

Climate changes and their repercussions on food security in Iraq

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Abstract

The study examined the impact of climate changes on the extent of achieving food security in Iraq, as the phenomenon of climate change posed a major threat to large areas of land resulting from the unsustainable exploitation of natural resources by humans. The research aimed to identify the reality of the phenomenon of climate change in Iraq as it is a region characterized by a climate It is semi-arid and sheds light on the extent to which Iraq is affected by these changes due to wars, pollution, drought and other environmental impacts. The results of this study showed that there is a clear climate change in most climate elements that has led to an increase in the general average temperatures as well as in the frequency of dust storms. And increasing daily levels of suspended particles, as well as environmental pollution. The exposure of large areas of land to deterioration directly contributed to the increase in the area of desertified lands threatened by drought and the loss of huge amounts of the surface layer due to the deterioration of vegetation cover, to soil deterioration and disintegration, land degradation and its repercussions on agricultural activity in Iraq and the resulting effects on food security and studying the reasons for the decline and decrease in Agricultural productivity to a level that does not meet the needs of local demand for it, and what are the implications of the inability of local production to meet the population's requirements on food security and self-sufficiency. In Iraq, there was and still is an urgent need to develop and develop agricultural productivity, especially the production of strategic crops, As one of the most important crops in the food security system, in order to secure the increasing demand for foodstuffs resulting from the increase in the population and the rise in their standard of living, and thus achieve food security.

Keywords: climate change, food security, strategic crops, environmental impacts.

التغيرات المناخية وانعكاساتها على الأمن الغذائي في العراق

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الملخص

تناولت الدراسة أثر التغيرات المناخية في مدى تحقيق الأمن الغذائي في العراق، لأن ظاهرة التغيرات المناخية شكلت تهديداً كبيراً لمساحات واسعة من الأراضي، فضلاً عن الاستغلال غير المستدام للموارد الطبيعية من قبل الإنسان، هدف البحث إلى التعرف على واقع ظاهرة التغيرات المناخية في العراق باعتباره منطقة تتميز بمناخ شبه جاف، وتسلب الضوء على مدى تأثر العراق بهذه التغيرات بسبب الحروب والتلوث والجفاف والتأثيرات البيئية الأخرى، وأظهرت نتائج هذه الدراسة بأن هناك تغيراً مناخياً واضحاً في أغلب عناصر المناخ أدى إلى زيادة في المعدلات العامة بدرجات الحرارة، وكذلك في تكرار العواصف الترابية، وزيادة المستويات اليومية لمجموعة الدقائق العالقة، فضلاً عن التلوث البيئي. وأن تعرض مساحات واسعة من الأراضي إلى التدهور ساهم بشكل مباشر في زيادة مساحة الأراضي المتصحرة والمهددة بالجفاف، وفقدان كميات هائلة من الطبقة السطحية بسبب تدهور الغطاء النباتي، لتدهور التربة وتفككها وتدهور الأراضي وانعكاساتها على النشاط الزراعي في العراق، والآثار الناجمة عنها على الأمن الغذائي، ودراسة أسباب تدني وانخفاض الإنتاجية الزراعية إلى مستوى لا يسد حاجة الطلب المحلي عليها، وما مدى انعكاسات العجز في الإنتاج المحلي عن مواجهة متطلبات السكان على الأمن الغذائي والاكتفاء الذاتي، وفي العراق كان وما زال هناك ضرورة ملحة لتنمية وتطوير الإنتاجية الزراعية، ولا سيما إنتاج المحاصيل الاستراتيجية، باعتبارها من أهم محاصيل منظومة الأمن الغذائي، بغية تأمين الطلب المتزايد على المواد الغذائية الناجم من الزيادة في عدد السكان وارتفاع مستواهم المعاشي، ومن ثم تحقيق الأمن الغذائي.

الكلمات المفتاحية: التغيرات المناخية، الأمن الغذائي، المحاصيل الاستراتيجية، التأثيرات البيئية.

Introduction

The climatic changes that the world is currently witnessing, especially the phenomenon of global warming that appears in different regions of the Earth, have affected Iraq in recent years, represented by high temperature rates, increased rates of solar radiation, and an increase in the frequency of dust storms, which led to negative effects.

