

1.0 INTRODUCTION

Climate change is now a serious and long-term threat that has the potential to affect every part of the globe. The impacts of climate change are already being felt in many sectors, and significant harm from it, is already occurring. With the recent evidence indicating that the world has already warmed by 0.8°C since the pre industrial era. Nigeria had been identified to be the top 10 most vulnerable countries to climate change. (Anthony.C. Anuforom, 2016) Under the business as usual, if adverse burning of fossil fuel as well as increase in industrialization is not put in check, global mean temperature could reach around 2°C by 2060 (PACJA, 2009). Climate models suggest that Africa's climate will generally become more variable, with high levels of uncertainty regarding climate projections in the Africa Sahel zone. Temperatures in West Africa, the Sahel in particular, have increased more sharply than the global trend, and the average predicted rise in temperature between 1980/99 and 2080/99 is between 3°C and 4°C, which is more than 1.5 times the average

global trend. For Nigeria, a recent study by DFID (2009) predicts a possible sea level rise from 1990 levels to 0.3m by 2020 and 1m by 2050; and rise in temperature of up to 3.2⁰C by 2050 under a high climate change scenario. This is based on Intergovernmental Panel on Climate Change (IPCC) assumptions, latest research findings and results of a consultation exercise in Nigeria. In line with the subject matter, changing climate change patterns have already begun to have considerable impact on agricultural production in many regions. In the near future, shifts in local climatic conditions and the frequency of extreme weather events such as droughts and floods are expected to occur even more frequently, with potentially devastating effects for agricultural yields. Strategies need to be developed to make our food and farming systems more resilient to the effects of climate change. This seminar paper presents the latest scientific findings to show how organic agriculture as a holistic sustainable production management can contribute to the promotion and enhancement of agro-ecosystem health, including biodiversity,

biological cycles and soil biological activity for effective climate change adaptation and mitigation strategies for the agricultural sector in Nigeria (International Federation of Organic Agriculture Movement IFOAM EU Group: an umbrella organization of organic food and farming, uniting and representing the expertise and interests of around 300 affiliates)

1.1 CONCEPT OF ORGANIC AGRICULTURE

The General Assembly of (IFOAM- Organic International) establish a succinct definition of organic agriculture.

“Organic agriculture is a holistic or an alternative production system that sustains the health of soils and ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions rather than the use of inputs with adverse effects”.

Organic agriculture promotes and enhances agro-ecosystem health, including biodiversity biological cycles (pest control) and soil

biological activity (crop rotation, green manure and compost) It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account conditions requiring locally adapted



systems.

Organic agriculture is not only a specific agricultural production system, it is also a systematic and encompassing approach to sustainable livelihoods in general, where due account is given to relevant factors of influence for sustainable development and vulnerability, be this on physical, economic or socio-cultural levels. (Eyhorn, 2007). Having a long tradition as a farming system, organic agriculture has been adopted for many climatic zones and local conditions as a development strategy for rural communities. (El-Hage and Hattan, 2007,

Eyhorn 2007). It does not just reduce the vulnerability of the farmers to climate change and variability, but also comprises highly diverse farming systems and this in return increases the diversity of income sources and the flexibility to cope with adverse effects of climate change and variability which changed rainfall patterns is very much inclusive. (International Journal of Agriculture and Rural Development, IJAR)

1.2 RELATIONSHIPS BETWEEN AGRICULTURE AND CLIMATE CHANGE

The relationship between agriculture and climate change is complex. Agriculture and climate are inextricably linked. Agriculture is both a victim and a cause of climate change. Agricultural production wholly relies fundamentally on the weather. The state of the atmosphere in terms of temperature, pressure, wind speed and direction, etc. at a given place and point in time is referred to as weather. Increasing severe weather patterns such as droughts, floods, desertification and disruption of the world have resulted in negative impact on agricultural production.

