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**Research Article**

# Environmental Threats and The Challenge of Achieving Food Security

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**ABSTRACT**

Environmental threats represent a global challenge with social, economic and health dimensions in addition to those related to food production and safety. As climate change has become one of the most widespread threats and one of the most prominent factors impeding efforts to achieve food security, its effects are not limited to food production only, but go beyond that to economic, social and health aspects that threaten social stability and the well-being of individuals.
This article aims to shed light on food security, which has become one of the most important global challenges faced by countries, especially in light of the increasing environmental threats that affect the ability of societies to produce and provide sufficient food sustainably, and therefore the concept of food security will be addressed by focusing on the most important axes on which it is based by addressing its dimensions in light of the growing threats to it, and the growing interest in food, its availability, distribution, quality and sustainability at the global level.

**Keywords:** threat, environment, environmental threat, food security, sustainable food security.

## Introduction:

Environmental issues of various types, dimensions and impacts represent real challenges and threats to human security, which includes food security as one of its most important dimensions, as environmental threats are considered one of the most prominent security challenges facing modern societies in their quest to achieve food security.
Building food security by providing enough food and the ability to obtain it in quantity and high quality provided that this abundance and quality is sustainable and is the ultimate goal that countries, governments and individuals aspire to, and this requires a clean, healthy and safe environment free of threats to it, as with the increase in climate change, depletion of natural resources and environmental pollution, the agricultural and food system has become at risk, which puts global food security in a real confrontation with these threats that have increased in severity in recent years, and thus the environment and all its changes have become the most important issues for humanity today. Agriculture and food are at risk, which puts global food security in a real confrontation with these threats that have increased in severity in recent years, and thus the environment and all the changes that occur in it have become the most important issues facing humanity today, and it has become difficult for any country alone to face these threats or take decisions in isolation from other countries about what can be done towards them.
The interest in food issues and achieving food security has become one of the most important cases that receive the attention of researchers and academics. After the focus in the past was on the military and economic aspects of state security and protecting its sovereignty, this endeavor has expanded and moved to talk about the individual as a basic unit within the borders of the state by taking care of his requirements.
Achieving its security, which is the key to achieving human security, including freedom from fear and freedom from need, encompasses many dimensions, of which food security is one of the most important.
Our study of environmental threats aims to highlight an important dimension that forms part of the overall approach to human security, which is food security, by addressing the most important axes on which food security is based by addressing its dimensions in light of the growing threats to it, and in light of the growing interest in food, its availability, distribution, quality and sustainability at the global level, so the need for

research on environmental threats and the issue of achieving food security emerged, which constitutes one of the important factors related to human freedom from many threats facing him, especially those related to the environment in general and hunger and malnutrition in particular, which leads us to ask How do environmental threats affect the growing issue of food security and what are the sustainable solutions to address them?

Through this question, we pose the following sub-questions:

- What do we mean by environmental threats and what do we mean by food security?
- How do environmental threats affect the availability of food security?
- What are the sustainable solutions to address environmental threats to achieve food security?

In order to answer the aforementioned questions, we divided the article into the following elements:

1- A conceptual approach.
2- The impact of environmental threats on the dimensions of food security.
3- Environmental threats and their impact on food security.
4- Natural disasters and their impact on food security.
5- Sustainable solutions to address environmental threats and achieve food security.

The importance of this study lies in shedding light on:

- The relationship between environmental threats and food security, especially in view of climate change and increasing environmental challenges.
- Understanding how environmental factors affect agricultural production and thus food availability.
- How these impacts are negatively reflected on human societies.

## I- Conceptual Approach

When studying any topic, it is important to provide definitions of all concepts related to the study, whether the linguistic definition or the terminological definition. It should also be noted that there are some concepts that are difficult to determine a precise definition for them, and this is due to the multidisciplinary nature and the different intellectual approaches of scientists and scholars, so to study the topic of environmental threats and the issue of achieving food security, we must explain the meaning of the threat, the environment and food security and the relationship that links these concepts to each other so that we can later identify the types of environmental threats that stand in the way of achieving food security.

### Definition of Threat

Threat is defined as “a concept that combines internal and external causes of harm, that it can be identified and characterized in a direct and unmediated way, and that it requires a clear, explicit and understandable response.” **(P & other's, 2008, p. 20)**

Conventional military threats are “threats to a state's security and control through the use of military force, so states seek to take the necessary measures to avoid these threats or respond to them if they occur.” **(P & Other, 2008, p. 21) .**

“It is called a threat because its image is clear and its occurrence is confirmed, in addition to the fact that the mechanisms to confront it are known and defined.”

Webster's Webstars Dictionary defines threat as “a statement or expression of intent to harm, destroy, or punish, also denoting danger or harm, such as a threat in war, security or political studies”.

It is also used as a term in politics and as a general concept and is not recognized in “social science dictionaries” **(Hans Gunter, 2011, p. 63)**

During the Cold War, the focus was more on external threats, but after the end of this phase, the concept of threat perception changed radically, as Steiner pointed out the fundamental change in risks and threats since 1990, which increased the risks of violent local wars and reduced the effectiveness of arms control systems, and following the expansion of the concept of security and its transition from the state's military power and traditional diplomacy to economic, social and environmental dimensions, the concept of threat expanded in turn and became applied to a series of new threats that not only affect state security but go beyond that to touch new security references. **(Hans Gunter, 2011, p. 63)**

The concept of threats is based on observing the reality of international transformations and their impact on the new contents of security, as the meaning of threat in the post-Cold War period has become obscure and undefined context, especially in terms of the absence of scrutiny about the sources of insecurity, where the non-traditional threat to security is defined as “the set of sources of threat or channels of causing damage that differ from what is included in the definition of the traditional threat to security, which may face a wide range of entities extending from the individual human being to human existence in its entirety, including but not limited to the state, and the scope of security threats expands to include a spectrum of economic, environmental or political issues. **(Awni, 2011, p. 03)**

As the relationship between the concept of threat and security is a relationship of mutual influence, and the interpretation of the concept of security starts first from identifying the sources of the threat, as the reason for the feeling of danger or threat calls for taking measures aimed at achieving security, while the threat in its strategic concept “is the achievement of the conflict of national interests and goals at a stage where it is impossible to find a peaceful solution that provides countries with a minimum of their political, military,

economic and social security, and in return their ability to balance external pressures, which may force the conflicting parties to resort to using military force, endangering the national security of other parties" **(Abdullah Al-Harbi, 2008 pp,27-28)**