Food issues and achieving food security in Iraq are one of the most prominent issues that receive the attention and study of researchers. Food shortages and the widening food gap have become the focus of attention of many conferences, organizations and parties interested in the issue of providing food to humans, including the 1996 conference, which was held under the slogan (Food for All) and discussed the possibility of addressing 839 million people are vulnerable to famine, and the number of hungry people in the world, according to 2018 statistics, reached more than 1,000 million people.

Agriculture is the basic basis for achieving food security, due to its importance in producing agricultural crops to meet the population's food consumption needs, as the world is witnessing increasing pressure on food, and more than 500 million people constantly suffer from food shortages.

Achieving food security requires the state to invest and exploit all available opportunities and capabilities to produce food in accordance with the principle of comparative advantage, that is, exporting surplus food commodities in which it has a comparative advantage and importing goods in which it does not have a comparative advantage, meaning that the state does not have the ability to produce them. The most important means of providing food security is self-reliance by providing food to the population in quantities and types in accordance with the needs of the population and international standards whenever possible.

-Search objective:

The research aims to identify the reality of the phenomenon of climate change in Iraq, as it is a region characterized by a semi-arid climate, and sheds light on the extent to which Iraq is affected by these changes due to wars, pollution, drought, and other environmental impacts, and their repercussions on agricultural activity in Iraq and the resulting effects on food security, and to study the causes of decline and decline in productivity. Agricultural production to a level that does not meet the needs of local demand for it, and what are the implications of the inability of local production to meet the population's requirements on food security and self-sufficiency.

-Search problem

The research problem lies in: -

- 1-What are climate changes? What is its impact on food security?
- 2-What is meant by the concept of food security? What are the indicators associated with it?

-Research hypothesis:

1- Climate changes and their phenomena include global warming, such as rising temperatures, lack of rainfall, the prevalence of drought, salinization of soil, deterioration of vegetation, and the spread of the phenomenon of desertification, which have repercussions on achieving food security.

2- Food security is the continuous provision of food in the quantity and quality necessary for activity and health for all individuals, based primarily on local production, and on the basis of indicators of the relative advantage of food commodities for each country, self-sufficiency and food deficit, and making it available to citizens, taking into account their incomes and financial capabilities.