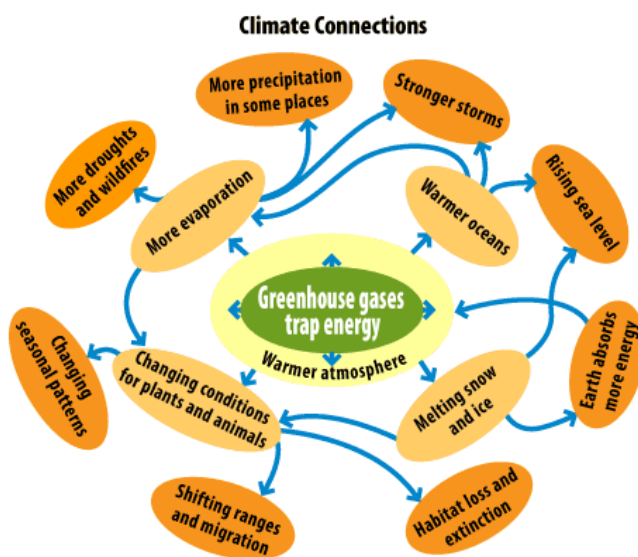
This negative impact is region-specific and is more severe in developing regions such as Africa especially in Nigeria which is already facing food security problems, than in developed countries. (William, 2007). According to the Food and Agriculture Organization (FAO, 2008) an increase of 2-4°C in the average global temperature above the pre-industrial levels could reduce crop yields by 15-35% in Africa and Western Asia, and by 25-35% in the Middle East. The impact has also adversely affected the ecosystems and biodiversity (WWF, 2006). Agriculture practices exacerbate climate change. It is also a major contributor to the emissions of methane CH₄, carbon dioxide CO₂ and nitrous oxide N₂O. A considerable amount of carbon dioxide has been released to the atmosphere from the burning of fossil fuels, agricultural and forestry activities, deforestation and other land use changes (Lal et al., 1997, Goh, 2004). Rice production in flooded paddy fields, lagoon storage of farmyard manure, and ruminant digestion of pastures herbage result in the production of methane while nitrous oxide originates from the microbial transformation of nitrogen (N) from

fertilizers, manure and soil organic matter. Per unit mass of gas, CH₄ and N₂O causes considerably greater global warming potential (GWP) (21 and 310 times respectively) than CO₂. According to IPCC, 2004 agriculture contributes 13.5% of Green House Gases (GHGs) emissions. When direct and indirect (land use, transportation, packaging and processing) sources are included, the contribution could be high as 32% (Greenpeace, 2008). Greenpeace 2008, reported that the largest sources of total non- carbon dioxide emissions in 2005 were from soil N₂O (32%) and CH₄ (27%) from enteric fermentation of cattle. Emissions of N₂O arose from N fertilizers and manure applied to soils and during manure storage. The livestock sector in agriculture has been identified as a major contributor to global GHGs emissions. The FAO 2006 report, on the 'livestock's long shadow' indicated that 18% of global GHGs emission were from livestock, including one third of this from deforestation. This exceeded that from the global transport.

However, agriculture also has a significant mitigation potential for climate change (Greenpeace, 2008), and could be improved from being

the second largest global GHGs emitter to a much less important emitter or even a net sink for GHGs. Thus, the solution to present-day climate change problems caused by agriculture lies in changing the farming practices of agriculture.

1.3 CONCEPT OF CLIMATE CHANGE



The diagram shows how global warming can lead to a variety of other changes.

The issue of climate change has become more threatening not only to the sustainable development of socio-economic (including

agricultural sector) activities of any nation but also to the totality of human existence (Nzeh, et al., 2010). This concept will be baseless if we fail to understand the definition of climate and climate change respectively. According to the Encyclopedia American (Vol. 7:71-81), climate is the average weather conditions of a region over a period of several decades or more. It is used to describe not only the average weather conditions but also all deviations from the average, which can be determined by taking observations over a period of at least (25-30 years). On the other hand, climate change is the change in the state of the climate that can be identified (e.g by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period typically decades or longer. (IPCC, 2007). The consequences of these changes include global warming, frequent hurricanes, droughts and floods of varying intensities. (Uguru, et al., 2011). Climate change is the result of many factors including the dynamic processes of the earth itself, external forces and human activities (anthropogenic factors) (IPCC, 2007). The most concern of the

anthropogenic factors are the increase in the CO₂, chlorofluorocarbons CFCs, N₂O and water vapour level due to emission from fossil fuels, cement manufacture, agriculture, deforestation, land use, processing and others. (Oyebade, 2009, Uguru, et al., 2011) Climate change is caused by increase in green house. Basically, climate change can be caused by two factors these include:

- Natural processes (biogeographical)
- Human activities (anthropogenic)

The Natural Processes:

The natural processes are the astronomical and extra-terrestrial factors respectively. Such as the changes in the eccentricity of the earth's orbit, changes in the obliquity of the plane of ecliptic, changes in orbital procession, solar radiation quantity and quality, volcanic eruption amongst others.

