OPEN ACCESS

Global Journal of Research in Agriculture & Life Sciences
Volume 01| Issue 02 | Sept -Oct | 2021
Journal homepage: https://gjrpublication.com/journals/

Review Article

Climate Change and its Effect of Agriculture Green Growth Sector – As an Article

*Fawzy. Z.F.[1], A.M. El-Bassiony[1] & A.A Ghoname[1]

[1]Vegetable Research Dept., Agricultural and Biological Research Division, National Research Centre, Egypt

Submission Date: 29 July 2021 | **Published Date:** 28 Oct. 2021

***Corresponding author:** Zakaria Foad Fawzy

Abstract

Egypt is highly vulnerable to climate change impacts, this due to the large and tightly packed population, and if climate change makes Egypt's climate drier or warmer pressure on agriculture would intensify. Also, competition - among the limited water resources States for water could escalate (even without climate change) in addition to increased warming, droughts and evaporation, reduced flow in the Nile would further worsen Egypt's problems, and the country could face an explosive situation.

Projected climate changes may have disastrous effects on agricultural production in the Arab world including Egypt. As a number of studies have shown, increased temperatures cause much higher water needs in summer crops. Water scarcity in the Egypt is projected to increase rather than decrease, and therefore agriculture and in turn the Arab region's food security – is highly vulnerable to climate change, with the risk of 50% decrease in food production if current practices continue.

The impact of climate change on the Egyptian agriculture

Challenges for Egypt in the 21st century
* Climate Change (Sea level raise)
* Food Security (Land-, water-, and nutrients availability)
* Poverty (income of farmers in rural Egypt)
In all these dimensions agriculture plays a crucial role. It is threatened by climate change, responsible for food supply and employs about 30% of Egypt's labor force.
Thus, a new paradigm, "sustainable agriculture", is needed which addresses all these issues simultaneously!
"Sustainable Agriculture" and Climate Change Adaptation Potential
Adaptation through adapting cropping patterns
– Salt resistant crops (sea level rise in agri. areas) – jojoba, Quinoa
– Less water intensive crops
– Heat resistant crops
- Adaptation through adapting crop characteristics

Keywords: Climate Change, Agriculture Green Growth, Global warming.

INTRODUCTION

Climate change has created challenges for the agricultural sector - and will continue to do so.

Increases in temperature caused by climate change, changing precipitation and the frequency and intensity of extreme weather events are increasing pressures on global agricultural and food systems.

Climate change is expected to negatively affect both crop and livestock production systems in most regions, although some countries may already benefit from the changing conditions. The changing climate also adds to resource problems, such as water scarcity, pollution and soil degradation.

Agriculture contributes a large proportion to the greenhouse gas emissions that cause climate change - 17% directly through agricultural activities and an additional 7-14% through changes in land use. So it's part of the problem - and potentially an important part of the solution.

The most important direct agricultural greenhouse gas emissions are nitrous oxide emissions from soil, fertilizer, manure, and urine from grazing animals; The production of methane from ruminants and from the cultivation of unshelled rice. Both of these gases have a much higher global warming potential than carbon dioxide.

Global warming and changes in climate have major implications for agriculture, affecting ecosystems and the benefits they provide to societies. This increasingly affects crop and livestock production, agricultural soil and water resources, and food security. Nuclear and isotopic techniques play a critical role in assessing the impacts of climate change.

The effects of climate change are expected to intensify, causing more extreme weather events such as droughts, floods, heat waves and unpredictable rainfall distribution, all of which pose a threat to food security and can make agricultural production difficult, if it was not impossible. The situation could be further exacerbated by the acceleration in the release of greenhouse gases into the atmosphere from the soil, leading to global warming. Ecosystems that are already fragile will be affected, causing severe land degradation and further jeopardizing food security.

Climate change is the tangible change in the weather pattern for a period of not less than 30 years. The agricultural sector in Egypt in general is considered one of the sectors that will be most negatively affected by this phenomenon. Egyptian agriculture in particular is particularly sensitive to climatic changes, as it resides in an arid and fragile environment that depends mainly on the waters of the Nile River and affected by expected climatic changes.

It is expected that climatic changes will affect the productivity of agricultural land, starting from affecting the natural, chemical and biological properties of the land, passing through the spread of pests, insects, diseases and other problems, and ending with affecting the produced crop. (Climate change and agriculture)

Global warming and changes in climate have major implications for agriculture, affecting ecosystems and the benefits they provide to societies. This increasingly affects crop and livestock production, agricultural soil and water resources, and food security. Nuclear and isotopic techniques play a critical role in assessing the impacts of climate change.

The effects of climate change are expected to intensify, causing more extreme weather events such as droughts, floods, heat waves and unpredictable rainfall distribution, all of which pose a threat to food security and can make agricultural production difficult, if It was not impossible. The situation could be further exacerbated by the acceleration in the release of greenhouse gases into the atmosphere from the soil, leading to global warming. Ecosystems that are already fragile will be affected, causing severe land degradation and further jeopardizing food security.