## Definition of Environment

Environment is a vague term, and its scope is not precisely defined **(Al-Dessouki Attia, 2009, p. 115).**
While Michel Prieur believes that "the environment is a volatile and changing concept" **(Michel, 1991, p. 7).**
Therefore, developing a specific and accurate definition of the environment faces many difficulties, given that scientific disciplines are multiple and intellectual approaches differ, which is why we find that definitions differ linguistically from one dictionary to another, and differ according to their contents.
The term ecology is found in the French language "Ecologie, which is a Greek term", where the German scientist Ernest Huchel referred to it **(Al-Dessouki Attia, 2009, page 104**), when he said that it is "a combination of two Greek terms Oikes meaning house, Logos meaning science, so it means 'ecology' and language meaning the science of the house or dwelling." **(L'oxford advanced)**
It is defined as "the set of conditions and circumstances prevailing in the space in which humans live that affect them and their health."
It is also defined as "the set of natural, physical and biological environmental factors that make up the ecosystem". **(Al-Qassas Mohammed, 1999, page 22)**
The United Nations Conference in Stockholm in 1972 defined it as "a set of natural, social and cultural systems in which humans and other organisms live, derive their sustenance and perform their activities" **(Tarraf, p. 21)**

## Definition of Environmental Threat

Through the previously mentioned definitions of threat and environment, we can also provide a definition of environmental threat that combines the terms threat and environment.
In 1993, Borundtland referred to the new threats to security and stated that they "may be caused by social unrest resulting from poverty, inequality, and environmental degradation through internal conflicts that lead to new waves of refugees".
It also indicated that "pressure on the environment from a rapidly growing world population will increase the likelihood of such conflicts, climate change, desertification, deforestation, loss of biodiversity, depletion of freshwater resources and soil erosion." **(Hans Gunter, 2011, p. 64)**
In 1988, President Gorbachev pointed out that the relationship between man and the environment was threatened: "The threat from the sky today is not so much nuclear missiles as it is the depletion of the ozone layer and global warming." **(Mayers, s.d.)**
The report of the Secretary-General's High-Level Panel on Threats, Challenges and Change, published on December 2, 2004, referred to the new tasks of the UN in the 21st century, stating that "today's threats do not recognize national borders, are interconnected and must be addressed globally and regionally, in addition to national levels." The Panel distinguished between six groups of threats, starting with "social and economic threats, including poverty, infectious diseases, environmental degradation, internal conflict between states, weapons of mass destruction, terrorism, transnational organized crime and, for the first time, environmental degradation" **(Paul & Williams, 2008, p. 8) .**
Alexandra Knigth sees environmental threat as a term used to refer to "threats posed by environmental change and degradation that put people's lives and living conditions at risk" **(Knigth, 2005, p. 1550)**
Norman Myers affirms that the world is engaged in a third world war, a war against nature. The threat has become targeting the depletion of the ozone layer, global warming, soil erosion and other environmental threats, in addition to population growth, excessive consumption of resources, and the spread of poverty in developing countries. Many political leaders and military planners have described it as the greatest threat to humanity without nuclear war, but the new concept emerging in foreign policy councils, military and strategists is "the environmental dimension of security issues." **(Myers, s.d.)**
Brian White, Richard Little, and Michael Smith have noted that "global environmental change and all the issues related to it are the new security issue that must be addressed with the same urgency as national defense."
If the definition of security "is the absence of threat, then the greatest threats to the survival of societies are environmental threats." **(White and al., 2004, p. 275)**
Environmental threats such as rising temperatures and depletion of the ozone layer represent possible threats to human security, as it is estimated that between a quarter and a third of all deaths of the world's population due to diseases are caused by environmental causes such as air, water and soil pollution, so they are not just theoretical predictions for the future but a clear and present danger and threat.
The security threats generated by the environment present humanity with three political risks:

- Environmental threats are often less obvious and direct than other types of threats, which G. Prins describes as "threats without enemies." Potential threats such as ozone depletion and temperature rise may be profound but are still long term.
- Actions to address such threats are usually expensive and involve compromising economic interests.

- Addressing environmental threats is achieved through global coordination. **(Hongh, 2004, p. 134)**
- According to UN Secretary-General Kofi Annan, "environmental threats must be addressed through the collective security system embodied by the Security Council and emphasizes that environmental degradation poses a threat to security through its potentially catastrophic consequences for human life." **(Knigth, 2005, p. 1551)**

Therefore, we conclude from the above that environmental threats vary according to their type and their different impacts on achieving food security, including natural environmental threats that are not caused by human activities, and non-natural environmental threats that are caused by human activity and lead to threats to human survival.

- **Definition of food security**

The concept of food security has evolved with new developments and the imbalance between food supplies and the national (local) production of a country and the needs of the population for food in that country, as countries that lack food have started importing, and many countries that are unable to produce enough food receive food aid from countries producing those materials, but this is not enough, considering that many people suffer from a severe shortage of food supplies, which has led to the spread of the phenomenon of hunger and malnutrition.

The concept of food security was first formalized by the Committee on World Food Security (CFS) in 1974 after the 1970 global crisis, defining food security as "the ability to provide an adequate supply of food" **(Zuberi, 2017, p. 66)**

At the global level, it means "the availability of food resources to feed the world's population in a way that meets the necessary needs for human growth and good health", while at the regional or national level it means "the ability of a country to secure the necessary food resources for its population" **(Al-Hazayma, 2005, pp. 111-112)**

The definitions of food security have multiplied as a result of the multiplicity of scientific disciplines and intellectual affiliations, and differed according to the different outlook of their authors, the development of a comprehensive definition of food security by many international bodies concerned with food and food security has gone through many stages, and each stage differs from the previous stage as a result of the multiplicity and diversity of threats to building and achieving food security, which affected the definition of food security dimensions, as the origin of the term dates back to the 1970s because food security was almost absent in many countries of the world, which suffer from a large food gap that led to increased foreign dependence to secure their basic needs.