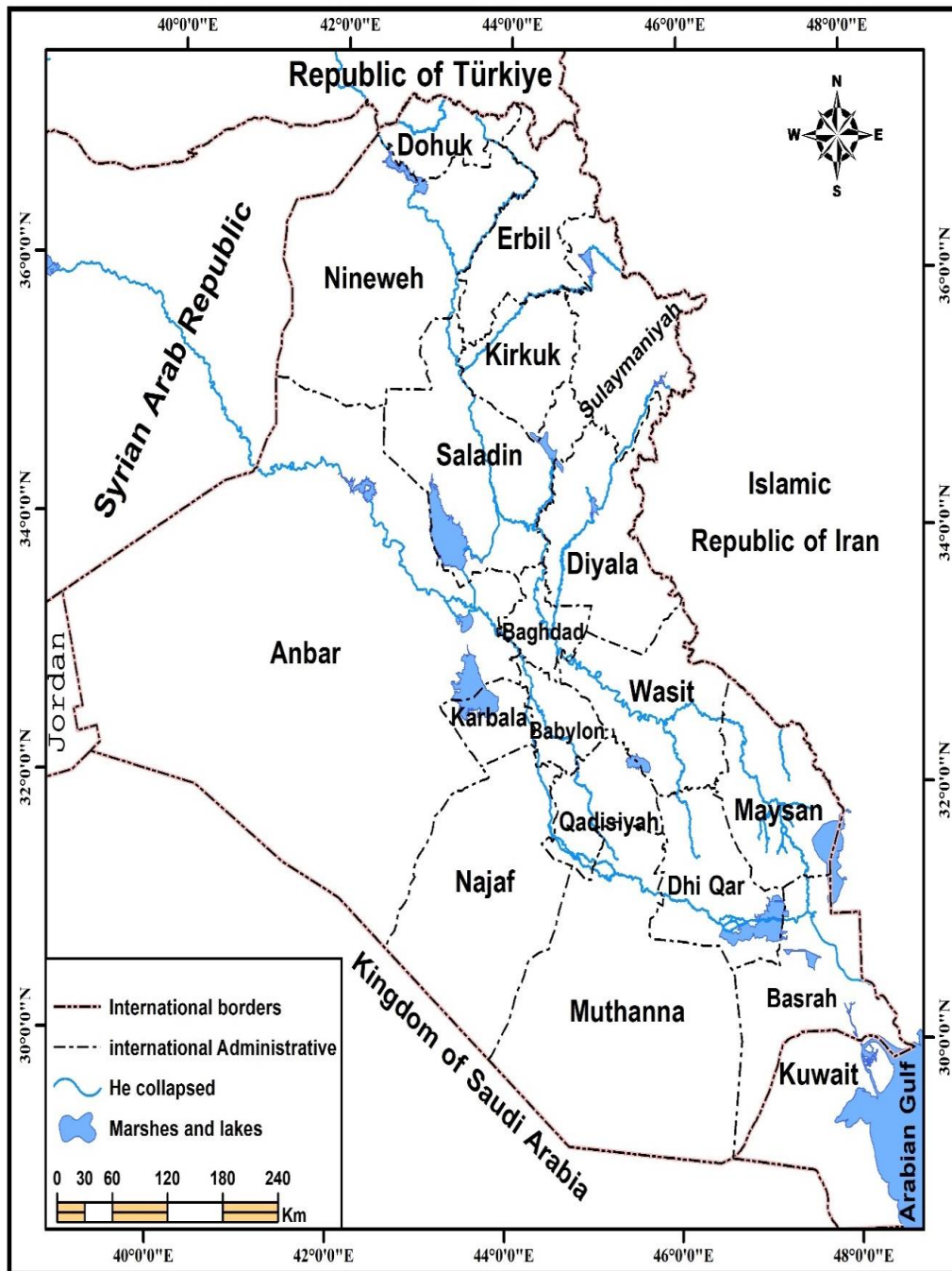
-The importance of research

The importance of the research lies in the fact that the phenomenon of climate change has been increasing in recent times and constitutes a major threat to large areas of agricultural land resulting from the unsustainable exploitation of natural resources by humans, and the exposure of large areas of land to the loss of huge amounts of the surface layer due to its deterioration and the spread of the phenomenon of desertification, which It has implications for achieving food security.

-Location of the study area

Iraq is located between latitudes (29.05-37.30) north, and longitudes (40.31-48.05) east ,Map -1- that is, in the southern part of the northern temperate zone in which agriculture is abundant. The total area of the country is (434,128) thousand km² (173,651) million dunums, and the area of arable land is (48) million dunums, constituting (28)% of the total area of the country. The area of cultivated land is (23) million dunums, constituting (47)% of the total arable area and (86)% of the cultivated area in the country. (Central Bureau of Statistics, Agricultural Census, 2021) From this it is clear that the percentage of land exploited for agriculture has decreased to The total area of the country.

Map -1- Administrative divisions of Iraq



Source: General Authority for Survey, map of Iraq, scale, 1/6000000, Baghdad, 2018.

-1- Concepts of the study

1- The concept of climate change: an old term, as the Earth was exposed during ancient geological times to periodic climate fluctuations for natural and geological reasons at the time. It is a global phenomenon that has different local impacts that vary from one place to another on the surface of the Earth depending on the nature and sensitivity of the ecosystems in each region. (Jaber, 2022)

The large changes in temperature that the world is witnessing today are the result of human activities and environmental pollutants emitted from the factories of developed countries and the use of chemicals in industry that have contributed significantly to the exacerbation of the phenomenon of global warming, which in turn has been reflected in rising temperatures and fluctuations in rainfall with the increased frequency of dust storms. The decrease in water levels. All of these phenomena are a result of the climate changes taking place.

Climate change is a change in the global climate system, meaning it is an imbalance in the proportions of climate components between excess and deficiency, which leads to negative effects on temperature, rain, wind patterns, and sea water levels that characterize each region because of their effects on natural biological systems. (Ali, 2012)

2-The concept of food security

The problem of providing food is one of the most troubling issues for most developing countries, which suffer from a deficit in their food production. Providing food in the quantity and quality necessary for activity and health on an ongoing basis for all individuals, relying on local production first and on the basis of the relative advantage of food commodities for each country, and making it available to citizens, taking into account their incomes and capabilities. Materialism.

The problem of food shortage is rooted in the lack of production capacity to meet the consumer needs of the population, as production levels have reached very low stages, barely covering more than 15% of the country's domestic demand (Al-Rawi, 2009), which has led to heavy reliance on imported products to meet the need. The market, which was reflected in the further deterioration of local production on the one

hand and the rise in prices of imported products on the other hand, and highlighted the severity of the food deficit.

