilities and Environment sector and worked for six years. During the period, I attended to the faculty of Agriculture, where I got my BSs Degree in fall 2005-2006. In 2010, I started to work Higher Institute of Water Affairs. I started at this institution as a Teaching Assistant and Trainer until 2013. I got a scholarship from this Institution to pursue MSc. My work experience in such different places made me adaptable and adjustable to different conditions. I may encounter in life. I went to a languages course the UK to improve my English. On completion this course, I come to TRNC to study Environmental Education and Management at Near East University.