After the global trade and economic transformations, especially after the liberalization of international trade for agricultural products that depend primarily on the principle of specialization and competitive advantages, the concept of food security began to evolve until it included many dimensions, "as it moved from a concept related to achieving self-sufficiency by relying on local productive resources and capabilities for food, to a concept that is achieved at all levels of the individual, family, national, regional and global, as it provides the individual with economic and physical opportunities that achieve access and physical access to his food needs in a safe manner" **(Latrach, 2015, p. 200)**

The traditional definition of food security "refers to achieving self-sufficiency by relying on the country's resources and capabilities to produce its food needs locally" **(Bakdi and Hamdi Basha, 2016, p. 36)**

The Food and Agriculture Organization (FAO) defines food security as "existing when all people at all times have physical, economic and social access to sufficient, safe and nutritious food that meets their nutritional needs and dietary preferences and ensures an active and healthy life" **(Committee on World Food Security, 2017, p. 8)**

This definition refers to the following dimensions of food security:

- The sufficiency dimension.
- The access to food dimension.
- The quality dimension.
- The stability and sustainability dimension.

So, food security as defined by the FAO does not only mean the availability of food, but also access, quality and sustainability.

It is also clear that there is a difference between this definition and the traditional definition of food security, which is related to achieving self-sufficiency by relying on the country's resources and capabilities to produce its food needs at the local level, and this makes it more compatible with the current economic changes and the accompanying liberalization of international trade in food products.

-The World Bank (BM) definition of food security means "the possibility for all people at all times to have access to sufficient food for a healthier and more active life" **(Fabray.l, p. 14)**

Food security is achieved when a country, with all its marketing and commercial systems, is able to supply all citizens with sufficient food at all times, even in times of crisis, in addition to the deterioration of local production and international market conditions. **(Salt, 2017, p. 48)**

We note from this definition that food security refers to the availability of sufficient food for individuals, and it is achieved when there is enough food available at all times to ensure that there is no hunger or exposure to it, and is used as a reference unit to prevent food deficits or interruptions due to the occurrence of crises such as

war, environmental pollution, desertification, climate change, drought and other threats that stand in the way of providing food security.

The World Health Organization (WHO) defines food security as "all necessary and essential conditions and standards during the production, processing, preparation and distribution of food to ensure that food is safe, reliable, healthy and suitable for human consumption. Food safety relates to all stages of agricultural production until the moment of consumption by the final consumer" **(Oum Al-Khair and Birch, 2019, p. 192)**

This definition focused on three main pillars that the World Health Organization (WHO) considers to be important stages in the realization of food security:

- Full availability of food commodities.
- Permanent presence of food commodities in markets.
- The prices of the products must be affordable. **(Oum Al-Khair and Birch, 2019, p. 192)**

The Arab Organization for Agricultural Development (AOAD) defines food security as "the provision of food in the quantity and quality necessary for health and activity on a continuous basis for all members of the Arab nation, relying primarily on local production and based on the comparative advantage of producing food commodities for each country, and making it available to Arab citizens at prices commensurate with their incomes and financial possibilities" **(Ibrahim, 2012, page 09)**

This definition makes it clear that food security is a noble goal that all peoples aspire to and seek to achieve in order to confront difficulties, threats and natural challenges, and provide all conditions for this, so that food is available to all from its sources, whether local or international.

In this context, and through the clarification of relevant concepts that present the relationship between food security and environmental threats through a deep understanding of the meaning of threat as a comprehensive concept of everything that has a role in negatively affecting social stability and the well-being of individuals and causing disruption in ecosystems, which refers to the biological framework of living organisms, including humans.

## II- The Impact of Environmental Threats on The Dimensions of Food Security

Through what was reviewed in the above mentioned literature on the definition of food security, in which we clarified its dimensions, which are respectively: food availability, food quality and sustainability of food security: Food availability, food quality and sustainability of food security, as they form an interconnected chain where one dimension is inseparable from the other, so that building food security will not be achieved without food availability, and the individual will not reach his sufficient right to food without its quality, and he cannot guarantee his rights without achieving sustainability, but environmental threats can prevent the realization of food security and raise the issue of availability, quality and sustainability.

Although there are many differences about the concept of food security and the dimensions it includes, it is possible to identify a number of dimensions on which several definitions agree, as follows: Food availability, quality, and sustainability.

### Food availability

The definition of food security at the World Food Summit in 1996 initially focused on the availability of food that guarantees access to food. According to that definition, the lack of food availability means the lack of access to food. Food availability means "the existence of food and its availability to individuals by various means, whether through local production, imports or food aid, and the availability of food for the individual and the family at the national and international levels" **(World Food, 2009, p. 23)**

This definition included the dimension of food availability and access to food for individuals, and also included some means by which both "availability and access to food can be achieved from local production, imports and food aid for both the individual and the family, and not necessarily access to food once it is available" **(Joochim, Howarthi, Shaubh, & Royal, 1992, p. 07)**

Availability does not always guarantee access to food. Food may be available but inaccessible to individuals for a variety of reasons, and environmental threats that affect food security can be one of the reasons for lack of access to food.

The definition given by the Food and Agriculture Organization, which defines food security as "achieving adequate food production for all people by combining international trade in food resources with local agricultural production and food aid." **(FAO, 1996)**, is a comprehensive definition regarding the means available to achieve the dimension of food sufficiency. **(FAO, 1996)**, is a comprehensive definition regarding the available means by which the dimension of food sufficiency is achieved, but it did not include all dimensions and did not differentiate between the dimension of food availability and sufficiency, which we can define as "the existence of what meets the purpose of all people from food resources, whether in quantity or quality" **(Hattar, DSN)**, by means that all depend on the existence of arable land and a healthy environment free from threats that allow it to be achieved.

When making a comparison between the definition provided by the World Nutrition Summit, which includes some means, such as imports and food aid, but not all means that can be realized after the availability of food, and the definition provided by the Food and Agriculture Organization (FAO): Importation and food aid, but not all the means by which the availability of food can be achieved, and the definition provided by the Food and

Agriculture Organization (FAO) included more comprehensive means, but the WFS definition added access to food by stating that it must be made available to individuals, while the second definition did not refer to this.