3- The concept of self-sufficiency

It is one of the important indicators for many developing countries, as self-sufficiency demonstrates the country's ability to provide sufficient food for its population from local production, or it is the extent of these countries' ability to achieve high levels of self-sufficiency, especially in key strategic goods. (Aziz, 1987)

There are several degrees or states of self-sufficiency: -

A-Safe self-sufficiency:-

Self-sufficiency is secure when the produced quantity of the local agricultural commodity is equal to or greater than the quantity consumed by community members, according to the following formula:

(Secure self-sufficiency = domestic production \geq available for consumption)

B- Safe nutritional deficiency

Self-sufficiency in food commodities in the event of a food shortage is safe when the produced quantity of the local food commodity is less than the quantity available for consumption by community members and greater than half of it, that is, when the ratio of local production to that available for consumption is limited to (50% - 100%).

C- Dangerous nutritional deficiency

Self-sufficiency occurs in the stage or degree of dangerous food shortage, when the available locally produced food commodity constitutes less than half of the quantity available for consumption of that commodity, meaning that the ratio of local production to the available for consumption is limited to between (0% - 50%).

2- The relationship between climate change and food security

The Earth has witnessed in the four times and fifteen eras that it has undergone major changes in its climate, between hot periods and ice ages, and between dry and humid eras, and most of the periods that the Earth lived were within warm climates that included ice ages.

Iraq is located within the zone of temperature increase (1-2) C, and the continuation of human activities will have a role in raising temperatures (3-3.5) C.

Some studies indicate that Iraq is within the driest geographical area, and rainfall is below average by up to 40%, as a result of drought, fluctuating rainfall, frequent dust storms, and the expansion of areas suffering from desertification and its encroachment toward agricultural lands, which has had a negative impact on all economic sectors, especially agricultural ones. Some of which negatively affect the availability of food and food security.

The region witnessed a noticeable rise in temperatures of the order of (0.5-1) C. During the past fifty years, the period (1995-2005) was the warmest year. This period witnessed a decrease in the number of cold days and frost rates and an increase in the frequency of heat waves. The year 1998 was severely affected by Iraq, and the heat wave was severe until 2010, and rainfall decreased by (5-20)%. (Jaber, 2022)

The change in temperature was accompanied by a change in atmospheric pressure, wind, and other elements. An increase in wind speed and a change in atmospheric pressure levels were observed. The decrease in tropical and subpolar low pressure on the one hand and the increase in subtropical high pressure areas on the other hand means the intensity of the general wind cycle.

The trend of change in temperatures indicates an increase of (0.1 - 0.15) C annually in the past century, and this is parallel to the general global trend, which recorded a rise in temperatures of more than 3 degrees Celsius. The amounts of rainfall fell below their rates in Iraq, which in turn affected The sources of the Tigris and Euphrates rivers and the decrease in water releases from the source country in Turkey to Iraq as a result of the repercussions of global warming, which is one of the most important climate change phenomena.

The World Meteorological Organization and the United Nations confirm that the world is witnessing a rise in the Earth's temperature between (1.5-4.5) C, and there is a noticeable rise in sea level over the past century, reaching (60) cm due to the decrease in the level of ice.

Because Iraq is located in an arid and semi-arid region, the amount of annual precipitation has ranged between 50-200 mm in recent years, which has led to climate change and global warming to the phenomenon of drought, resulting in a significant decrease in the amount of rain and snow in the upper basin countries and a decline in incoming water revenues. To Al-Nahrain, where the amount of rain falling in Iraq decreased from 310 mm in the climate cycle (1941-1975) and to 242 mm in the climate cycle (1999-2009), with an amount of change of -2.78 mm. (Al-Shiblawy, 2010)

All of these climate changes resulted in many phenomena, including: global warming, desertification, and others, and the effects that they cause, as they constituted a major threat to large areas of land and their degradation, which contributed directly to increasing the area of desertified lands threatened by desertification and the loss of huge amounts of the surface layer due to Deterioration of vegetation cover, soil deterioration, dryness, disintegration, land degradation, and decreased agricultural productivity.

Global warming is the gradual rise in temperature in the layer near the surface of the Earth due to the increase in the emission of greenhouse gases, which affects the rise in temperatures, lack of rainfall, and lack of water supplies, and then the drying and salinization of the soil, and other damages to agricultural activity, biodiversity, and ecosystems.