The Human Factors:

The human factors that emit large amounts of greenhouse gases

which depletes the ozone layer or the activities that reduces the amount of carbons absorbed from the atmosphere are industrialization, burning of fossil fuels, gas flaring, urbanization, deforestation, alterations of land use, water pollution, agricultural practices etc. (IPCC, 2007). The human factors have been proven to be responsible for the ongoing unequivocal climate change (IPCC, 2007) or global warming in Nigeria.

1.4. KEY CONCEPTS OF CLIMATE CHANGE

The key concepts of climate change includes the following:

◆ VULNERABILITY TO CLIMATE CHANGE:

This can be defined as the degree to which a system is susceptible to, or unable to cope with adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity.

◆ SENSITIVITY:

This refers to the degree to which a given community or

ecosystem, is affected by climatic stresses. For example, if a community is dependent on rain-fed agriculture, it is much more sensitive to changing rainfall patterns than one where mining is the dominant livelihood.

◆ **ADAPTIVE CAPACITY:**

This is the ability of a system (human or natural) to adjust to climate change (including climate variability and extremes) to moderate potential damages, to take advantage of opportunities, or to cope with the consequences. One of the most important factors shaping the adaptive capacity of individuals, households and communities is their access to and control over natural, human, social, physical and financial resources.

RESOURCES AFFECTING ADAPTIVE CAPACITY:

In general, the world's poorest people often have limited access to

those livelihood resources that would facilitate adaptation. Access to and control over these resources also varies within countries, communities and even households. It is influenced by external factors such as policies, institutions and power structures.

◆ RESILIENCE:

Resilience can be defined as the ability of a system (human or natural) to resist, absorb and recover from the effects of hazards in a timely and efficient manner, preserving or restoring its essential basic structures, functions and identity. Resilience is a familiar concept in the context of disaster risk reduction (DRR), and is increasingly being discussed in the realm of adaptation. A resilient community is well-placed to manage hazards, to minimize their effects and/or to recover quickly from any negative impacts, resulting in a similar or improved state as compared to before the hazard occurred.

◆ HAZARD:

Hazard is a dangerous phenomenon, substance, human activity or

condition that may cause loss of life, injury or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage. According to the community based adaptation toolkit, hazard refers to both shocks, such as floods (rapid onset), and to stresses such as droughts or changing rainfall patterns (slow onset).

◆ SUSTAINABLE LIVELIHOODS:

Livelihood comprises the capabilities, assets and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from external shocks and stresses, and maintain or enhance its capabilities and assets now and in the future.

1.5 ADAPTATION OPTIONS AND CLIMATE CHANGE:

Adaptation refers to adjustments in practices, processes or

structures in response to projected or actual changes in climate (Ifeanyi-Obi, et al., 2012) with the goal of maintaining the capacity to deal with current and future changes. Adaptation is therefore critical and of concern in developing countries, particularly in Africa and even in Nigeria where vulnerability is high because ability to adapt is low. According to (Nzeh and Eboh

2009), adaptation helps farmers achieve their crop, income and livelihood security objectives in the face of changing climatic and socio-economic conditions, including climate variability, extreme weather conditions such as droughts and floods, and volatile short-term changes in local and large-scale markets (Kandlinkar and Risbey, 2000). Farmers can reduce the potential damage by making tactical responses to these changes. In the views of Hassan and Nhemachena 2008; Nzeh and Eboh (2010), adaptation options to climate change by farmers in Africa can be classified into farmers' perceived adaptations option and actual adaptation measures used by farmers' perceived adaptations options, in different African communities including Nigeria. They include

the followings:

- Different crops
- Different varieties
- Crop diversification
- Different planting dates
- Shorten length of growing period
- Movement to different site
- Changes in amount of land
- Increase in use of irrigation etc.

The adaptation component of Nigeria's Intended Nationally Determined Contributions (INDCs) is derived largely from the National Adaptation Strategy and Plan of Action for Climate Change Nigeria (NASPA-CCN).