**Food quality**

Food quality is defined as "a set of values that affect food and make it desirable on the one hand and suitable for consumption on the other hand, where these values are manifested in: The nutritional value, i.e. the nutrients that the food contains, such as proteins and vitamins, while the technological value means the ingredients of the product, while the health value means the safety of the product from any contaminants or anything that poses a risk when consumed, while the sensory value appears when eating the product, such as: Shape and color" **(André & Hans, p. 437)**

The International Organization for Standardization (ISO) defines food quality as: "a set of characteristics by which the suitability of a product for consumption can be determined" **(ISO, undated)**, through this definition there is no clarity on the difference between food quality and its validity or safety.

Meanwhile, FAO defined food quality as "the degree to which a food has sufficient characteristics and qualities to satisfy the consumer's need and desire for that food, while achieving the quality standards set by a competent body." **(FAO report, 2001)**

The organization also aimed to define the difference between food quality, food safety and food suitability as follows:

-Food safety: The organization defined it as "the absence of food during its circulation from any source of danger in accordance with the approved rules and specifications."

Food safety is defined as "the condition in which food is fit for human consumption or for the purpose for which it is intended, and includes both the quality and safety of food." **(FAO report, 2001)**

In other words, there is an overlap between the three concepts and the concept of food safety remains the main vessel for food quality and food safety.

## Food sustainability

The word sustainability has its origins in the development crisis that hit the world after World War II, when many people suffered from extreme poverty, malnutrition, famine, and little prospect of a better future. **(J, Kibert, Lesile, Anna, & Martha, 2005, p. 13)**

The origin of the use of this concept dates back to the Germans in 1713 when they tried to take care of the sustainability of forests, then moved to the concept of preserving natural resources and their origin, especially agricultural lands, then this concept was used by economists and the first to use it was Thomas Malthus in 1798 in his famous article on "famine", followed by the economist Harold Hotelling in 1931 in his theory on "optimal utilization of non-renewable resources" and then the concept was addressed more broadly and comprehensively in the "Portland Commission Report in 1987" **(Tom & John, 2010)**

Rebert Gilman defined sustainability as "giving equal weight to present and future decisions by extending the Golden Rule over time."

As Hawken Paul says, "Sustainability requires leaving the world better than you found it, not taking more than it needs, and not harming environmental life." **(J, Kibert, Lesile, Anna, & Martha, 2005, p. 12)**

The Portland Commission on Environment and Development defined it as "meeting the needs of the present without compromising the ability of future generations to meet their own needs." This concept focused on basic needs and the constraints that technology imposes on the environment and prevents its sustainability. **(world commissionen environment, 1987, p. 69)**

The Committee recognized that sustainable development is based on three main pillars: "social development, economic development and environmental development", linked by justice, equity and empowerment, and that sustainability should include the following elements:

- It includes all the freedoms of human life, not just the basic ones.
- Access to opportunities, not just the granting of rights.
- Sustainability should include distributive justice.
- Future generations should not have to choose between an abundance of goods and services and clean air.
- Not only the cases that are most probable, but also those that are possible. **(United Nations Development Program, New York, 2011, pp. 17-18)**

## Definition of sustainable food security

The association of food security with the concept of sustainability implies the time dimension of both availability and quality so that:

- Sustainable food security is defined: "economic, social and physical access to a balanced diet and safe drinking water to enable everyone to live a healthy and productive life forever." **(Nicholas & Erhard, 2009)**

In this definition, the availability of food at certain times and the lack of food at other times must be avoided, and the rights of future generations to a good life and sustainable food in all its dimensions are not addressed or included in this definition.

The definition adopted by the 1996 FAO report recognizes that sustainable food security is "the security that exists when all people at all times have physical, economic and social access to sufficient, safe and nutritious food that meets their dietary needs for an active and healthy life." **(Agriculture, 2009)**

This definition includes all dimensions of food security, as it is concerned with the rights of all generations. Future food security depends on matching supply to demand, in other words, providing the food supply with quality, sustainability and suitability for the growing population demand at the global level, but these expectations are subject to uncertainty due to many challenges, including environmental threats, whether natural or unnatural, such as climate change, environmental pollution, natural disasters, and desertification.

**(Christian, Monika, & Tom)**

### 1- Natural environmental threats and their impact on achieving food security

Today, the world is facing a range of threats that have elevated in recent years, including environmental threats to the security of individuals. ، Where the environment and its changes have become one of the most important and complex threats facing the world, It has become difficult for a single state to face these threats in isolation from other states in what can be done towards them. **(behnassi, sidney,& Sanni, 2011, p. 186)**

Environment and food security as dual integrated and two dimensions from the humans security ones, this late concept since the seventies, specifically during the Stockholm Conference in 1972, human security has occupied a distinguished position in the field of academic, political and global studies, so the concept of security has changed from a traditional narrow-scale concept that focuses on the state and aims to protect national borders by military force to a new and expanded concept with the main focus Individual**. (behnassi, sidney,& Sanni, 2011, p. 187).**

Developments have emerged with regard to the development of a definition of human security, which includes "the meaning of freedom from fear and freedom from need", and thus includes many dimensions: "cultural security, water security, economic security, personal security, community security, environmental security and food security", the latter has become facing natural environmental threats manifested in climate change and desertification in addition to natural disasters whose effects negatively reflects the availability of food in various Environmental problems are also closely related to all areas related to human activity, whether at the economic, political or social levels, as threats constitute a security bet that extends to all regions, as these threats vary from regional to global and this sum of all these threats can be summarized in the following elements:

### 1.1Impact of climate change on food availability:

The phenomenon of climate change is one of the challenges facing humanity, and one of the most important issues on the global agenda in light of the serious changes that may result in threatening the future of man, as interest in it as a phenomenon began at the end of the twenty-ninth century, where scientists and researchers in earth and climate sciences stressed that the earth is in constant change and will negatively affect the lifestyle of the world's inhabitants in various fields, and this is due to several natural and human reasons, as the United Nations Convention On climate change provided a definition in the first paragraphs of climate change, which I considered as" Those changes in climate are directly or indirectly attributable to human activity that leads to into changein the global atmospheric composition which is observed in addition to the natural variability of the climate over similar time periods.**".(United A.,1992, Page 03 ).**