Desertification is another manifestation of climate change and represents a threat to food security. It is a process of demolition and destruction of the earth's vital energy and then leads to desert-like conditions, as a result of lack of water or increased salinity in the soil, its dryness and disintegration, which affects vegetation cover and agricultural productivity.

It is a manifestation of the widespread deterioration of the soil and environmental systems in that region, and then affecting the fulfillment of human living requirements, resulting in the encroachment of the desert at the expense of arable agricultural lands, in addition to the

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threat to human existence. It has its causes, including environmental and social, and these factors vary from one place to another. As a result of the above

The consequences of desertification are dire in terms of the impact it has on food security as a result of the decline in the productivity of environmental and agricultural systems and their effects on food security.

3- The repercussions of climate change on food security (strategic crop productivity as an example)

Climate change threatens the livelihoods of thousands of people in vast areas of Iraq, and is considered one of the main factors that result in the phenomena of global warming, desertification, and the emergence of an imbalance between agricultural production and food consumption, as agricultural lands decline in their ability to produce in many areas of Iraq. Due to the deterioration and disintegration of the soil and its reaching advanced stages of erosion of its fertile layer. Over the past years, due to climate change, Iraq has witnessed the worst droughts it has ever experienced.

The lands suffered from a rapid growth rate of deterioration, desertification, and the depletion of the natural capabilities of the land, which affected the deterioration of its capacity and the failure of agricultural food production in those areas. The environmental statistics report for 2019 indicates that the percentage of desert and desertified lands reached 15.6%, while the lands threatened by desertification constitute 53%, meaning that the percentage of desertified lands reached 15.6%. The percentage of degraded lands constitutes 69.5% of the total land area in Iraq (Central Bureau of Statistics, 2020), in addition to the scarcity of water resources due to the decrease in water imports from upstream countries, which contributes to its increasing threat to food conditions and production in Iraq. Iraq faces the problem of providing the agricultural and food crops necessary to achieve sustainable food security, especially in light of the constantly increasing population growth rate. (International Food and Agriculture Organization, Rome, 1995).

In line with the research objectives, we will shed light on the reality of strategic crop productivity in Iraq as a model for the period

2010-2022 (Central Agency for Agricultural Statistics, 2020), as production levels have reached very low stages, barely covering more than 15% of the need for local demand. On the other hand, there is an increase population at rates exceeding the increase in food production rates, which widened the food gap and the weakness of the production capabilities of strategic crops to meet consumer needs, Iraq became a wide market for the sale of foreign products, which led to high rates of imports from abroad and dependence on imported products, which emerged from the problem of food security.

In order to ensure the sustainability and stability of strategic products, the state's role must be activated in developing the agricultural sector in general, producing strategic crops in particular, and raising the production level as a means of achieving self-sufficiency and food security. The deterioration of agricultural productivity in Iraq is the result of climate change due to increasing human activities and the loss and weakness of agricultural policies as a result of the high costs of agricultural production and limited state support for the agricultural sector, as well as competition from low-priced imported crops. This means that production capacity does not cover consumer needs, which requires reliance on On imports. Therefore, the research examined the reasons for the decline and decline in the productivity of strategic crops to a level that does not meet the need for local demand for them What are the implications of the inability of local production to meet the population's requirements on food security and self-sufficiency? Despite the great potential (natural and human) available in Iraq to develop the agricultural sector and increase the cultivated area to raise the productive capacity of the land and raise the level of production, the quantities of production are not commensurate with that. Resources and capabilities, as well as the population's needs and nutritional requirements.

In food security, sufficient quantities of food are available, and sufficient food supplies are available to meet consumer needs, and the stability of supplies refers to reducing the possibility of a decrease in food consumption from drought years to below the level of consumer requirements.

Wheat cultivation occupies the largest portion of the cropped area for grain production. During the period (2010-2022), the areas cultivated with wheat increased in varying ways, reaching its highest

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level in 2015, amounting to (6411) million dunums, while it reached its lowest level in 2020, amounting to (5050) million dunums.

As for the barley crop, the highest area amounted to (5,395) million dunums in 2018. It decreased by a small percentage, reaching (2,820) million dunums in 2019. While the areas occupied by summer crops (rice, yellow corn) amounted to (339,490) thousand dunums, respectively. With regard to the production quantities of wheat and barley crops, the highest amount reached (2748) (1137) million tons, respectively, in 2010, while they recorded the lowest production amount in 2018, amounting to 1,354 (million tons) (404 (thousand tons), respectively, while the production of summer crops reached) 393 (288) thousand tons respectively.