In order to assess the impact of these climate changes, it is important to have vital information that allows modeling and prediction of future climate trends. Together with the FAO, the IAEA aims to enhance and optimize the capacity of Member States to use nuclear and isotopic techniques in order to learn more about and assess the impacts of climate change, supporting the intensification of crop production and the conservation of natural resources.

Climate change and agriculture:

Climate changes are now clear and unambiguous, especially the increase in temperatures, the increase in CO_2 concentration, the melting of snow, and the rise above sea level, while the increase in the frequency of droughts is very likely but not certain.

Climate changes taking place now have (and will have in the future) adverse effects on food production and quality. These adverse effects are the results of biotic and abiotic stresses, as shifts are expected in the growing seasons, epidemic patterns, agricultural pests, the quantity and quality of total crops, in addition to losses and losses. Biodiversity "Biodiversity."

Agriculture is the most vulnerable and sensitive to these climatic changes. High temperatures reduce the total yield, quantity and quality, while encouraging the growth of weeds, diseases and other pests.

The overall effects of climate change on agriculture will be negative and threaten global food security. One of the important challenges within the climate change challenge is the urgent need to know the response of crops to these climate changes and how to adapt to them and mitigate their effects.

The estimates of the Intergovernmental Panel on Climate Change (IPCC) indicate that agriculture is responsible for emitting about 14% of all greenhouse gases, and at the same time, agriculture has huge potentials to reduce carbon emissions and sequester increasing amounts of carbon by absorbing it from the atmosphere. (Climate Smart Agriculture)

The global warming which related to climate changes proceeds more rapidly. Where, extremes in weather can cause unsustainable summer heat along with no longer sustainability for water use and the consequences of the possible increase risk of transferable new diseases.

There are two main strategies concerning with climate change and global warming, firstly, reduction by taking activities in a less carbon-intensive way; secondly, offsetting by taking external actions to compensate for Footprint Family by means of track and reduction of human pressure on the surrounding environment, where pressure is defined as appropriation of biological natural resources, emission of greenhouse gases (GHGs) and consumption & pollution of global freshwater resources. Therefore, the three key ecosystem compartments in the Footprint Family, namely the biosphere, atmosphere, and hydrosphere through the Ecological, Carbon, and Water Footprint, respectively must be monitored .

There are many disciplines (i.e. Water chemistry, Hydrobiology, Waste treatment technology, biodiversity…,) in water pollution research department contribute directly and indirectly for adapting water management to climate change.

Implementation of the Paris Agreement reached at the 2015 United Nations Climate Change Conference - COP21. Both the text and country-level strategies to reduce emissions, defined in the form of Nationally Determined Contributions (INDCs), recognize the threat posed by climate change to sustainable food production, and provide valuable opportunities for agriculture and the food chain to be an active part of the climate change solution.

Broader social, economic and environmental policy settings – such as trade, investment, infrastructure and education policies – must consistently support sustainable productivity growth, in conjunction with adaptation and mitigation efforts. Inconsistent or contradictory signals, such as import restrictions protecting water-intensive crops, can exacerbate poor choices for farmers. Improving the overall policy coherence will be more effective than the marginal adjustment of existing agricultural policies.

There is a need to reform skewed and distorted agricultural policies that encourage unsustainable intensification and overuse of natural resources and potentially harmful inputs. More than half of agricultural subsidies across the OECD region still cause potential damage to the environment; while measures targeting sustainable productivity or climate change goals remain marginal. Excessively subsidized insurance, market price subsidies, and input subsidies must be reduced with a view to their eventual abolition.

More investment in research and development (R&D) is needed to spur innovation that can improve sustainable productivity growth. Governments may facilitate private sector innovation, for example, by addressing investment barriers to research and development, ensuring the dissemination of private knowledge, and, where appropriate, encouraging public-private partnerships for research and development that have public benefit outcomes.

Policies to address climate change should focus on results-based incentives for farmers and knowledge transfer systems that enhance farmers' ability to achieve sustainable productivity growth through mitigation and adaptation practices.

- Where possible, financial incentives should target sustainability performance rather than practice. Untargeted incentives can encourage farmers to adopt measures that have high initial costs, or are socially beneficial but privately costly.
- Governments should ensure the provision and dissemination of relevant and up-to-date information on resource efficiency and risk management to help farmers and other private agents make informed investments in adaptation and mitigation measures. Enhancing access to knowledge and risk management mechanisms is essential to increasing adoption of sustainable and productive practices. It is often advisable to simplify adaptation and mitigation advisory procedures in existing institutions and to coordinate these with the private sector

The impact of climate change on the agricultural sector:

The implications of the agro-industry on low carbon, green growth strategy and roadmap for some countries worldwide

Climate change refers to changes beyond the average state of the atmosphere caused by natural factors such as the Earth's eruptive orbit, volcanic activities, crustal movements, and artificial factors such as increasing concentrations of

greenhouse gases and aerosols. Climate change due to global warming, which refers to the average increase in global temperature, has become a major trend that will lead to major global changes in the future.