Climate change is one of the most dangerous phenomena that have become threats to global security in general and environmental and food security in particular, as David Arson, Canadian Minister of Environment, presented in February 2004 his statement about the phenomenon of climate change as" Terrorism is not likely to turn 500 million people into refugees, but it can be caused by climate change. " ، In the same year, the British government's chief scientist, David King, proposed "Climate change poses a much greater threat to stabilize the world from international terrorism".. **(Mohamed Saadeni and Ms Awda, 2007, Page 123 )**

### A/ The impact of climate change on agricultural production

Agriculture is one of the most necessary elements to achieve food security, whether it is in terms of providing food or providing jobs and earning strength to provide food, both of which are exposed to relatively negative effects due to climate change, as agricultural production is affected as well as income, especially for developing countries in Asia and Africa, which have large populations that depend on agriculture for their livelihood. Their number is estimated at about 3/4 of The world's population they are the most vulnerable to food insecurity due to lack of food availability and impact to climate change. ( **United B., 2007 )**

The impact of climate change on agricultural crops is a direct threat to food availability due to crop spoilage. Although there are differences in the degree of vulnerability between agricultural regions. However, this leads to the infection of agricultural crops with various diseases and the spread of harmful bacteria and various insects**.(change, s.d.)**

Where we find that, one of the effects of climate change on agricultural crops is the rise in temperature to 4 ° C, this leads to the decline in production in many agricultural products in many countries ، Bangladesh's rice production has fallen by 30 percent and wheat production by 50 percent, and the production of several agricultural, food-security crops are expected to decline further by 2030, including wheat in South Asia, rice in Southeast Asia, and maize in South Africa. **(The World, 2010, Page 169)**

The vulnerability of agricultural crops due to climate change is one of the threats to the ability of countries to secure and build their food security.

In addition to the effects of climate change, these changes also lead to multiple natural disasters that damage agricultural production, such as droughts, hurricanes and floods, for example, what happened in Australia

during the drought, which led to a decrease in the proportion of rice crop, which led to a rise in its prices in the markets, as well as what happened in Argentina, where increasing soil erosion and desertification due to high temperatures, which certainly led to heavy losses in the production of an important crop, soybeans in 2004,**(United B.,2007)** most of these effects on agricultural production have negative repercussions on food availability. This prevents building a solid base for food security.

### B/ The impact of climate change on livestock production

The change of weather conditions due to climate change leads to sudden and paradoxical natural disasters, as they occur in different and separate regions of the world, such as floods and droughts, which leads to large losses that affect livestock in most cases, either directly or by infecting them with diseases that lead to their death and thus a decrease in their number, or indirectly due to the losses to fodder, pastures and agricultural crops as well as the lack of water resources, as the most affected areas are Africa and East Asia, especially mountainous areas and deserts, and this makes them unable to build their food security. **(christoph, sven, & windfuhr, 2008, pp. 88-89)**

Fish wealth is also affected by the impact on the spatial distribution of fish stocks, the latter changes due to the migration of fish from one confluence area to another in search of suitable conditions for living, in addition to other influences that lead to their decline, which is the increase in acidity in the oceans, and the change in rainy seasons and the large amounts of rainfall cause floods on the one hand and on the other hand the rising of sea level, which affects fish wealth, their numbers and reproduction, and thus their decline, which negatively affects the availability of food, especially for countries that depend largely on fish for their food**. (christoph, sven, & windfuhr, 2008, p. 89)**

### c/Impact of climate change on biodiversity

The vulnerability of biodiversity to climate change leads to the affect of individuals, either by their inability to face risks and disasters, or they do not have a means of living under these changes, which gives them the ability to adapt to them, this is due to the importance of biodiversity for humans in providing livelihoods, food security and clean water, according to former Secretary-General of the United Nations Kofi Annan in his report entitled: "In an atmosphere of freedom for the year 2005" that another serious concern is the loss of biodiversity. This is happening at an unprecedented rate within countries and as a whole, but while this trend is alarming, it also seriously affects the right to health, livelihoods (i.e. the right to work, food production and the right to clean drinking water), and increases the vulnerability of communities to natural disasters and climate change. **(Secretary General's Report,2005, Page 27).**

Biodiversity is one of the most important natural resources that can build and achieve food security if it is not affected by climate change because it plays a crucial role in addressing environmental threats.

### D/ Impact of climate change on water sources

Water is life for the Almighty to say, "And we made of water every living thing " It is a universal human right that is not only used to produce food, but it is the basis for all daily activities carried out by humans to ensure their survival, and the lack of clean drinking water and daily use in food is a result of the effects of climate change on the availability of food by being polluted by floods caused by climate change, or decreased due to dry seasons, especially in desert areas, and climate change and global warming also lead to a decrease in the flow of rivers in various countries of the world, and the melting of glaciers. These factors lead to a decrease in water flow and low water levels, especially for the population that depends on rivers for water supply, which numbered about one-sixth (1/6) of the world's population. **(christoph, sven, & windfuhr, 2008, p. 91).**

The most water-scarce region is the Middle East, for example, the high temperature in Lebanon, where an increase of 1.2 degrees Celsius is expected to lead to a shortage of stored water, which is estimated at 15%. **(United B., 2007, Page 85).**

Naturally, the shortage and lack of water reflects negatively on agriculture, as approximately 70% of this water is used in agriculture to ensure abundant production, and its shortage certainly affects the availability of agricultural production and thus the availability of food.

### 2-Unnatural environmental threats and their impact on food security

Unnatural environmental threats vary according to the degree of their impact, as these threats arise due to human activities such as pollution, intensive agriculture and unsustainable use of natural resources, most of these threats are increasingly affecting global ecosystems and thus reflected on food security.

Pollution is one of these threats that stand in the way of achieving food security, as food pollution prevents the achievement of quality and sustainability, some link the lack of food quality to pollution of all kinds of water, soil and air pollution, they are interconnected with each other, as air pollution may lead to soil pollution and thus food pollution.

So we will tackle the definition of environmental pollution by giving a comprehensive overview of the concept and what it refers to.