The goal of the adaptation component spells out actions to be taken to reduce vulnerability to climate change impacts, minimize risks, increasing resilience, improving adaptive capacity, leveraging on new opportunities and facilitating collaboration within the country as well as

the global community. The INDC outlines adaptation strategies for 13 sectors, namely:

- Agriculture (Crop and Livestock)
- Water Resources (Fresh and Coastal)
- Forestry
- Biodiversity
- Health and Sanitation
- Energy
- Human Settlement and Housing
- Transportation and Communication
- Industry and Commerce
- Disaster management, Migration and Security
- Livelihood
- Vulnerable groups
- Education

1.6 HIGHLIGHT OF THE PARIS AGREEMENT:

The Paris Agreement or Paris Deal is probably one of the most remarkable achievements of the most remarkable achievements of the United Nations Framework Convention on Climate Change (UNFCCC) since it came into force. It was adopted at Conference of Parties (COP 21) in December 2015. It aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty. This is to be achieved through:

- Keeping temperature rises below 1.5°C
- Pledges to curb emissions
- Long-term global goal for net zero emissions
- Take stock every five years
- Loss and damage
- Finance (Anthony C. Anuforom, 2016)

1.7 THE POTENTIAL OF ORGANIC AGRICULTURE IN MITIGATING CLIMATE CHANGE

Climate change mitigation refers to actions taken by man to

reduce climate change or green house effects. Therefore, building adaptive and mitigation capacity involves developing skills, knowledge, attitude, resources and measures that reduce vulnerability and increase the resilience of farmers farming communities and the ecosystem. Studies have shown that the level of awareness of climate change phenomenon is still low in developing countries like Nigeria (Nzeadibe, *et al.* 2010; Nzeh and Eboh, 2010). Advocating for organic agriculture have been solicited worldwide for mitigating climate change (e.g Kotschi and Müller-Sämman, 2004; ITC, 2007; IFOAM, 2008; Ellis, 2008; Smith, 2009). The potential of organic agriculture in mitigating climate change depends on its ability to reduce emission GHGs, N₂O and CH₄, increase soil carbon sequestration, and enhance effects of organic farming practices which favour the above two processes. Diversified crop rotation with green manure improve soil structure and diminish emissions of N₂O. Integration of livestock and arable production. The rule on organic farms, can thus reduce the global warming potential of food production. Organic cattle husbandry contributes positively to

reducing methane emissions by aiming towards animal longevity (Kotschi and Müller-Sämman, 2004).

The President of the Federal Republic of Nigeria (Muhammadu Buhari) had at various fora stated the commitment of his administration to combating climate change. In his address at the 70th General Assembly of the United Nation UN in September 2015, contributed to the discussion on combating climate change:

“To address these negative effects we have developed a national policy to guide Nigeria’s response to climate change. Our response is broadly based on the twin strategy of mitigation and adaptation”. He further stated that:

“The Paris Agreement should be rules-based, predictable, and robust to adequately address climate change vulnerabilities. It is essential that the least developing countries and small islands developing states receives the institutional capacity support for mitigation, adaptation, gender and climate change linkages towards building a sustainable environment”.

The following are the mitigation strategies in Nigeria's INDC:

- Agriculture, forests and land use change
- Gas flaring
- Energy
- Transport and infrastructure
- Manufacturing
- Short-lived pollutants and air quality
- Climate smart cities
- Gender impacts and social inclusion
- Changing consumer behavior and diet
- Stopping deforestation etc. (Anthony C., 2016)

2.0. HISTORICAL INFORMATION OF ORGANIC AGRICULTURE IN NIGERIA

Nigeria has 170 million people making it the most populous country in Africa. The country's economic mainstay before the oil boom was agriculture. The country is blessed with both natural and human

resources. Huge oil deposits in the Niger Delta region bring both economic benefits and adverse impacts to the environment and the nation as whole. The practice of organic agriculture in an organized manner is still new to the country with less than ten years of application. As of 2007, Nigeria had 3,154 hectares under organic agriculture of which 59 hectares were fully converted and managed by a few farmers and NGO's with little government involvement. However, it was reported that in 2010, land under organic production increased to 11,979 hectares with 517 producers. This is the last year of reliable figures. In spite of the low level of activities in organic agriculture in Nigeria, the practice has great strengths that can be exploited to accelerate development. There are organizations and stakeholders that are involved in the development of organic agriculture in Nigeria.