Global warming causes not only a change in average temperature and precipitation, but also an increase in the frequency of floods, droughts, heat waves, and the intensity of hurricanes and cyclones following a change in temperature and precipitation patterns. Climate change impacts also appear in various other forms around the world, including sea level rise, glacier decline, and northward movement of plant habitats, changes in animal habitats, ocean warming, shorter winters, and early arrival of spring.

It takes at least 5 to 10 years to assess the impacts and vulnerabilities of climate change and to prepare appropriate countermeasures against it. In particular, since agriculture is climate dependent and therefore vulnerable to climate change, it is very necessary to prepare adaptation measures against climate change. Appropriate countermeasures based on scientific diagnosis and assessment of climate change impacts on agriculture in East Asian countries are essential in setting the vision and management policies for future agriculture. This will also provide valuable information for local governments in developing medium to long-term agricultural development plans and for farm families to prepare their own production plans.

Climate refers to a long-term variation in the state of the atmosphere of a particular region or regions, and climate change means a gradual change in the climate system due to both natural and man-made causes. Climate change is caused by the change in every component of the climate system such as the atmosphere, hydrosphere, biosphere, cry sphere and lithosphere or due to the complex interactions between these components. The causes of climate change are largely divided into natural causes and artificial causes.

Natural causes include change in solar activity, volcanic eruption, sea water temperature, ice sheet distribution, westerly waves, and atmospheric waves. On the other hand, the synthetic causes include carbon dioxide emissions from industrial and agricultural production activities, deforestation, acid rain, and the destruction of the ozone layer with Freon, with global warming by increasing greenhouse gases. Education, Science and Technology.

Global warming refers to the average increase in Earth's temperature due to the greenhouse effect from carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydro fluorocarbons (HFCs), per fluorocarbons (PFCs), and sulfur hexafluoride (SF6). 1 Global warming, which means a continuous increase in the Earth's temperature due to the greenhouse effect, started from the time of the Industrial Revolution which was accompanied by a rapid increase in the consumption of fossil fuels. The issue has attracted international attention as scientific knowledge of climate has accumulated since the 1970s and scientists have become widely accepted that human greenhouse gas emissions are the cause of global warming.

Agricultural production is carried out by selecting crops suitable for the climate of a particular area and applying appropriate farming methods. Therefore, agriculture is a vital climate-dependent industry with outstanding regional characteristics. Regional characteristics refer to the characteristics of an ecosystem that are determined by the climate of an area. Climate change is disrupting the agricultural ecosystem, altering agro-climatic elements such as temperature, precipitation, and sunlight, while increasing the impact on the agriculture, livestock and hydrology sectors.

First of all, the effects of climate change on the agriculture and livestock sector are recognized through biological changes including changing flowering and harvest seasons, changing quality, and shifting areas suitable for cultivation.

Climate change affects hydrology including groundwater level, water temperature, river flow, and water quality of lakes and swamps, by affecting precipitation, evaporation and soil moisture content. In particular, increased precipitation due to climate change increases outflow while higher temperature increases evaporation, thus reducing outflow. In order to understand the quantitative effects of climate change on water resources, a specific hydrological model is used, based on the general circulation model.

As explained above, climate change has a wide range of impacts on the rural economy including agricultural productivity, farm household returns and asset values, and it also affects agricultural infrastructure through the change in water sources available for agriculture.

To date, quantitative analyzes of the impacts of climate change on the agricultural sector have been empirical centered on cross-sectional analysis. Empirical analyzes are performed on the basis of agricultural and economic simulation models. It is similar to controlled experiments in which relevant variables are regulated, as greenhouse gas-related variables such as temperature levels and carbon dioxide emission levels are regulated. In these experiments, the impact of climate change on agricultural production can also be estimated.

In addition, each crop requires different climatic and environmental conditions for growth.

Climate change occurs as the temperature rises, the borders and areas suitable for cultivation are moving north and thus the main production areas are also changing. The change in the main areas of production may be a crisis for certain areas but it may be an opportunity for other areas, so it cannot be classified as a positive or negative effect.

In short, the effects of climate change on the agricultural sector have conflicting characteristics in terms of positive impacts creating opportunities and negative impacts with costs. Therefore, it is very important to formulate adaptation strategies that can maximize opportunities and reduce costs that will lead to sustainable agricultural development.

Agricultural production is closely related to climate, and thus bears the brunt of climate change. With evidence from numerous studies confirming the impact of climate change on crop yields [1, 2]; an increasing number of researchers have focused on the resulting economic impacts [3, 4, 5, and 6]. The negative effects of climate change on Chinese agriculture have been confirmed, and increases are expected in the future [7]. Agricultural production accounts for a large proportion of China's national economy, so the resulting economic consequences cannot be ignored. Meanwhile, the debate continues over regional differences in the economic consequences of rising temperatures in today's temperate climates, such as those prevailing in China.