### 2.1 Environmental pollution and its impact on food security:

It is among the most serious threats to the environment and humans and the most harmful to food security, as these threats also reach all dimensions of food security and affects them, because the dangers of pollution are multiple and its effects impact on different countries, whether they cause it or not, and its effects are transmitted from one region to another, such as the Chernobyl accident of 1996, which indicates that it is an environmental threat and not just a danger as it is transboundary due to the effects it leaves. In addition, It is a threat with consequences and causes that affects various groups, especially the fragile, weak, and most vulnerable, such as women, children and the sick, as it is considered an unnatural threat because human activities are the main cause of its occurrence.

There are many definitions related to environmental pollution ، The Environmental Pollution Commission of the United States President's Advisory Committee on Science defined it in 1965 as "the undesirable change in our surroundings directly caused by human activities." or indirectly." **( Elnnakar, 2007, page 101).**

Therefore, through this definition, environmental pollution can be considered as the introduction of harmful elements into the environmental environment mainly by man, which leads to affecting the environment and causing harm to it and from it to humans. **(Adassouki Atya, 2009, Page 175).**

The most common definition of environmental pollution is that issued in the recommendations of the Council of the Organization for Economic Cooperation and Development issued in 1974, where environmental pollution is defined as "the introduction of substances or energy caused by man, directly or indirectly, into the environment so as to result in harmful effects that threaten human security and health and harm environmental resources, both living and non-living."".

There are also many causes and symptoms of environmental pollution, as most of its cases are caused by human activities, and there are only exceptional cases where there is natural environmental pollution, for example volcanoes and earthquakes, while the most prevalent cases are mostly due to human activities such as developmental, industrial and technological activities, the most important of which are emissions resulting from the combustion of fossil fuels, especially coal and petroleum, and smoke from factories, car engines and power plants, and the individual resorts to changes in the environment that affect it. Causing pollution such as cutting trees for the purpose of heating and cooking, and of course it results in air pollution, and from it the type of human activities is what determines the type of environmental pollution, in addition to that, there are several criteria that would determine the types of pollution, for example: pollution in view of the polluting material, from which several types branch, including biological pollution, radioactive pollution, chemical pollution, but in view of the source of pollution, there are two types :Natural pollution resulting from natural phenomena, and industrial pollution resulting from human activities.

Looking at the environment in which it occurs, there are three types: water pollution, air pollution, and soil pollution. The following is a detail about what has been mentioned about these threats.

### A/ Water pollution and its impact on food security:

Water is one of the necessities that depend on it in daily life, so obtaining clean and drinkable water or to use it for preparation is important and essential to obtain healthy and quality food, but in most regions of the world, especially rural ones residents rely on ponds or polluted rivers for their water supply, which is also used for irrigation and livestock. This contaminated water can lead to food borne illnesses, such as diarrhea, which disproportionately affects children and compromises food security in two ways:

First, the immediate picture is that diarrhea prevents nutrient absorption.

Second, the indirect picture is that diarrhea weakens the body from working, and instead of spending money to obtain food, it is spent on obtaining health care. **(Report of the nutrition and agriculture organization, 2001).**

Water pollution occurs due to contaminated sewage that contains bacteria by disposingo them into rivers or areas that contain underground wells.

- Waste from chemical factories and food waste.

-Waste that reaches the seas and rivers and the pollution that occurs from mixing with them.

-Radioactive substances such as reaction residues and experiments of scientists and experts on nuclear reactors, which seep into the water when not buried deeply**. (Islam, 1990, Page20),** agricultural pollution results in watering farmland with unclean water or sewage as a less expensive source, but it contains viruses and bacteria that are harmful to human health. The International Water Management Institute has estimated that about 20 million hectares of the world's farms are irrigated with wastewater, with the proportion especially high in developing countries, for example, in Ghana, more land irrigated with wastewater than irrigated with clean water, and in Pakistan, a quarter of vegetables are watered in this way **(United nation's program for environment, 2010, page 27).** The causes of water pollution are numerous, including the dumping of toxic waste as well as industrial waste in the seas and oceans, which reflects negatively on the water wealth in it, as it is exposed to diseases transmitted to humans, and this phenomenon has worsened in recent years.

The Use of contaminated water in the food and beverage industry have negative effects, According to the World Health Organization, about 87% of the world's population uses contaminated water sources, resulting in unhealthy food that leads to the spread of diseases and epidemics that particularly affect the health, security, livelihoods and quality of life of children. They are earlier in their impact and more severe in the impact on adults. **(Global health organization, 2010).**

### B/Soil pollution and its impact on food security

Soil is one of the basic materials for the production of nutrients. No food can be produced on a large scale if the soil is prone to degradation, nor can livestock—essential for the food and livelihood of a large proportion of the world's population—be fed. The soil is limited, fragile, and a resource that requires special care from its users. Many current soil and crop management systems are unsustainable. On one hand, the overuse of fertilizers in the European Union has led to nitrogen deposition, threatening the sustainability of about 70% of the soil. On the other hand, in most parts of sub-Saharan Africa, there is a lack of fertilizer use and a failure to replenish the soil nutrients that crops deplete, leading to soil degradation and reduced production. **(And agriculture;2011).**

From this, we can conclude that fertilizers are a double-edged sword: while they are beneficial and nutritious for the soil, their overuse leads to soil pollution, negatively impacting the yield necessary to meet future nutritional needs. Although fertilizers have contributed to a 40% increase in food production over the last 40 years, they have also imposed significant environmental costs, with Asia and Europe currently having the highest rates of mineral fertilizer use per hectare. These regions face the most severe problems associated with environmental pollution from excessive fertilizer use, including soil and water acidification, surface and groundwater pollution, and increased emissions of greenhouse gases. **(And agriculture., 2011).**

In Europe, 75% of nitrogen comes from synthetic fertilizers, while globally, this figure is about 50%. However, crops benefit from only half of the nitrogen used, with the remainder infiltrating waterways, groundwater, or being lost to the atmosphere, contributing to nitrogen losses from animal waste, estimated at 30% to 40%. The other half escapes into the atmosphere as ammonia, with particularly high emissions recorded in the Netherlands, Belgium, Denmark, and Sichuan Province in China, where annual reactive nitrogen emissions from fossil fuel combustion reach 25 million tons. **(United b, 2007).**

In Arab countries, especially in the Middle East, the rate of fertilizer use in cultivated areas is estimated at about 108 kg per hectare, primarily consisting of nitrogen, potassium, and calcium—elements that impact food production. When used properly and in moderation, these elements have positive effects, while excessive and unregulated use can have negative consequences on food production.