As for the yield of a dunum, it varies according to the variation in cultivated areas and the quantity of production. The highest yield for wheat and barley in 2010 reached (495.8) and (282.4) kg/dunum, respectively.

As for the dunum yield for summer crops, it amounted to (789.8) (587.3) kg-dunam, respectively. In 2018. (Central Agency for Agricultural Statistics, 2020)

It is clear from the above the extent of the variation in areas cultivated with strategic crops during the study period, which negatively affected the volume of production and the average yield per dunum, which requires activating the role of the state to develop and develop the agricultural sector to raise the level of production as a means of self-reliance and achieving food security.

Achieving self-sufficiency is linked to the available resources and capabilities and their ability to produce to meet the required needs. The lowest level of self-sufficiency in the wheat crop was (41.8%) in 2010, while the self-sufficiency rate of rice reached (36.6%) (The Arab Organization for Agricultural Development , Yearbook of Arab Agricultural Statistics, 2004-2020) for the same year, which is the lowest percentage of self-sufficiency during the period (2010-2022). This is due to climate change and its effects, and that more than half of the area cultivated with grains falls within the demesne zone, in addition to the use of traditional methods in agriculture. The lack of modern technology necessary to develop and increase production, in

addition to the weakness of the state's procedures to oblige farmers to cultivate 60% of large agricultural areas.

It is clear from the above that the self-sufficiency rate of wheat and rice during the study period falls within the stage of dangerous food deficit* (Arab Organization for Agricultural Development, 2008) due to the decline in local production of the two crops below the consumption need by more than double, which prompted the state to resort to imports in order to meet its needs. As for barley, the rate of self-sufficiency in it falls within the stage of secure food deficit. The second indicator is that all individuals at all times obtain sufficient food by providing stable food supplies that are physically and economically available to all. (Ahmed, 1999)

Achieving food security requires the state to invest and exploit all available opportunities and capabilities to produce food in accordance with the principle of comparative advantage, i.e. exporting surplus food commodities that enjoy a comparative advantage. Importing goods in which it has no comparative advantage, meaning the country does not have the capacity to produce them.

The most important means of providing food security is self-reliance by providing food to the population in quantities and types in accordance with the needs of the population and international standards whenever possible, even if the capabilities and foreign currencies necessary to obtain food from abroad are available.

Conclusions

1-Climate phenomena have increased in severity in recent years through rising temperatures, lack of rainfall, and severe droughts, and have become a real threat to food security, whose significant impacts are reflected in human life and constitute a major obstacle in addressing hunger, poverty and its effects, and overcoming the effects of climate change.

2 - Rising temperatures and changing rainfall patterns and fluctuations may cause a negative impact on agricultural crops, including strategic ones. This requires appropriate management of land use, increasing agricultural productivity, and then achieving self-sufficiency.

3- Climate changes have increased the pressure on environmental resources to meet food requirements, which requires uniting efforts to reduce them by all means, as they create an imbalance in the natural balance, which in turn affects food security.

4- Climate changes have impacts on food security as a result of the decline in the productivity of environmental and agricultural systems and their effects on agricultural production.

5- Failure to develop a plan and solutions that reduce the impact of climate change and ensure food security will negatively affect the food and health of citizens, especially the poor segments of them.

6- Despite the international efforts made to limit these climate changes, they have not succeeded in truly addressing them for economic and political reasons.

Suggestions

1- This study suggests to specialists to expedite the development of rapid programs and plans capable of confronting the dangers of these climate changes and reducing human activities that are harmful to the environment.

2- Crystallizing integrated and advanced production systems, that is, integrating research that addresses these issues and crystallizing them into a complete agricultural production system for specific agricultural commodities, meaning transferring the results of research and research centers to the field and consolidating efforts between researchers and agricultural extension workers and among farmer producers.

3- Adopting a specific, clearly defined strategy and developing its administrative, technical and scientific capabilities to develop the agricultural sector in Iraq, raise the level of local production, enhance

the rate of self-sufficiency in grain crops, and then achieve food security.

4- In the eyes of specialists, food security is considered human fuel and cannot be dispensed with under any circumstances, and this phenomenon will expose large areas to great risks. Therefore, food security must be regulated, one must avoid food waste, use more rational dietary patterns, and focus on healthy foods.

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