Recent developments in assessing the chain of impact from climate to crops and then to the economy have been rapid [8] and driven by advances in computing power, data, and methodology [9]. With the identification of more fluid relationships between climate components and biophysical responses [10], we can assess the ultimate economic consequences of climate change. Existing assessments have been conducted at the global and national levels, showing a high probability of significant declines in global well-being [11] and a potential loss in gross domestic product (GDP) of more than 2% in the Middle East and North Africa for higher scores Heat from 2°C to 3°C [12]. By the late twenty-first century, the United States is expected to experience a significant decline in GDP due to the impact of global warming on agricultural production, and it is noted that the poorest third of counties is expected to suffer more damage than the richest third [13]. A global assessment also predicts that poor countries are expected to suffer most of the damage from climate change [14].

Most assessments of the economic impacts of climate change are done at the national level and ignore regional differences, which are evident in the county-level assessment in the United States [13]. Moreover, China is usually seen as a homogeneous entity in climate change research. It is a vast country with significant regional differences in economic development, agricultural production and climate change [15], which will also lead to different economic consequences of climate change. The country-wide effects of warming on global economic production [3] show that China will experience moderate negative impacts at the end of the twenty-first century (Representative Concentration Path [RCP] 8.5). However, the economic consequences of climate change are different for countries at the same latitude as China: low latitudes (such as India) will suffer severe negative economic impacts, while higher latitudes (such as Russia) will benefit from climate change. In addition, reallocation of production and consumption through interregional and intersect oral trade networks [16], as well as regional changes in economic development, further alter the economic consequences of climate change in China.

Green growth concept

Sustainable development means achieving sustainable economic growth consistent with environmental protection. Since it first appeared in the United Nations Declaration.

The concept of sustainable development emerged from the thinking of the economic model from ordinary economists, which revolves around the idea of “growth first”, clean up later” as one believes that the economy should develop first and the environmental damage dealt with later. The World Conference on Sustainable Development (WCED) defines sustainable development as “development that meets the present without compromising the ability of the future generation to meet its own needs”.

The concept of green growth was created in order to increase the enforceability of policies in the field of sustainable development, the concept of which is simply a broad concept that covers the three aspects of economic viability, environmental protection and social justice.10 In other words, green growth is qualitative growth that enhances the standard of living by achieving environmental integrity and economic. The Korean government presents green growth as “economic growth that reduces environmental pollution and greenhouse gases, while creating a new engine for growth and jobs” (Presidential Council for the Future and Vision, 2009). In addition, the relevant Framework Act defines green growth as “growth achieved through saving and using energy and resources efficiently to reduce climate change and

damage to the environment, securing new growth engines through research and development in green technology, creating new jobs, and Harmony between the economy and the environment" (Article 2, Section 2 of the Low Carbon Green Growth Framework Act). As green growth is defined differently, it can be understood as a complex and open concept that accepts the new civilization and system of change. In this context, we can understand that green growth is a concept in preparation, subject to future discussions.

The operating principle of the green growth policy is to transform the vicious circle between environment and economic growth into a virtuous cycle by shifting to a new growth pattern and economic structure. Under the new paradigm of qualitative growth, the fundamental factors of production are new ideas, transformative innovations and modern technology. Economic growth based on these drivers is expected to generate substantially intense qualitative growth in contrast to the large-scale quantitative growth of the past.

Therefore, green growth continually enhances productivity by putting green capital (i.e. green technology and green knowledge) into the production process, thereby reducing pollution and expanding natural capital (energy and environmental resources). As a result, green growth leads to changes in production patterns, technology, consumption and environmental efficiency by taking into account the ecological capacity and the economic and ecological aspects of production and consumption.

Green growth includes a system of policies and a social value because it aims to achieve economic growth through a low carbon society and green industrialization. Achieving green growth comes with a great deal of economic costs and efforts and, above all, requires us to move away from our current lifestyles. Thus, in order to achieve green growth, economic incentives, development and distribution of green technology, understanding and cooperation of relevant bodies are of paramount importance and urgently require a paradigm shift and rapid response.

Green growth in the agricultural sector is more inclusive than sustainable agriculture, and means growth that ensures environmentally sound and economically viable growth that takes into account the ecological capacity of the agro-ecosystem. Green growth in the agriculture sector is achieved through a shift in agricultural practice that takes into account the environmental capacity of each different region and water system, low carbon agriculture by reducing greenhouse gases and increasing absorption capacity, and energy efficiency and savings. Green growth can be achieved by switching to a sustainable agricultural system including low carbon green agriculture. Thus, green growth in the agricultural sector can be considered more comprehensive than sustainable agriculture.

Meanwhile, green growth in the agri-food sector means growth through a shift towards an environmentally sound and low carbon life cycle in the agricultural aspects of not only production but also distribution, processing and consumption.

Agriculture that pursues green growth can be defined as green agriculture. However, the term is not widely used. Several terms are used in the agricultural sector in relation to the concept of green. However, special attention should be paid to how they actually relate to green growth. For example, China uses the term "green food" to increase the public's familiarity with the concept of environmental friendliness, and this term is somewhat closely related to green growth. In Korea, the "green revolution" refers to a significant increase in productivity through the development of high-yielding rice varieties (for example, the new rice variety "Tongil" IR667), but it is hardly associated with green growth. By contrast, the term "Second Green Revolution" is used to describe the cultivation of wheat, green manure crops and forage crops on idle lands during the winter season, and is highly relevant to green growth in the agricultural sector as it includes energy savings and mitigation of greenhouse gases.