These main stakeholders are:

- Dara/Eurobridge Farm, which is known as the pioneer organic farm in Nigeria and produces lemongrass, turmeric, ginger, plantains

and medicinal herbs

- Organic agriculture project in tertiary institutions in Nigeria (OAPTIN), which organized a pioneering network in 2004. Its activities focus on capacity building and networking of academics in organic agriculture.
- Olusegun Obasanjo Centre for Organic Agriculture Research and Development (OOCORD), which was established in 2007 and is the first of its kind in Nigeria. It focuses on research and development in organic agriculture.
- Nigeria Organic Agriculture Network (NOAN), which was formed as an initiative of (OOCORD) and designated to be an umbrella body for organic agriculture activities in Nigeria in August 2008. Its function is to network organic agriculture organizations in Nigeria.
- Organic Farmers Association of Nigeria, Organic Fertilizer Association of Nigeria, "Nigeria Go Organic", Ibadan Go Organic, are other organic stakeholders in the country.
- Worldwide Opportunities on Organic Farms (WWOOF)

WWOOF is a network of national organizations that helps volunteers to live by and learn organic farming properties. They bring from around the globe to work on farms in Nigeria and also work to promote organic agriculture among the Nigeria population. Conferences and seminars were also held to promote organic agricultural practices in Nigeria such as National Conference of Organic Agriculture held in 2005 and the first West African summit on organic Agriculture which was held in university of Ibadan, Nigeria in 2012.

Similarly, universities in Nigeria organized projects and summer programmes on Organic Agriculture in 2010 and 2011 to train farmers, researchers and other groups, these activities helped to rekindle hope for farmers who are interested in organic farming. The recent pronouncement by the African Union to assist in the development of organic agriculture in the continent of which Nigeria is a front runner, will also help in boosting organic agriculture.

About 70 percent of the Nigeria farmers think they practice organic

agriculture by default because of the prohibitive costs of chemical fertilizers and other agro chemicals but true organics is a certified production method. They are not touched by government policies on input supply and other incentives to optimize agricultural productivity; according to Prof Jiuire Adeoye, Director of Research and Development at Olusegun Obasanjo Centre for Organic Research and Development (OOCORD). In collaboration with agronomists at the university of Ibadan, OOCORD has developed organic fertilizer from the waste products generated in large quantities in urban centers and has also raised the awareness of the importance of organic produce for better health. With funding support from the MTN Foundation (a mobile telecommunication giant), Nigeria now has integrated organic fertilizer processing plants at strategic places in Oyo and Ondo states. With the intervention of Nigeria Network for Awareness and Action for Environment (NINAFFE), a local non-governmental organization, the products are being distributed to products are being distributed to small scale farmers to “create wealth from

waste”. The products are now in high demand among farmers in Ondo state, Nigeria largest Cocoa producing state.

Presently, certified agricultural products in Nigeria are: ginger, turmeric and lemon grass tea. In the case of livestock production, the standard for certification are being developed, while a few farms are transitioning to organic production.

Organic agriculture in Nigeria is beginning to emerge, from a cursory review of sector in 2014, we have very few farmers adopting the practices under the tutelage of some institutions like universities, research institutes or some private organization.

Some supporting institutions on Organic Farming in Nigeria are:

1. Organic Agriculture Projects in Tertiary Institutions (OAPTIN)
2. Nigerian Organic Agriculture Network (NOAN)
3. Olusegun Obasanjo Centre for Organic Research and Development (OOCORD).
4. Ladoké Akintola University of Technology Ogbomoso (LAUTECH)

Organic Farm. (Global Agriculture Information Network, 2014)

2.1. NIGERIA AND APPLICATION OF ORGANIC AGRICULTURE

Nigeria, as any other developing country in Africa that is interested in advancing in organic agriculture, has multiples natural and human resources that can be harnessed to produce agricultural crops to meet organic standards. Higher yields in low input systems are mainly achieved by the application of manure from integrated livestock production, composting and diversification. In humid areas where traditionally less livestock is integrated into the farming systems and little or no manure is available, organic yields depends on the availability of other organic nitrogen source. Nigeria being a developing country which has arid, semi-arid and humid climate could double its yield organically due to the favourable conditions existing in all the agro-ecological zones.

Also the geographical location of the country is the best blessing from nature which provides the potentials for exploring virgin and untapped natural environment suitable for organic agriculture. The

climate in the mountainous and plateau provide comparative advantage for the production of temperate crops which can be harnessed organically to increase yield of crops. The abundant natural resources in the country is another potentials at the disposal of Nigeria to explore to develop organic agriculture apart from climate. Water, land and natural forest and grassland play a vital role in any agricultural production.