### A- Positive effects of the use of chemicals:

These effects appear to preserve food as natural without the addition of chemicals and these effects vary between psychological, economic and health effects.

- **Psychological effects**

It is reflected in the consumer's vision of natural foodstuffs of no quality, and this is through the external form of the product due to the appearance of some parasites, worms and insects, especially in the period of harvesting, transportation and storage, this is what reflects negatively on the consumer's psychology and makes him always confused in the best choice of food, is it based on the price among natural materials without chemical additives or to which chemical substances were added. **(Salah, 2006, page 89).**

- **Economic Impacts:**

Using natural materials often leads to higher prices, forcing farms to raise their prices to compensate for losses due to bacteria and insects**.(Saleh, 2006, page 90-91).** Thus, avoiding preservative chemicals can threaten food quality, negatively impacting food security, alongside soil pollution from liquid or solid waste dumping and natural disasters. Factors like earthquakes and climate change also contribute to soil quality degradation, affecting food quality.

- **Health Effects:**

Not using preservatives naturally exposes food to bacteria, germs, and insects, especially during transportation and storage. Natural foods may contain toxic substances that some chemicals could help mitigate.

- **Negative Effects of Chemical Use:**
- Increased nitrogen levels can delay the ripening of fruits and vegetables.
- Excessive nitrogen can lead to unpleasant flavors in cooked food.
- High nitrogen and potassium levels may reduce starch quality in potatoes**. (Saeb, 2008**, **Page 139).**

The main purpose of pesticides is to eliminate pests, but frequent use can lead to pest resistance, prompting farmers to increase quantities without realizing the potential harm to food quality. Consequently, the Stockholm Convention on Persistent Organic Pollutants was established in 2004, banning all pesticides containing chlorinated hydrocarbons**. (Saeb, 2008, Page 142).**

### C/Air pollution and its impact on food security

Air is an essential element in human life in order to ensure his well-being, and to live in sound and active health, but if this air is exposed to some harmful and toxic elements, it becomes polluted and contains one or more dangerous substances that harm human food and thus his right to health. In life, especially for people living in urban areas, dangerous substances leave significant health effects, especially those that cause respiratory diseases, vascular diseases and heart disease, while their effects on the food product vary between direct and indirect effects, It is the direct effects that appear directly on the product and therefore become unconsumable.

**(Mashood, 2011, p.278).**
as for indirect effects, the impact is on all sectors, including the food production sector, and thus the inability to produce food and the failure to achieve the availability of quality food, which leads to the lack of sustainability of food security. **(.Fiona and Mick, s.d).**
In the first decades of this century, the focus was on air pollution in urban and industrial areas as a phenomenon that spreads in these areas only, but recently it has become a threat due to the exacerbation of the problem and the transmission of its effects to rural areas, which negatively affected the agricultural production of those areas and thus the achievement of food security.
The acceleration of industrial development, the rapid pace of urbanization, and the increase in emissions from car engines and factory smoke have all combined to exacerbate this problem.
There is also an inverse relationship between air pollution and agriculture, where agriculture causes air pollution, in 2004 it was estimated that 14% of greenhouse gases caused by agricultural activities in the world were those gases such as nitrous oxide produced from fertilizers, methane and carbon dioxide produced by fires.
Many studies have been conducted on the effects of air and its consequences on agricultural land, which is the first affected by it. Lisa Emberson From the Stockholm Institute Environment In New York ensures that, the relationship between air pollution, agricultural production and food security is reflected in a decrease in productivity of up to 50%, especially in areas near power plants, and this decrease leads to creating problems about the availability of food, especially for poor and rural groups that depend heavily on agriculture for survival and the ongoing**. (United B., 2007, Page 100).**

### Fourth: Natural disasters and their impact on food security:

Natural disasters are among the environmental threats that threaten human security and stability, they differ in terms of type, there are natural disasters resulting from geographical and natural factors, and disasters resulting from weather and water factors, the first type Includes Earthquakes, volcanoes, tsunamis and volcanic avalanches, the second type includes storms, drought, fires and floods. the degree of impact of the second type on the availability of food is greater than the first, the first type has multiple effects, and can be reviewed what has been included in this element as follows:

### A/The impact of natural geographical disasters on the achievement of food security:

Natural geographical disasters are one of the main reasons that prevent individuals from accessing various sources of food, and countries are prevented from providing food assistance to individuals in need due to road blockages, in addition to the destruction of markets and infrastructure, including roads and irrigation networks, which hinders the movement of internal trade, and disasters caused by industrial and nuclear accidents, such as the disaster that occurred in Japan in February 2011 due to the earthquake that hit the Dashi power plant. nuclear in Fukushima, which had long-term effects and continues to persist for decades to come, particularly in its effects on food and food affected by radioactive materials due to radioactivity containing two essential substances, radioactive iodine Who has a life span Short where disappears from food naturally and within a short time, radioactive socium, which remains stuck in nature for many years, All of these Sustained threats to food security, both in the region and neighboring areas, which harm the production of food products, as these radioactive materials move to rivers and lakes and become food for fish and this Exposes seafood to contamination and spoilage ، as Is also A threat to food security and food availability for individuals**. (Wahiba, 2014\2013, Page 86).**

### B/The impact of natural air and water disasters on food security:

Results from natural disasters Influences many threats that have a negative impact on food availability such as, floods, desertification, soil erosion and global warming, drought and hurricanes. The latter is a frequent occurrence in recent years. Natural disasters also produce significant repercussions, the effects of which vary according to the type of disaster. Direct Effects on the availability of food resulting from floods represented in destruction of agricultural crops, death of annimals, lack of stock waters. While the indirect effects are manifested in the closure of roads, movement bans, and electricity cuts, and all communication networks. These are all factors that prevent access to adequate food and it is responsible for increasing the severity of the food problem in the world, as well as causing damage to devices and machines used in the production of food, in addition to the spread of pollution, especially contamination of wastewater in food (**Madjakapita, 2008, pp. 38-39)**, it results also on casualties and numbers of deaths leading to obstruction operations productivity. Therefore, it lead into an equal decrease between the proportion of local and international food production. As it also cause a destruction on worksites that are considered a source of income which depends on it in providing food.(**Programs, 2009, p.43).**