Climate change adaptation priorities:

- ✓ Stress-tolerant varieties, improved cropping pattern
- ✓ Changing planting dates.
- ✓ Improving on-farm irrigation management.
- ✓ Improving agricultural drainage networks.
- ✓ Integrated and improved crop management.
- ✓ Capacity building and public awareness.
- ✓ Building effective systems and institutional frameworks.
- ✓ Expansion of new land reclamation.

The concept of climate-smart agriculture - and its objective:

Climate-smart agriculture is an approach used in agriculture with the aim of reaching the highest agricultural productivity of horticultural and field crops while preserving the natural agricultural resources of land, water and others for future generations and also working to reduce harmful gaseous emissions to the environment (especially carbon dioxide and methane) to To the least possible extent, while adapting to future climate changes and mitigating their direct and indirect effects. Therefore, the main objective of applying the climate-smart agriculture approach is to improve the agricultural system in both developing and developed countries alike.

The need to implement the climate-smart agriculture approach:

Working on the dissemination and localization of climate-smart agriculture applications and technologies in Egypt will inevitably result in a maximization of Arab agricultural production, through:

- ✓ Improving the efficiency of using agricultural inputs such as fertilizers, pesticides and irrigation water.
- ✓ Improving the efficiency of agricultural machinery use.
- ✓ Improving crop productivity
- ✓ Better control of costs and profitability of agricultural projects.
- ✓ Preserving natural resources, especially irrigation water.
- ✓ Helping to make decisions quickly based on software on mobile phones.
- ✓ Using short missions in extension and awareness activities to communicate with farmers.
- ✓ Direct linkage with market data through informational software to make the right decision to market products.
- ✓ Expected effects of applying the climate-smart agriculture approach in small farms.

When these techniques and practices are applied in combination, by different "small farm" stakeholders:

- ✓ Reduces water loss
- ✓ Reduces land degradation
- ✓ Increase the availability of soil water
- ✓ It gives a fair distribution of the water resource
- ✓ Boosts agricultural production and productivity
- ✓ Enhances food security
- ✓ Contributes to poverty alleviation
- ✓ Creating resilience to climate change
- ✓ Hence, it effectively contributes to achieving sustainable agricultural development for food security in light of climate change

The economic feasibility of applying the climate-smart agriculture approach:

The application of climate-smart agriculture will bring many benefits to the agricultural system from improving agricultural horticultural productivity and obtaining safe, healthy and high nutritional value agricultural products and will reduce agricultural inputs "pesticides and chemical fertilizers", which are a burden on the environment through pollution and reduction of harmful emissions. Therefore, the use of climate-smart agriculture will achieve an agricultural renaissance and a great agricultural economic addition. It is new to mention that the use of the climate-smart agriculture approach will not entail any additional economic burdens, but on the contrary, it will achieve a high economic return in the short and long term.

Climate Change Center

Remote sensing perspective

One of the advantages of satellite imagery for environmental research is the capability to capture a synoptic view of a large part of the land surface and to repeat capturing of the same area on a steady basis. So satellite remote sensing is an important source of data for studies of the climate change. Several scientists make extensive use of satellite data because it is possible to derive quantitative measurements of the earth surface features. Remote sensing is an effective tool to examine climate change indicator response to human induced environmental changes. These data are valuable to make suitable policy that mitigate the hazard resulted from climate change.

Vision

Remote sensing provides major advances in understanding the climate changes by quantifying the spatial and temporal changes in the environment (air, land and water). It is a key role in observing various indicators of climate change and in the identification of priority areas for conservation.

Mission

Our mission is to support the scientific and governmental community and increasing the public awareness of climate change by providing research-quality data. This allows taking a right decision on environmental management, conservation and protection of the land resources and supporting the sustainable environmental management. The "Center" will work on modern technology transfer in the fields of remote sensing, climate change and information management. Also the "Center" will implement training courses for undergraduate and young researcher in the field of remote sensing and change detection.

Objectives

Data obtained from remote sensing are characterized as integrated and multi-temporal, the main objective is to use these data to extract scientific reports about (1) sea level rise (2) vegetation cover (3) rainfall rate (4) land surface temperature (5) changes of coastal shorelines (6) land use/ land cover change detection (7) the environmental degradation (8) the impact of climate change on food crops (9) the impact of climate change on Nature reserves (10) the flash flood impact on urban and cultivated areas and (11) climatic database for environmental planning.

Realizing the objectives

Several measures could be undertaken to achieve the objectives of the center that include a well-qualified staff, high-precision equipment and the availability of up-to-date and standard data. The long-term sustainability of the center could be realized through (1) Ensuring the human resources (2) Research infrastructures should be in the forefront of research and technology (3) Adapting state-of-art data processing and analysis software (4) Confirming long-term data storage (5) Developing and sharing "know-how" with leading international partners (6) Supporting young researchers and technical staff.