Even though the soil in the northern part of the country are low in nutrients and/or organic matter, the adoption of the principle of recycling and crop rotation in organic agriculture could help in restoring the nutrient to enhance production. Total cultivable land in Nigeria that is estimated at 61 million hectares, which is 66% of the total area of the country. In 2002, the cultivated area was 33 million hectares, of which arable covers 30.2 million hectares. This shows that the country has untapped land resources of about 28 million hectares which can be harnessed for sustainable organic agriculture.

About 60-70% of Nigerian farmers are traditional rural farmers who by

their nature of subsistence agriculture produce uncertified organic foods using localized and natural resources due to inability to secure synthetic inputs even though what they produce is considered non certified organic foods, their practices provides a good opportunity for easy conversion to organic practice.

In Nigeria, these groups of farmers exist in every community and their number is a substantial one that can be used in improving organic agriculture.

2.2 SUB-SAHARAN AFRICA AND ORGANIC

AGRICULTURE AS CLIMATE CHANGE ADAPTATION AND MITIGATION STRATEGIES

In recent years, the climate change risks in many countries of Sub-Saharan Africa have come under greater global searchlight. This is because the environmental resources are already under severe stress from population pressure, inappropriate resource management and rapid urbanization. The nexus of poverty resource degradation and

effects of climate change portends great risks for economic growth and sustainable development. Existing resource degradation scenarios in the region predispose agriculture especially crop to the risks of climate change. The global attention to consider ways to respond to threats of impacts of climate change which organic agriculture is a vital key towards achieving it. Mitigation and adaptation are two broad response approaches to dealing with the risks of climate change. While mitigation focuses on measures to prevent greenhouse gases emission that results to global warming, adaptation entails coping with climate change and its impacts (Nzeh et al., 2012).

The effects of climate change vary across geographical regions, the worst effects are projected to be in tropical regions including Sub-Saharan Africa (Rosenzweig and Parry, 1994). Sub-Saharan Africa countries are likely to suffer most from the negative impacts of climate change, due to substantial economic role of climate dependent sectors such as agriculture, forestry and fisheries and also due to limited financial, institutional and human capacity to anticipate and respond

adequately to the direct and indirect effects of climate change (IPCC, 2001). Also high temperature have led to reduced length of growing seasons with detrimental affection on crops (IPCC, 2007) and both mean and extreme temperature that crops experience during the growing season will change in both temperature and tropical areas (Brett, 2009).

2.3 NIGERIA POLICY ON CLIMATE CHANGE

One major policy of the Nigerian government in the fight against climate change is the National Adaptation Strategy and Plan of Action on Climate Change for Nigeria (NASPA-CNN). This strategy envisions a Nigeria in which climate change adaptation is an integrated component of sustainable development, reducing the vulnerability and enhancing the resilience and adaptive capacity of all economic sectors and of all people particularly women and children to the adverse impacts of climate change while also capturing the opportunities that arise as a result of climate change. Some of NASPA-CNN strategies for the

agricultural sectors includes:

- Increase access to drought resistant crops and livestock feeds
- Adopt better soil management practices
- Provide early warning / meteorological forecasts and related information
- Increase planting of native vegetation cover and promotion of re-greening efforts.

Considering the huge adverse effect of climate change, Nigeria has no other option than to move from business- as- usual model of agriculture to climate-smart agriculture. Planting of native vegetation cover and promotion of re-greening efforts will provide employment for those producing nursery bags as well as those on the field who plant and nurture the trees with organic certified plants not exclusive. (Martin Eke, 2016).

Others includes:

- National policy on Environment which aims at ensuring

environmental protection and the conservation of natural resources for sustainable development.

- The National Agricultural Resilience Framework (NARF) which aims at strengthening the overall policy institutional framework for improved resilience and adaptation to climate variability and change in the agricultural sector.
- The President of Federal Republic of Nigeria launched the Agricultural Promotion Policy (APP) which thrust relevant to climate change include: boosting public awareness through advertising of importance of Climate-Smart Agriculture.

2.4 CLIMATE CHANGE POLICY FRAMEWORK

In order to reflect the increasing importance of climate change issues in Nigeria, the Federal Executive Council adopted in 2012 the Nigeria Climate Change Policy Response and Strategy. To ensure an effective national response to the significant and multi-faceted impacts of climate change, Nigeria have adopted a comprehensive strategy, as

well as a number of specific policies.