- Drought is also among the natural disasters that have various effects on the soil and water used for food provision. It affects not only agricultural production but also livestock production, as animals suffer from a lack of drinking water and the absence of grazing lands, which turn into barren areas due to drought. This also leads to reduced crop yields and poor quality, thereby lowering the necessary food supply. Additionally, it decreases water quantities in reservoirs, and as rainfall declines, food crop production for both local consumption and export diminishes, resulting in higher prices and making access difficult, especially for rural residents and those

with low incomes. Furthermore, the lack of export goods negatively impacts the state's foreign currency revenues, hindering its ability to import and provide the necessary food quantities for its population. The low agricultural crop production also affects other sectors, leading to job losses for many, which results in a lack of income and the inability to secure food for their families. **(Universal, 2003).**

- African countries, particularly those in the south of the continent, are among the most affected by drought. For example, Kenya has experienced severe drought waves since 2006, impacting food provision in various aspects, including the depletion of grazing lands, which has forced the population, especially herders, to migrate to cities. The poor health of animals has led to their deaths due to hunger and a lack of water from wells and basins, with an estimated loss of around 70% of livestock in northeastern Kenya. This significantly affects food availability, as these animals are a primary source of sustenance, contributing to rising malnutrition rates. **(Programs W.F., 2006 p28).**

Arab countries have also been affected by drought. The Arab Organization for Agricultural Development indicates that in recent years, countries like Syria, Iraq, and some North African nations such as Algeria and Morocco have seen their main food grain production groups impacted by drought and irregular rainfall patterns during agricultural seasons.

- as for desertification, it also has a profound effect on food security. The United Nations Convention to Combat Desertification, held in 1992, defined it as "land degradation in arid, semi-arid, and dry areas due to various factors, including climate change and human activities, leading to the destruction of the land's vital potential."(Luis Alfredo, 2010), This potential represents the primary source of food availability, with drylands now occupying 41% of terrestrial land. According to a report by UN Secretary-General Kofi Annan in 2006, "drylands account for 44% of the land area and are home to one-third of the world's population, most of whom are in Asia and Africa, with developing countries, especially in Africa, being the most affected." The majority rely on agriculture for sustenance, and drylands are home to over 46% of the continent's population, particularly in Nigeria, Sudan, Ethiopia, South Africa, Algeria, and Morocco, where many face food insecurity with varying degrees of vulnerability. (United, A,A, 2006, p07 ).

The effects of desertification on food availability include:

- Degradation of agricultural and pastoral land, leading to increased rates of malnutrition, famine, and growing food crises in affected countries.
- Loss of biodiversity.
- Depletion of water sources, both groundwater and surface water, which are vital for food preparation, drinking, and agricultural or livestock production.
- the decrease in soil fertility, in turn, affects the diversity and quality of agricultural food products.

### Fifth: Sustainable solutions to confront environmental threats and achieve food security:

To face environmental threats, a number of solutions must be available to address these threats and achieve food security, as follows:

- Relying on modern agricultural practices to conserve soil and water such as: crop rotation, agriculture without tillage, cultivation of environmentally improved plants.
- Raising the level of water use efficiency in agriculture using modern irrigation techniques such as reuse of treated water and drip irrigation.
- Conserve biodiversity and protect natural ecosystems that support food production to avoid environmental degradation
- Trying to adapt to climate change by developing drought and heat-resistant crops and creating agricultural systems adapted to climate change.
- Reducing food waste by improving the food supply chain from production to the consumer.
- Encourage urban agriculture to reduce transport-related carbon emissions, and reduce pressure on rural areas
- Promoting the culture of innovation by using artificial intelligence techniques and drones to monitor agricultural crops, improve cultivation methods and predict weather conditions and possible environmental conditions.
- Develop international and national policies that seek to achieve sustainability of agricultural and food systems, guarantee the right of farmers and protect the environment from threats to it.
- Spreading awareness about agriculture and its sustainable importance and introducing agricultural and environmental technologies through specialized media.

## Conclusion:

Through the theoretical literature reviewed, the study concluded a number of results, summarized as follows:

- Environmental threats are one of the most prominent challenges facing humanity today, making them an obstacle to achieve food security.
- Environmental degradation constitutes a real obstacle to achieve food security, as a result of climate change, environmental pollution of all kinds and the depletion of natural resources.
- Climate changes such as high temperatures and changes in precipitation patterns lead to a decline in

agricultural production, especially in areas exposed to drought and desertification.
- The impact of environmental pollution on soil and water quality, which negatively affects agricultural production and thus on food security.
- Increased pressure on natural resources such as water and arable land reflects negatively on food and thus a lack of food supply, which pushes countries to rely on imports.

Achieving food security depends on technological investment in agriculture and environmental innovation to reduce the impact of environmental threats. Therefore, through the mentioned above, and as a researcher, I see that the issue of environmental threats is a difficult challenge to achieve and maintain food security, the latter is considered one of the most important issues that have raised a number of challenges as an essential part of the overall approach to human security that countries seek to accomplish, especially in light of climate change, scarcity of water resources and degradation of agricultural land, most of which are threats that not only affect agricultural production, but also lead to the creation of other effects on societies, especially the most vulnerable. This leads to food insecurity, which requires rebalancing environmental sustainability by adopting effective strategies and developing development policies that include social, economic and environmental dimensions, and ensuring the availability of food in a sustainable manner.

As a researcher on the subject of environmental threats and the problem of achieving food security, I drew my attention to the existence of several research areas that I believe there is a possibility to propose as future research to address and reduce these threats to achieve sustainable food security in the present and for future generations, respectively:

- Study on:

- Using artificial intelligence techniques to predict environmental threats.
- Agricultural biodiversity as a tool to address climate change and enhance food security.
- Environmental and food policies - a comparative study of international experiences that excelled in facing environmental threats and achieved sustainable food security.
- The impact of conflicts and wars on ecosystems - food security risk assessment -.
- The role of sustainable waste management techniques to reduce food loss.

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