In summary, we can say that smart agriculture has several important benefits and goals, the most prominent of which are:

-Promoting agricultural innovation.

-Creating green jobs.

-Preserving and protecting the environment through better management of natural resources.

-Adaptation to climate change.

-Reducing greenhouse gas emissions.

-Reducing the phenomenon of hunger and poverty.

-Increasing production and improving the quality of agricultural crops.

-Applying sustainable management of natural resources.

-Improving soil management and fertility.

-Converting animal waste into biogas as an alternative and renewable source of energy.

-Establishment of climate-resilient fisheries and aquaculture, through storm-resistant fish cages and fish ponds, and adaptive fisheries management.

And when using and applying climate-smart agriculture in small farms using some solutions to the problems facing the crops in those lands and villages, production will increase and the farmer's income will increase, and access to safe and healthy agricultural products and sustainable agricultural production.

Climate Change Center:

According to the most recent studies and its findings, Egypt, especially the Nile Delta region, is one of the most vulnerable countries to climate change impacts. However, there is still no clear framework - whether research or institutional - to assess these impacts or how to cope with them. A limited number of studies have been conducted to assess these effects, with a focus on the material aspect of these impacts, with almost complete absence of economic and social studies, and the lack of consideration of the parties involved.

Overall objective and detailed objectives:

The project and the scientific center for climate change aims to:

To establish the Center for Climate Change Adaptation Research Center at the National Research Centre as a distinct center for multidisciplinary developments and to promote knowledge-sharing and policy-oriented research, exchange of experiences and best practices in adaptation to climate change.

The Center deals with achieving its general objective, which is mentioned above, on a number of axes:

1. Supporting research capacity in the field of adaptation to climate change through workshops focusing on the technical aspects in this field, as well as supporting research capacity of researchers. The Center will also provide competitive research grants to researchers in this field.
2. Identify the parties concerned with regard to this phenomenon and work to identify policy makers and decision makers on the phenomenon of climate change and its results, especially economic and social consequences.
3. Conducting economic and social studies to examine the best ways to adapt to climate change.
4. Study and reduce the amount of emissions from agricultural activities.

The most important global and local recommendations for climate change:

1. Interest in scientific research on future climate change
2. Taking care to take adaptive steps to future climate change
3. Environmental awareness in all media about the risks of climate change in all environmental, agricultural and developmental fields.
4. Organizing international conferences and workshops to identify new ways to address future climate change in all aspects of environmental, economic and social life.
5. Conduct the necessary studies on how to deal with the worst and best scenario for future climate change
6. Follow up the implementation of local and international recommendations for dealing with climate change

Climate Changes and Agriculture sector:

Vision and Mission

Problem Statement Climate change can lead to serious impacts including but not limited to: agricultural production, soil, water resources, livestock, food security, health, fisheries, tourism, social and broad economic impact. The vision of this agreement is to assess and identify the determinants of users for knowledge, attitudes, and practices related to climate change

Importance of the study Climate change is one of the most serious problems that confront the world. There is plenty evidences that climate change might negatively affect many aspects of life for all people around the world, such as impact on agricultural production, soil, water resources, droughts, livestock, food security, industry, diseases and pests, economic consequences, flooding, human health, fisheries, ecosystems and biodiversity.

Climate change, and increasing climate variability, as well as other global environmental issues such as land degradation, loss of biological diversity and stratospheric ozone depletion, threatens our ability to meet the basic human needs of adequate food, water and energy, safe shelter and a healthy environment.

The vulnerability of agriculture to natural climate variability and climate change can be somewhat decreased through more informed policy choices, practices and technologies. Negative impacts of climate change on agriculture can be further reduced by increasing climate knowledge and improving prediction capabilities, which will lead to the development of relevant information and prediction products for applications in agriculture.

However, while farmers are heavily dependent on the climate, farmers can exploit weather and climate services to minimize the impact of these hazards, either by planning to avoid the risk in the first place or by taking precautionary measures when there is warning that a hazard may arise.

ADAPTATION TO CLIMATE CHANGE IN AGRICULTURE:

Objectives

Develop and disseminate affordable climate change adaptation technologies and practices in the agricultural sector, by conducting comprehensive public awareness and outreach campaigns combined with capacity building programs tailored to the needs of farming operations.

Components

1. Develop, test, demonstrate, and disseminate innovative climate change-related adaptive agricultural practices to minimize the adverse impacts of global warming on the prevailing high-value crops in the targeted regions.
2. Public awareness and civil society capacity building to raise awareness of the forthcoming challenges of climate change and the necessity for joint community-level responses and action

Vision

Building up a climate change center as a excellence focusing to scientific role in the studies of vulnerability, mitigation and adaptation in Agriculture sector in Egypt and some African countries.