The strategic goal of the Nigeria Climate Change Policy Response and Strategy is to foster low-carbon, high growth economic development and build a climate resilient society through the attainment of the following objectives:

- Implement mitigation measures that will promote low carbon as well as sustainable and high economic growth;
- Enhance national capacity to adapt to climate change;
- Raise climate change related science, technology and R and D to a new level that will enable the country to better participate in international scientific and technological cooperation on climate change;
- Significantly increase public awareness and involve private sector participation in addressing the challenges of climate change;
- Strengthening national institutions and mechanisms (policy, legislative and economic) to establish a suitable and functional

framework for climate change governance. (Anthony, 2016)

3.0 PRINCIPLES OF ORGANIC AGRICULTURE

Organic Agriculture is based on the following:

- The principle of health
- The principle of ecology
- The principle of fairness
- The principle of care

PRINCIPLE OF HEALTH:

Organic agriculture should sustain and enhance the health of soil, plant, animals, human and planet as one and indivisible.

PRINCIPLE OF ECOLOGY:

Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help sustain them through establishment of habitat as and maintenance of genetic and agricultural diversity.

PRINCIPLES OF FAIRNESS:

Organic agriculture should build on relationships that ensure fairness with regard to the common environment and life opportunities. The principle emphasizes that those involved in organic agriculture should conduct human relationships in a manner that ensures fairness at all levels and to all parties-farmers, workers, processors, distributors traders and consumers which in turn yields good quality life, food sovereignty and poverty reduction.

PRINCIPLE OF CARE:

Organic agriculture should be managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment. Organic agriculture is a living and dynamic system that responds to internal and external demands and conditions. Hence precaution and responsibility are the key concern in management, development and technology choices in organic agriculture. (IFOAM, Organics International, 2006 poa.english.web.pdf.)

4.0. SUMMARY, RECOMMENDATION AND CONCLUSION

SUMMARY:

The benefits of Organic Agriculture regarding climate change can be summarized as follows:

- Organic agriculture has considerable potential for reducing emission of greenhouse gases
- Organic agriculture in general requires less fossil fuel per hectare and kilogram of produce to the avoidance of synthetic fertilizers. Organic agriculture aims at improving soil fertility and nitrogen supply by using leguminous crops, crop residues and cover crops.
- The enhanced soil fertility leads to a stabilization of soil organic matter and in many cases to a sequestration of carbon dioxide into the soils.
- This in turn increases the soils water retention capacity, thus contributing to better adaptation of organic agriculture under unpredictable climatic conditions with higher temperatures and

uncertain precipitation levels. Organic production methods emphasizing soil carbon retention are most likely to withstand climatic challenges particularly in those countries most vulnerable to increased climatic change. Soil erosion, an important source of CO₂ losses, is effectively reduced by organic agriculture.

- Organic agriculture can contribute substantially to agro forestry production system.
- Organic systems are highly adaptive to climate change due to the application of traditional skills and farmer's knowledge, soil fertility building techniques and a high degree of diversity.

RECOMMENDATION:

The weakness of organic agriculture is mainly related to productivity and yield losses in some crops and production areas. There should be need for more research as well as funding in order to improve organic agriculture's performance and to allow more assistance to be provided to organic agriculture projects in low input or developing countries like

Nigeria where CO₂ mitigation would be most beneficial. More research is needed in the following areas:

- Soil fertility management, crop growth and health
- Better exploitation of leguminous plants in improved crop sequences
- Habitat management with improved manipulation and exploitation of diversity at all levels
- Crop breeding programmes especially in South-East Nigeria focusing on the adaptability of plants to low-input situations in soils, on weed competition and on pest and disease tolerance.
- Improved plant protection techniques and compounds from natural sources.
- Breeding strategies and programmes for adaptability to management and environmental stress situation in organic livestock production
- Reduced tillage organic systems.

CONCLUSION:

In spite of these weaknesses, organic agriculture is so far the most promising approach for mitigation and adaptation to climate change. Organic agriculture presents a positive example of how farmers can help mitigate climate change and adapt to its predictable and unpredictable impacts.

It can as well serve as a benchmark for allocating development resources to climate change adaptation or to measure progress in implementing climate-related multilateral environmental agreements.

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Thank you, God bless you.