Mission

1. To survey, collect and evaluate the demands of technology of Egypt and other African countries to address the climate change and taking the technology demand information for sharing.
2. Studying methods of mitigation and/ or adaptation to the ongoing climate changes issues in Egypt and other African Countries about Agriculture sector.
3. To recommend and send technical and management personnel from Egypt and other African countries to attend technical training, international workshop, technical exhibition and other activities in China.
4. Full and fruitful cooperation with various sectors and ministries in the field of climate change issue in the specialty of Agriculture and Irrigation sectors.
5. Activating the role of projects related to the issues of climate change at the local and international level
6. Expansion in the field of organic farming, which reduces the use of fertilizers, and therefore reduces the use of energy sources used in the production of fertilizers.

Climate Change, Foods and Food Safety:

According to the predictions of Agriculture and Food Organization (FAO), in the year 2050 world population will be 9.1 billion. It is emphasized that, in order for the growing population to be nourished, until 2050 food production must be doubled, while using natural resources sustainably. Again according to FAO data, in order to meet future demands, by 2050, wheat production have to be increased by 1 billion tons per year, while meat production should increase by 200 million tons, reaching 463 million tons .

As a result of the negative impact on food prices, and also rural sustenance and working conditions, most predictions point out climate change's threat to the food production. This situation can cause the amount of people living under hunger threshold, now 10%, to double, becoming %20, by the year 2050. Because of insufficient resources, low income rate and level of technological advancement developing countries will be the least adaptive to the alterations. Africa, Southeast Asia and a section of Central America will be the most affected regions by climate change, due to the amount of developing and under developed countries populating these areas. In countries where most of the workforce, income and nourishment of the population is dependent on local farming, sustenance of millions of people and food safety will be at risk .

According to the research made, in mid-high latitudes, where temperature increase is between 1°C and 3°C, depending on the crop, product efficiency can be improved, if only slightly, conversely it will be impaired in some regions. It is predicted that in lower latitudes, especially places experiencing seasonal droughts and tropical regions, crop productivity will be impaired, even if the warming happens to be 1°C to 2°C, and this in turn will increase the risk of hunger (Kılıç, 2009).

Some of the important applications aiming at alleviating the effects of climate change over food safety are directed to increase local food production and consumption. Preventive measures ensuring the existence of small and median agricultural businesses are highly important. Another important topic is to support and prioritize the strategies and efforts (use of local and adaptive seeds) of adapting to climate change. Political precautions will enable us to minimize potential short term implications.

Due to insufficient access to drinking and irrigation water and decline of agricultural production, risk of lessened subsistence of farmers and villagers, especially in semiarid regions.

Climate Change and Climate Migration:

Migratory delocalization of people as a result of natural disasters and evnironmental problems, such as desertification, floods, drought or tsunamis, is called climate migration .The presumption that, due to climate change, millions of people will have to leave their place of dwelling, in order to settle in a safer area, is placed in the elaborated scenarios.

According to predictions, around mid-century 200 million people will migrate as a consequence of climate change. According to scientists, migration is one of the ways for people to adapt to climate change. According to the researches conducted, as a result of climate change water resources will be depleted, crop productivity will be reduced, extreme weather events will be frequent and bio-diversity around the globe will be lessened, and consequentially people will want to leave the areas where it's hard to live due to increased human fragility. Main causes of migration will be :

- The expected sea level rise that will occur with the melting of glaciers: according to the studies 10% of world population resides within 10 metres distance from sea level. The sea level rise can have negative consequences for these habitats.

- The possible decline of agricultural production and efficiency: while people will struggle with hunger, migrations caused by famine will be compulsory. Famine will cause deaths and disease.
- Increased malnutrition and heat will be a threat to human health. Due to heat and lack of nutrition an increase in epidemics will be seen.
- As a result of melting of glaciers in high latitudes clean water resources will lessened.

Climate Change and Poverty:

In order to provide nourishment for the world population, which will reach 9 billion during 2050s, production will have to increase accordingly. Today, more than 1 billion people are struggling with hunger and poverty, similarly 1,5 billion people are struggling with diseases related to overeating.

One of the most important consequences of climate change will be related to production, alongside famine and hunger. It is certain that agriculture will be affected differently in many countries. Research conducted point out that in the production areas crop productivity, sown land and efficiency can be decreased dramatically. It is expected that, in northern countries there will be increased efficiency, whereas in the south efficiency will be decreased. Moreover, international agreements related to the limiting of CO2 emissions are important factors that directly upset developed countries' industrial activity, and consequentially, income per capita.

It is possible to classify countries, according to the climate change's impact: countries that suffer the most damage, countries that suffer less damage and countries that profit. Of course, due to the unequal distribution of effects, regarding countries, on a global scale, imbalances regarding income distribution will emerge, or the ongoing imbalances will become severe.

The income difference between under developed or developing countries, as well as regions and countries which will suffer the most due to climate change, and developed countries and countries that will benefit from climate change, will be greater, and in some countries poverty rate will be highest. This situation will bring about many social problems

Conclusion

In conclude, the following climate changes impacts on agriculture are expected:

1. Increase of temperature and frequency of extreme events will reduce crop yield (some crops are more tolerant than others).
2. Change of average temperature will induce changes of the agricultural distribution of crops.
3. Increase of temperature will negatively affect marginal land and force farmers to abandon marginal land.
4. Shortage of water resources will also force farmers to abandon marginal land, and increase desertification.
5. Socio-economic impacts associated with loss of jobs, such as increase of unemployment, loss of income, and political unrest.

References

1. Challinor, A. J., Watson, J., Lobell, D. B., Howden, S. M., Smith, D. R., & Chhetri, N. (2014). A meta-analysis of crop yield under climate change and adaptation. Nature Climate Change, 4(4), 287– 291. https://doi.org/10.1038/nclimate2153
1. Knox, J., Hess, T., Daccache, A., & Wheeler, T. (2012). Climate change impacts on crop productivity in Africa and South Asia. Environmental Research Letters, 7(3), 034032. https://doi.org/10.1088/1748-9326/7/3/034032
2. Burke, M., Hsiang, S. M., & Miguel, E. (2015). Global non-linear effect of temperature on economic production. Nature, 527(7577), 235– 239. https://doi.org/10.1038/nature15725
3. Costinot, A., Donaldson, D., & Smith, C. (2016). Evolving comparative advantage and the impact of climate change in agricultural markets: Evidence from 1.7 million fields around the world. Journal of Political Economy, 124(1), 205– 248. https://doi.org/10.1086/684719
4. Robinson, S., Mason-D'Croz, D., Sulser, T., Islam, S., Robertson, R., Zhu, T., et al. (2015). The international model for policy analysis of agricultural commodities and trade (IMPACT): Model description for version 3. Washington, DC: International Food Policy Research Institute (IFPRI). https://doi.org/10.2139/ssrn.2741234
5. Takakura, J. Y., Fujimori, S., Hanasaki, N., Hasegawa, T., Hirabayashi, Y., Honda, Y., Iizumi, T., Kumano, N., Park, C., Shen, Z., & Takahashi, K. (2019). Dependence of economic impacts of climate change on anthropogenically directed pathways. Nature Climate Change, 9(10), 737– 741. https://doi.org/10.1038/s41558-019-0578-6

6. Liu, Y., Li, N., Zhang, Z., Huang, C., Chen, X., & Wang, F. (2020). The central trend in crop yields under climate change in China: A systematic review. Science of the Total Environment, 704, 135355. https://doi.org/10.1016/j.scitotenv.2019.135355
7. Nelson, G. C., Valin, H., Sands, R. D., Havlík, P., Ahammad, H., Deryng, D., Elliott, J., Fujimori, S., Hasegawa, T., Heyhoe, E., Kyle, P., von Lampe, M., Lotze-Campen, H., Mason d'Croz, D., van Meijl, H., van der Mensbrugghe, D., Müller, C., Popp, A., Robertson, R., Robinson, S., Schmid, E., Schmitz, C., Tabeau, A., & Willenbockel, D. (2014). Climate change effects on agriculture: Economic responses to biophysical shocks. Proceedings of the National Academy of Sciences, 111(9), 3274– 3279. https://doi.org/10.1073/pnas.1222465110
8. Carleton, T. A., & Hsiang, S. M. (2016). Social and economic impacts of climate. Science, 353(6304), aad9837. https://doi.org/10.1126/science.aad9837
9. Auffhammer, M., & Schlenker, W. (2014). Empirical studies on agricultural impacts and adaptation. Energy Economics, 46, 555– 561. https://doi.org/10.1016/j.eneco.2014.09.010
10. Moore, F. C., Baldos, U. L. C., & Hertel, T. (2017). Economic impacts of climate change on agriculture: A comparison of process-based and statistical yield models. Environmental Research Letters, 12(6), 065008. https://doi.org/10.1088/1748-9326/aa6eb2
11. Roson, R., & van der Mensbrugghe, D. (2012). Climate change and economic growth: Impacts and interactions. International Journal of Sustainable Economy, 270– 285. https://doi.org/10.1504/IJSE.2012.047933
12. Hsiang, S., Kopp, R., Jina, A., Rising, J., Delgado, M., Mohan, S., Rasmussen, D. J., Muir-Wood, R., Wilson, P., Oppenheimer, M., Larsen, K., & Houser, T. (2017). Estimating economic damage from climate change in the United States. Science, 356(6345), 1362– 1369. https://doi.org/10.1126/science.aal4369
13. Mendelsohn, R., Dinar, A., & Williams, L. (2006). The distributional impact of climate change on rich and poor countries. Environment and Development Economics, 11(2), 159– 178. https://doi.org/10.1017/S1355770X05002755
14. Mi, Z., Meng, J., Guan, D., Shan, Y., Song, M., Wei, Y. M., Liu, Z., & Hubacek, K. (2017). Chinese CO2 emission flows have reversed since the global financial crisis. Nature Communications, 8(1), 1712– 1710. https://doi.org/10.1038/s41467-017-01820-w
15. Schlenker, W., & Roberts, M. J. (2009). Nonlinear temperature effects indicate severe damages to US crop yields under climate change. Proceedings of the National Academy of Sciences, 106(37), 15,594– 15,598. https://doi.org/10.1073/pnas.0906865106